Federal Railroad Administration

Track Safety Standards Compliance Manual

United States Department of Transportation

Office of Safety Assurance and Compliance

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TABLE OF CONTENTS

Federal Railroad Administration
Track Safety Standards
Compliance Manual

Chapter 1
Introduction/General Guidance

Office of Safety Assurance and Compliance
Track and Structures Division

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CHAPTER 1

Introduction/General Guidance

Introduction to Track Inspection

The Track Safety Standards Compliance Manual (Chapters 1-7 and Appendix) provides technical guidance to Federal and State Track Inspectors. The Compliance Manual provides guidance for enforcement of the Track Safety Standards (TSS). The guidance provided in this manual may be revoked or modified without notice by memorandum of the Associate Administrator for Railroad Safety/Chief Safety Officer. This manual does not modify, alter, or revise the TSS in any way.

Comments, additions, and suggestions for future changes should be directed to Regional Track Specialists for consideration.

Inspectors should refer to this manual as often as necessary for clarification of FRA regulation interpretation and policy. When an inspector is unsure of meaning or intent in this manual, the inspector should promptly contact a Regional Track Specialist for guidance. The entire manual can be viewed and printed online at:

http://www.fra.dot.gov/us/content/460

Safety

The first priority of the Federal Railroad Administration (FRA) is safety. Therefore, all activities are to be conducted with personal safety and the safety of accompanying personnel in mind. Inspectors shall conduct activities in accordance with the safety instructions contained in the General Manual. Roadway Worker Protection, Bridge Worker Safety, and Roadway Maintenance Machine Safety guidance is in the Railroad Workplace Safety Compliance Manual online at:

http://www.fra.dot.gov/us/content/1719

Track Inspections

An Inspector's primary duty is to conduct inspections to determine whether the railroads are complying with the TSS and Railroad Workplace Safety (Bridge Worker Safety, Roadway Worker Protection, and Roadway Maintenance Machine Safety). Effective inspection requires identification, evaluation, and reporting of conditions and practices that fail to meet minimum Federal compliance requirements.

Since the purpose of regular inspection activity is to evaluate the performance of the carrier and the carrier's representatives in conducting thorough inspections and complying with the TSS, an inspection of track inspection records maintained by the carrier as required by 49 CFR 213.241 and 213.369 is necessary. Determine the adequacy of the carrier's inspections by evaluating what is recorded on the carrier's inspection reports, and determine if these reports reflect the actual conditions of the track structure.

To conduct a thorough inspection, the following preparations are suggested:

- Obtain the names and locations of the supervisor's territory to be inspected.
- Advise the supervisor of the territory to be inspected and invite them to have a railroad representative accompany you.
- Set a date, time, and location for the inspection.

- If you must change the date, time, or location, make every effort to contact the carrier as soon as possible to advise them.
- Determine what, if any, transportation will be furnished by the carrier.
- Always have a copy of the TSS and the Compliance Manual as reference.
- Carry properly calibrated track measuring equipment (tape measure, level board, string line).
- If possible, have the following information before the inspection:
    - Timetables and Special Instruction for speeds and restrictions.
    - Current slow orders.
    - Recent carrier track inspection reports.
    - Train, tonnage and hazardous material information.
    - Current and recent program work.
    - Current carrier RWP program.
    - Current CWR program (if required).

For information on general FRA policy, refer to the General Manual Part IV Chapter 2 for issues such as property entry, refusal to permit inspections, forcible interference with official duties, and release for entry and strike or labor disputes.

Opening Conference

Before starting an inspection, Inspectors should introduce themselves to all present and obtain a list of individuals participating in the inspection. An inspector may then explain the reason for the inspection as:

- Regular – to ensure the carrier's inspection process is adequate in finding, reporting, and remedying non-TSS-compliant conditions.
- Follow-up – or "re-inspection" of a regular inspection to ensure proper remedial action.
- Complaint – of unsafe conditions by an individual, group or entity. Caution must be used to not to identify the complainant. It is not mandatory to divulge that you are on a complaint investigation, as it may compromise the investigation. Inspectors should consult with the Regional Track Safety Specialist.
- Accident – investigations caused by derailments or accidents, etc.
- Waiver – investigation for relief from TSS.
- ATIP – FRA geometry car inspections (Chapter 3).
- Special Inspections – such as focused inspections or program enforcement.

During the Workplace Safety Briefing prior to the inspection, all parties involved should understand that FRA's goal is to help the carrier improve safety, and we welcome suggestions and ideas.

Closing Conference

Upon completion of an inspection, the inspector shall provide the carrier representative a report with all conditions that do not meet minimum safety requirements. Field reporting is discussed in Chapter 2. The reporting of exceptions to the standards is discussed in Chapter 4.

Federal Railroad Administration
Track Safety Standards
Compliance Manual

Chapter 2
Field Reporting Procedures and Forms

Office of Safety Assurance and Compliance
Track and Structures Division

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Table of Contents

CHAPTER 2

Field Reporting Procedures and Forms

Introduction

Inspectors must record each field inspection on a Track Inspection Report Form, F6180.96 (also called “form 96”). Inspection reports shall be completed and promptly submitted, even when an inspection is free of defect observations. The data contained in each F6180.96 form (including a railroad’s reply to corrective action items) transfers to FRA’s safety database for processing in order to permit the generation of several management reports. This data helps to determine the effectiveness of the overall inspection program, the degree of compliance, and the effect of the Track Safety Standards (TSS) on reducing track-related accidents.

The information obtained by inspection activities also plays a key role in the development of FRA’s National Inspection Plan. This Plan is a critical tool in providing for efficient allocation of FRA’s resources throughout the Nation in order to ensure the safety and viability of the general system of rail transportation.

Track Inspection Report Form, FRA F6180.96

General Instructions

This section describes the methods used to prepare an inspection report. Since January 1995, Track Inspectors have been recording their inspection activities on a multidiscipline form, FRA F6180.96. The purpose of the form is to record inspections and defects for placement into FRA’s safety database.

The Railroad Inspection System for Personal Computers (RISPC) provides Inspectors with the capability to enter inspection data via their PCs. This program allows Inspectors to maintain electronic records, which facilitates data analysis. Throughout RISPC, help instructions are available to assist in the navigation and use of the software (by using the menu’s “Help” selection or the question mark icon).

Each Inspector engaged in field inspection activities must complete a track inspection form 96 the day of the inspection, generating complete and legible information, and submit the form 96 to the railroad representative. Electronic RISPC-generated track inspection report entries are the preferred method to be used. Inspectors can utilize the hand-printed F6180.96 forms when necessary (e.g., computer failure). Inspectors must make hand-printed entries with a black ballpoint pen applying sufficient pressure to ensure legibility of copies. If additional space is required, Inspectors must use the 96a continuation sheet and number each page in the upper right corner of the report. When using a hand-written report, Inspectors should enter the information into the RISPC as soon as practicable.

Inspectors shall provide notice of defective conditions found on the day of the inspection by either: 1) an electronic PDF copy of the F6180.96 inspection report (e-mail or other electronic medium) or 2) a hand-delivered paper copy. If F6180.96 reports contain line items recommending a civil penalty, then a hand-delivered paper copy, signed by the Inspector, shall be provided to the railroad representative.

For special instructions on the completion of each field in the F6180.96 report, refer to [EM] Appendix C–Instruction, F6180.96 Track Inspection.

Special Instructions–Inspections from/to State Lines

Complete an inspection report that begins within a State, and terminates at the State line as follows: Enter the name of the community (if not originating in a community, use the county) nearest the inspection starting point in the "From City" block on the inspection form and the State line name from the drop-down menu in the "Destination City" block to indicate the State line. A four-digit artificial identifier code starting with the digits "99" to indicate a State line, followed by the two-digit State code for the adjacent State, is in the drop-down menu. For example, an inspection conducted from Erie, Pennsylvania to Ashtabula, Ohio, would be reported on two separate reports as follows:

First Report

From			Destination		
City:	Erie	2640			
State:	PA	42	City:	PA/OH State line	9939
County:	Erie	C049	County:	Erie	C049

Second Report

From			Destination		
City:	OH/PA State Line	9942			
State:	OH	39	City:	Ashtabula	0330
County:	Ashtabula	C007	County:	Ashtabula	C007

Inspection reports should be numbered consecutively. They can then be associated with each other in a listing of inspection activity, and a clear picture of the location of the entire inspection will be available.

An inspection crossing an entire State will show State line identifiers at each end, and will be associated with adjoining inspection reports by use of consecutive report numbers. For example, report an inspection from Pittsburgh, Pennsylvania, through West Virginia, to Columbus, Ohio, as follows:

First Report

From			Destination		
City:	Pittsburgh	6600			
State:	PA	42	City:	PA/WV State Line	9954

County:	Allegheny	C003	County:	Allegheny	C003

Second Report

From			Destination		
City:	WV/PA State Line	9942			
State:	WV	54	City:	WV/OH State Line	9939
County:	Brooke	C009	County:	Brooke	C009

Third Report

From			Destination		
City:	OH/WV State Line	9954			
State:	OH	39	City:	Columbus	1800
County:	Jefferson	C081	County:	Franklin	C049

Use a county or nearest city code for inspections beginning or ending at international borders (e.g., Canada or Mexico).

Note: When an inspection occurs at one point only, for example an inspection within the confines of a yard in one municipality, it is not necessary to fill in the “destination” fields.

Defect Line Item F6180.96 Reports

Inspectors must upload their RISPC inspection reports on a weekly basis. If an error is discovered requiring correction of a report, then the corrected report must be issued to the railroad representative. Furthermore, as soon as possible, the corrected report must be uploaded to FRA’s data contractor.

When making an unaccompanied inspection, the Inspector will deliver a copy of the report to the railroad personnel having jurisdiction in the area covered by the report. However, when an inspection such as one from a train occurs and no defects are noted, it is not necessary to deliver a copy of the report.

In the track discipline, do not mix defect-only line items and items checked yes in the recommended for violation field on an F6180.96 form. In the case where an Inspector discovers defect items and violation items during an inspection, these will require at a minimum two separate reports (one with defects only and another with violation items only). See below for line items with a recommendation for violation.

Violation Recommended Line Item F6180.96 Reports

Inspectors shall complete a separate F6180.96 report for any item(s) identified for recommendation for violation. However, the above instructions pertaining to uploading and corrections also apply to reports containing items checked “yes” in the “Violation

Recommended" field. In addition, carefully monitor the "Written notification to FRA of remedial action required" field to ensure railroads are complying with this requirement. Failure of the railroad to comply with the written notification requirement should be considered for a violation (Part 209, Section 405(a).

Multiple violation line items on an F6180.96 report must be of the same CFR Part, because all items from such a report will automatically populate into an F6180.111 violation narrative report (see below).

Violation Report Narrative - FRA F6180.111

General Instructions

It is always necessary to provide supplemental information to an F6180.96 by writing a narrative report (F6180.111) when recommending a violation. These written narratives will accompany the F6180.96.

In the RISPC system, use F6180.96 forms that contain items recommended for civil penalty to generate an F6180.111. Open the RISPC main menu and perform the following actions:

1. Select "Other Programs"
2. Select "New Violation Report"
3. At the blank violation screen, select "New Report"
4. From the Inspection Reports Wizard select the appropriate violation form (Track 213), [1]
5. Highlight the report and line item number you want and click on "Select and Create Violation Report"
6. Inspectors are to enter their sequential violation number and click on "OK."

Note [1] when recommending violation for a Roadway Workplace Safety item, select the Track-214 form.

For special instructions on the completion of each field in the F6180.111 report, refer to Appendix D–Instructions, F6180.111 Track Violation.

A narrative submitted with a track inspection report should contain sufficient detail to completely describe and support the inspection activity. Copies of all pertinent data, such as railroads' plans, records, bulletins or orders; any pertinent photographs, the names and titles of railroad employees who were witnesses, the time of day when the inspection or investigation was conducted, and the location of any violation with reference to some fixed object should also be furnished to further support the inspection activity. GPS coordinates, if available, may also be used.

When filing a violation report, take great care to obtain adequate evidence to support the violation. This should include evidence through personal observation and/or records indicating train operation(s) over the track defect. Also include, evidence that the railroad should have known (knowledge standard) that the defect existed must be included in accordance with §213.5(a), which states that the track regulations apply to any track owner "... who knows or has notice that the track does not comply with the requirements...." This is the "knowledge standard."

If pertinent, include copies of previous FRA track reports or the railroad's own records to document prior knowledge given to the railroad indicating the presence of the track defect. Establish knowledge of a defect by constructively showing that the defect is of such a nature that the railroad would have known of the defect from past track inspections. See Chapter 4 of this manual for additional instructions concerning the knowledge standard.

Inspectors should be careful to identify, in the narrative report, all circumstances or facts that the Inspector did not witness by stating the source of such information. If necessary, accomplish this by attaching a report of an interview to the narrative report. Identify all copies of records by providing the name, title, and address of the custodian of original records.

Submission of Photographs as Evidence

Photographs can be very strong evidence in support of a violation. When utilizing photographs in the violation narrative package, explain what each photograph shows. Clearly identify what each photo illustrates in support of the violation. In violations with multiple counts or line items, caption each photo to link it to a specific violation item. Submit two copies of each photograph to FRA's Office of Chief Counsel to ensure that the respondent will have the same evidence FRA has in its possession.

Digital photographs are an acceptable alternative to conventional prints. The use of software to place descriptions or pointers to help the reader understand the nature of the violation is acceptable. However, photographs shall not be digitally manipulated in any manner to alter the appearance of any item or element in the photograph. In addition, annotate digital photographs to indicate that there are no electronic alterations.

Statements of Witness

Unless a violation is substantiated by an Inspector's personal knowledge, the railroad's own records, or admissions of railroad officials contained in reports of interview, the violation report should be accompanied by one or more witness statements on the appropriate "Statement of Witness." (That form is designed for use by railroad employees; if a statement is being obtained from a nonemployee, consult the Office of Chief Counsel about how to proceed.) The witness statement must clearly substantiate any element(s) of the violation not established by other evidence. As in any type of 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. The safety laws (49 U.S.C. §20109[h]) prohibit 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, and mailing address of the person who was interviewed.

Copies of Railroad's Records

When necessary, the violation report must be accompanied by legible copies of the railroad's relevant records containing information that will provide FRA's Office of Chief Counsel with substantiating documentation of the violation. The violation report should give a clear understanding of how the documents help demonstrate 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.

Violation Report Package Arrangement

Arrange the violation report package in the following order:

1. Form FRA F6180.111, including any continuation sheets.

2. Original Form FRA F 6180.96 containing the recommendation for civil penalty (Exhibit A).
3. Form FRA F 6180.96 reports for the inspection that includes the defects not recommended as violations (identified as an Exhibit).
4. Statements of Witness, if any (identified as an Exhibit).
5. Copies of pertinent pages of the timetable and any other instructions that are in effect at the time of violation, such as a temporary speed restriction that amends the authorized speed (identified as an Exhibit).
6. Photos as described above. Photos should clearly illustrate the severity of the violation, any dynamic movement added to a measurement, or anything to further document why the defect is recommended for violation. Do not include photos if they do not show something that is significant in supporting the violation (identified as an Exhibit).
7. Copies of railroad records when they are available and are part of your determination to recommend a violation (identified as an Exhibit).
8. Include any other items that may further substantiate that a violation is in order (identified as an Exhibit).

For identification purposes, each attachment to the violation report package must be labeled with the Inspector's initials and the violation report number typed in the upper right corner of each sheet. Annotate any attachments in the upper right corner of each page with the date, time, and location the document was received, and it should indicate the name and title of the person (custodian of records) from whom the document was received.

Example: JRI-35 / 09-10-00 / 9:15 a.m. / New Orleans, LA

If an Inspector feels that a violation needs special handling, the Inspector must submit an additional cover memo (to be signed by the Regional Administrator) justifying the recommendation. Special handling includes a penalty above the amount shown in the penalty schedule (Appendix B to Part 213), up to or including the maximum penalty of $27,000, or when numerous counts of multiple days are recommended.

Supervisory Review

Upon receipt of a Track Inspection Report, or any other report submitted by an Inspector, the Track Specialist will make a thorough review to determine:

- Completeness of the report.
- That it has been prepared in accordance with outstanding instructions.
- That the type and number of inspections are consistent with the goals of the FRA.
- Focused attention on violation reports that the Inspector has recommended for civil penalty. The penalty schedule issued in conjunction with the TSS provides penalty amounts for each standard violated. The Inspector's recommendation for prosecution should leave no doubt as to the degree of seriousness of the violation in order to assess the appropriate penalty.

Before uploading an F6180.111 form to the RISPC system and sending hard copies to the regional headquarters, Inspectors are to send a draft copy to their Supervisory Specialist for review. An electronic draft copy can be generated by "printing to PDF" and e-mailing it. The

Specialist—after considering the hazard of the specific track violation, the railroad's record of accidents, and its overall compliance attitude—should indicate his/her concurrence or nonconcurrence with the Inspector's estimate of the seriousness of the violation. The Specialist may also indicate edits or corrections the Inspector can incorporate into the final report package.

If the Specialist does not concur with the Inspector's estimate of the seriousness of the violation, the Specialist should prepare a memorandum stating that fact and the reasons for his/her nonconcurrence. He/she should address the memorandum to the Regional Administrator, attached to the violation report and a copy furnished to the Inspector. The report should then be discussed with the Inspector.

Violation Report Package Distribution

Upload the F6180.111 form narrative to the RISPC database within 30 days after the date of the inspection report. After the upload process, Inspectors shall prepare paper copies of the entire violation package (F6180.111 and all attachments) and send them to their Specialist. The violation report package will include a copy of the inspection report and supporting documentation. Inspectors shall prepare and submit to the regional office an original and two copies of the report. If the report has photographs, include photographs on the original and copies. Do not use photocopies.

After review by the Supervisory Specialist, the region will distribute the original and two copies received as follows:

- The original report with photographs and one copy of the report with a duplicate set of photographs to FRA's Office of Chief Counsel.
- One copy, including photographs, for the regional file.

Note: In addition to the above, one copy of only the transmittal form shall be submitted to the Track Division (RRS-15). The Inspector may wish to retain a copy for his or her file.

Number the violation narrative reports sequentially throughout each Inspector's career without regard to the end of any calendar or fiscal year. FRA F6180.96 attachment(s) to the narrative will continue to be numbered independently based on the calendar year.

Special Notice for Repairs

General Guidelines

The Special Notice for Repairs Report (SNFR) is an effective instrument to handle certain circumstances in which a railroad does not take the proper remedial action to address defects. Use it in accordance with current FRA policy and in circumstances where noncomplying track conditions are repetitive or pose a safety risk. For example, if an Inspector has determined that a segment of track does not comply with 49 CFR Part 213, is unsafe for continued service, or presents an imminent safety hazard to railroad employees or the general public, and if voluntary compliance has not been undertaken by the railroad, then Inspectors should be prepared to issue a Special Notice for Repairs under the guidelines described in Chapter 4 of the Track Safety Standards Compliance Manual. Line items in the Inspector's F6180.96 that support the SNFR should have the line item box labeled "SNFR" checked.

Special Notice for Repairs F6180.8 Instructions

When the defects noted on the SNFR form are representative of general conditions identified on the track segment, the Track Inspector should include a note on the Track Inspection Report form stating that the conditions reported are representative of the conditions on the identified track segment. Attach copies of the Form F 6180.96 to the SNFR form (F6180.8).

Fill out the original and three copies of the SNFR form. Give the original to the appropriate carrier official and distribute the copies as follows:

1. The first copy–send to the Track Specialist.
2. The second copy–forward to the Office of the Associate Administrator for Safety, attention Track Division, RRS-15.
3. The third copy–Inspector's file.

Upon receipt of an SNFR, the railroad may appeal the decision of the Inspector to the Regional Administrator. Such appeal must be in writing. The Regional Administrator will then assign an Inspector, other than the Inspector who originated this action, to reinspect the track. If the decision of the original Inspector is sustained, the Regional Administrator will notify the railroad that the appeal is denied.

If found to be safe to operate at the class deemed proper by the railroad, the Regional Administrator will immediately notify the railroad that the restriction is no longer in effect. In the case where doubt exists as to the seriousness of the conditions, the Regional Administrator can postpone the effective date of the slow order until a reinspection occurs. Only the Regional Administrator has this authority. Inspectors shall not make any statement that could be an indication of how FRA will resolve the appeal.

For instructions concerning the completion of Form F6180.8, in RISPC, see Appendix E–Instructions, F6180.8 Special Notice for Repairs.

Special Repair Remedial Action Report F6180.8a Instructions

An appropriate railroad official completes the Special Repair Remedial Action Report (SRRAR). It indicates remedial action taken by the railroad to correct the noncomplying condition(s) listed on the SNFR. The RISPC program will populate data from the SNFR to the SRRAR once the SNFR is completed. Inspectors will have the option of printing a hard copy or saving the SRRAR in PDF. In addition, Inspectors will also have the option of emailing the report to the appropriate railroad official. However, Inspectors are encouraged to hand deliver a hard copy of the SRRAR, along with the SNFR, to the appropriate railroad official whenever possible and should always mail an original copy of each to the railroad.

For instructions concerning the completion of Form F6180.8, in RISPC, see Appendix F–Instructions, F6180.8a Special Repair Remedial Action Report.

Reinspection

When assigned to reinspect track involved in an SNFR, the Inspector shall commence that activity immediately. The Inspector will conduct the reinspection in accordance with the provisions of Chapter 1 of this manual and it will be made over the entire limits covered by the SNFR. The Inspector will determine if the defects present support the decision to issue an SNFR. The Inspector must also submit to the Regional Administrator a thorough and complete written report that must include:

- A written description of the conditions found.
- Field measurements (where applicable).
- Photographs.

- A statement giving reasons for either denying or approving the appeal.

The reinspection will take into consideration all aspects of the TSS and shall not be limited to the defects listed on the SNFR.

It is the responsibility of the Track Specialist to keep the Regional Administrator advised of developments as they occur. If the carrier does not provide an F6180.8A to FRA in 30 days, then a followup inspection will be conducted. The purpose of this inspection is to determine if the carrier is complying with the provisions of the SNFR. If the carrier does not address the conditions noted in the SNFR, then refer to the section titled “Violation of FRA Emergency Order or FRA Special Notice for Repairs,” in Chapter 4.

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Appendix A - Activity Codes

Activity Code	Description	Use/Instructions	Instruction for No. of Units
209	Remedial Action not Reported	Document a railroad's failure to report remedial action required on a previous inspection.	
217O	Other Operational Observations	Document railroad operational rule deficiencies.	
218C	Camp Car Protection	Document an observation concerning Part 218, Subpart E, §§218.71 to 218.80.	
ATIP	Automated Track Inspection Program Surveys–FRA	Document an inspection onboard an FRA geometry car.	Document only one unit per track mile.
BAP	Review Subpart G Barrier Plan	See §213.361.	
BWK	Bridge Worker Safety	Document an observation or a deficiency concerning Railroad Workplace Safety, Subpart B.	Document one unit for each bridge gang or work group (EDM).
CWRP	Review CWR Plans	Document the review of railroad CWR plans or document a defect. See §§119 (low speed) and 343 (high speed) of the Track Safety Standards. Inspectors are also to claim a CWRP unit whenever conducting a track inspection where there is any CWR observed.	Document only one unit for review of railroad CWR plans. Inspectors are also to claim only one unit whenever conducting a track inspection whenever any CWR is observed, regardless of the mileage.
DER	Inspect Derail	Document an observation or deficiency of any derailing device (i.e., block/sliding derail or switch point assembly used to divert free-rolling equipment off the track).	Document only one unit per derail inspected.
GRMG	Inspection from Gage Restraint Measurement Vehicle–Government Owned	Document an inspector's observations occurring onboard an FRA-owned gage restraint measurement vehicle.	Document only one unit per track mile.
GRMS	Inspection from Gage Restraint Measurement Vehicle–Other Than Government Owned	Document an inspector's observations occurring on board a railroad owned gage restraint measurement vehicle.	Document only one unit per track mile.

Activity Code	Description	Use/Instructions	Instruction for No. of Units
HGCT	Highway-Rail Grade Crossing–Track	Document vegetation that interferes with motorist visibility of highway-rail grade crossing warning devices. See §§213.37(a)(2) and 213.321(a)(2).	Document only one unit when vegetation interferes with motorist visibility of highway-rail grade crossing warning devices.
LRA	Inspect Lift Rail Assemblies	Document an observation of railroad bridge lift-rail assembles and associated devices such as expansion joints.	Document only one unit per railroad bridge lift-rail assembles and associated devices such as expansion joints. Each assembly on a bridge is considered a unit and each track on a moveable bridge should have four lift rails. Record an LRA unit for each assembly inspected.
MSB	Bridge Observation	Document an observation of a railroad bridge structure. See FRA bridge policy.	Document only one unit per bridge observation. A unit may only be claimed when walking on a bridge and specifically inspecting/checking bridge structural components. This includes inspection of track on an open-deck bridge where the timbers are an integral structural load distribution element of the bridge.
MTH	Inspect Main Track–Hi-Rail	Document an observation of main track while on board hi-rail or other on-track vehicle such as a motorcar.	Document only one unit per occupied track mile inspected.
MTW	Inspect Main Track–Walking	Document an observation of main track inspection while walking.	Only one unit per track mile walked. Example: if an inspector walked three curves at three different milepost locations averaging 800 feet per curve, only one unit should be documented.
NOIS	Conduct Wayside Noise Inspection	Document test of wayside noise. See Railroad Noise Emission Standards, 40 CFR Part 201. Consult industrial hygienist for additional guidance.	

Activity Code	Description	Use/Instructions	Instruction for No. of Units
QTP	Review Subpart G Qualification Test Plans	See §213.345.	
QVT	Vehicle Qualification Testing	See §213.345.	
RMI	Inspect Rail Mill Facility	Document an officially directed visit to a rail mill.	Document only one unit when officially directed to visit a rail mill.
RMM	Roadway Maintenance Machine & Hi-Rail	Document an observation or a deficiency concerning Railroad Workplace Safety Subpart D.	Only document roadway maintenance machines or hi-rail vehicles that you observed. Example: a large scale tie unit consisting of 10 roadway maintenance machines and one hi-rail vehicle; you inspect five machines and one hi-rail for deficiencies. Units would be six.
ROWP	Review Subpart G Right-of-Way Plan	See §213.361.	
RWP	Roadway Worker Protection	Document an observation or a deficiency concerning Railroad Workplace Safety, Subpart C.	Only document one unit when attending a job briefing consisting of a group of employees. When walking a production crew and questioning at different locations with seven employees pertaining to type of on-track protection, this would be seven units. Each train that is required to give an audible warning is one unit.
RXM	Inspect Rail Crossing–Main Track	Document an observation or a deficiency concerning an at-grade, rail-to-rail crossing (diamond) located in a main track. May only be claimed during a walking inspection.	Document one unit per rail crossing
RXY	Inspect Rail Crossing–Yard Track	Document an observation or a deficiency concerning an at-grade rail-to-rail crossing (diamond) located in a yard (other than main) track. May only be claimed during a walking inspection.	Document one unit per rail crossing

Activity Code	Description	Use/Instructions	Instruction for No. of Units
SPCL	Speed/Class Inspection	Document use of radar to determine compliance with excepted track and track class.	Document only one unit per track mile.
TGMS	Inspection From a Track Geometry Measurement Vehicle (Other Than Government Owned)	Self-explanatory.	Document only one unit per track mile.
TOM	Inspect Main Track Turnout	Document observation or a deficiency concerning a turnout located in a main track. Only record for turnouts walked.	Document number of turnouts inspected (walked).
TOY	Inspect Yard Track Turnout	Document observation or a deficiency concerning a turnout located in a yard (other than main) track. Only record for turnouts walked.	Document number of turnouts inspected (walked).
TREC	Review Railroad's Track Inspection Records	Document an observation or a deficiency concerning an inspection of carrier's official inspection records.	Document number of reports viewed.
TRM	Inspection From a Train	Document observation of track/train interaction, right-of-way signage, signals obscured, etc. when on board a train. Under this activity code, Part 213 defects are limited to vegetation.	Document only one unit per track mile.
VTI	Inspection From a Vehicle/Track Interaction Car	Self-explanatory.	Document only one unit per track mile.
WPI	Inspect Welding Plant Facility	Document an officially directed visit to a rail welding facility.	Document only one unit.
YTH	Inspect Yard Track–Hi-Rail	Document an observation or defect of yard (other than main) track while onboard hi-rail or other on-track vehicle such as a motor car.	Only one unit per track mile hi-railed. Example: if an inspector hi-railed three yard tracks averaging 1500 feet per track, only one unit should be documented.
YTW	Inspect Yard Track–Walking	Document an observation or defect of main track inspection while walking.	Only one unit per track mile walked. Example: if an inspector walked three yard tracks averaging 1500 feet per track, only one unit should be documented.

Appendix B - Source Codes

Source Code	Description	Use/Instructions
A	Regular Inspection	A periodic inspection activity conducted by Federal and State railroad safety inspectors in accordance with established procedures to determine railroad, shipper, consignee, contractor and manufacturing facility compliance with Federal statutes, rules, regulations, orders and standards within the jurisdiction of FRA.
B	Complaint Investigation	An inspection initiated by a complaint when an investigation is conducted. This code may only be used when a file number has been assigned.
C	Accident Investigation	An inspection or series of inspections resulting from an accident/incident. This code may only be used when a file number has been assigned.
D	Special Inspections or Investigations	Inspections or investigations initiated with a specific reason or purpose. This code may only be used when a file number has been assigned for that specific reason or purpose. Use this code for activities formerly termed “focused inspections.”
E	Waiver Investigation	Inspection–investigation for temporary relief from Federal regulations. This code may only be used when a file number has been assigned.
F	Unused/Reserved	Unused/reserved.
G	Unused/Reserved	Unused/reserved.
H	Nuclear Route Shipment	Inspections of nuclear routes or shipments as specified in the Safety Compliance Oversight Program (SCOP) Plan.
I	ATIP Survey	Use this source code with an Office of Safety-assigned ATIP survey file number (e.g., CSXT0126). Use this code when inspecting track during ATIP active status surveys. Fill out only the report header of the form during these inspection activities. Do not record survey defects on the ATIP Survey 96 Form. When the car is stopped to verify defects, those items shall be recorded on a separate 96 Form using source code J-ATIP Followup (see below). Enter only the number of miles of track inspected under the (activity code) unit’s field. This is to correspond with the daily number of miles operated by the ATIP geometry car either self-propelled or towed by a locomotive during an ATIP active status survey.

Source Code	Description	Use/Instructions
J	ATIP Followup	Use ATIP number corresponding to the original survey file number (e.g., CSXT0126) assigned by the Office of Safety. On-the-ground field verification of reported noncompliance conditions will normally take place at some time following the survey. If using field verification procedures while the ATIP vehicle is in survey status and citing noncompliance conditions, the inspector must initiate a report separate from the one required under ATIP survey. Under no circumstances should you use data generated by the ATIP vehicle to cite defects from the standards without the inspector first verifying their existence through field verification procedures.
K	Unused/Reserved	Unused/reserved.
L	Regular Inspection of STRACNET Segment	Special codes identify inspections conducted on track segments of the Strategic Railway Network (STRACNET), an assigned military route important to National defense. The regional track specialist will keep inspectors informed of railroad routes in this network. Inspectors are to ask their supervisory track specialist about updating correct information annually.
M	Special Inspection or Assessment of STRACNET Segment	Assigned investigations identified along designated military routes important to the national defense. Specifically directed by Headquarters, these inspections have an assigned file number. Examples include multidiscipline team inspections to assess the condition of a rail line in anticipation of Government shipments or ongoing safety monitoring of a funded project.
N	ATIP Inspection of STRACNET	ATIP inspection of STRACNET line (see L).
O	RS&I Investigation	S&TC use only.
P	PS-AP Investigation	S&TC use only.
Q	False Proceed Investigation	S&TC use only.

Source Code	Description	Use/Instructions
R	Reinspection	Use to identify all previous inspections made on track segments within a 90-day period. Although the 90-day limit is arbitrary, it is in keeping with the need to verify railroad responses to previously detected safety hazards. A reinspection can disclose a track condition where nothing has been done by the railroad to initiate remedial action, under §213.5(a) responsibility. A reinspection report will cover only those units inspected during the initial inspection. Record other identified defective track conditions reported on a separate form, F6180.96, using the appropriate source code (initial) for that activity. Use 5-digit inspector ID number and report number of initial inspection (i.e., 16680-999). The same inspector may or may not conduct the initial inspection and the reinspection. RISPC is not intuitive enough to recognize and associate reports not made by the same inspector.
S	Unused/Reserved	Unused/reserved.
T	Unused/Reserved	Unused/reserved.
U	Unused/Reserved	Unused/reserved.
V	Inspection of Manufacturer's Facility	MP&E/Hazmat only.
W	Unused/Reserved	Unused/reserved.
X	Activation Failure	S&TC only.
Y	Unused/Reserved	Unused/reserved.
Z	Outbound Extend Haul Trains	MP&E only.

Appendix C - Instructions, F6180.96 Track Inspection

F6180.96 Field	Format	Instructions/Special Features
Inspector's ID Number	Numeric	The RISPC automatically places the inspector's ID number in this field. An inspector using a hand-printed report must show the assigned five-digit identification number. This field is mandatory because RISPC rejects a report without the inspector's ID number.
Report Number	Numeric	A report number assigned to each inspection activity. Inspectors must number their reports consecutively beginning with number one (1) on the first inspection day of each calendar year. Care must be taken so that subsequent numbers are correct and not duplicated. This field is automatic with RISPC and will generate a mandatory report number, or you can enter a report number up to a maximum of 999. A maximum of three digits in each number is allowed.
Date (of an Inspection Activity)	Date	Inspectors must show the correct inspection date and enter the occurrence of the inspection activity. The field is mandatory and automatically entered by RISPC. Indicate by a two-digit number each the year, month, and day of the inspection. For example, enter June 19, 2001, as 06/19/01. Inspectors can make an entry postdated, but they cannot predate inspection reports.
Violations Recommended	Check Box (Y/N)	If a track inspector recommends a civil penalty (violation) against a track owner or other responsible party, a narrative report is generated (F6180.111) by RISPC. The narrative numbering sequence begins with the first report submitted by an FRA inspector and continues sequentially throughout their career without regard to the annual inspection numbering. The F6180.96 form that accompanies an inspector's violation report must have one or more line items with the "yes" field (recommended as violations to Chief Counsel). Where a variety of defects are discovered during an inspection (e.g., some of which meet the criteria to support a recommendation for civil penalty), two separate reports must be prepared: 1) a report listing defects only and 2) a report listing items recommended for civil penalty only. See instructions under "Violation Report Narrative - FRA F6180.111".
Railroad/Company Name and Address	Drop-down List/Text	Enter the name of the railroad/company responsible and the subject of the inspection. RISPC users default to the R/C field first, then enter in the RR/CO. code. This field generates a name and address based upon the railroad code input. In RISPC, click on the "table lookups" button to search for and select a code. Click the scroll bar arrows or drag the field in the scroll bar to look through the entries. You may also search through the entries, and enter division and subdivision.
R/C	Drop-down (Y/N)	Enter either the code "R" if the report is for an inspection of a railroad defined in the general railroad system of transportation or a "C" for a company (facility) not a part of the general railroad system of transportation. This field is mandatory and is necessary for the proper classification of reports. Source code V should be associated with this type of activity (e.g., inspection conducted in a welding plant [activity code WPI] or rail plant [RMI] facility).

F6180.96 Field	Format	Instructions/Special Features
RR/CO. Code	Drop-down List/Text	Enter the code assigned by FRA for the railroad/company. This field is mandatory. If the required information is missing or invalid, RISPC will flag the report as incomplete pending inspectors' verification and correction. Indicate the name of the railroad responsible for the maintenance of the track, for which the report is prepared, and the correct alphabetical code for that railroad in the space provided on the form. In addition to the RISPC listing, the source of this code is published in Appendix A of the FRA Guide for Preparing Accident/Incident Reports, without periods, hyphens, or other additions (maximum of four characters).
Division	Text	RISPC allows division codes—an elective for regional inspector purposes. Division is the alphabetic code representing an operating division (or region–district) of a railroad. For railroads not divided into operating divisions show as "System."
Subdivision	Drop-down List/Text	Railroads can be organized into subdivisions (sometimes called branch lines, or other names), identified in timetables or other railroad special instructions. Using the RISPC drop-down list, enter the name of the subdivision at the location the inspections were made. If the RISPC system does not contain the subdivision name, use "system." In such a case, inform the regional track specialist to have the name added into RISPC. This field is mandatory.
RR/CO. Representative (Receipt Acknowledged)	Text	Print the name and title of the railroad official contacted or accompanied. Obtain a signature, acknowledging receipt by an accompanied railroad official and initialed on the continuation sheets, to signify receipt of their copy. RISPC allows you to input data, search, and recover representative record information. If an unaccompanied inspection becomes necessary, show the word "unaccompanied" in this field. If, on the day of inspection, the inspection report cannot be personally delivered, those defects and their locations must be given by phone at the end of the day to a responsible railroad official. Note the time, date, name and title of the person who receives this defect information on the track inspection report form. Mail the railroad's copy to the appropriate railroad official. When using the RISPC program rather than generating a printed copy, it is acceptable to e-mail a PDF copy to the railroad representative. A return e-mail from the railroad representative is an acceptable alternative to a signature of receipt. This is only acceptable for F6180.96 reports that do not contain line items recommended for civil penalty.

F6180.96 Field	Format	Instructions/Special Features
From City/State/County	Drop-down List/Numeric	RISPC allows users to open State codes from a drop-down menu. Identify the city, State, and county name, as applicable, where the inspection activity began. In addition to an imbedded lookup in the RISPC program, all appropriate codes regarding the city, State, and county names are in the GSA Worldwide Geographic Location Guide books. Leave this field blank whenever an inspection did not take place in the boundaries of a city, town, etc. However, list State and county code identifiers, as they are mandatory. Precede county codes with the letter "C" to ensure that a listed city it is within the geographic boundaries of the county identified. If conducting an inspection between two points, enter in the appropriate field the name and code of the county the inspection began. Also, see "Special Instructions - Inspections From/to State Lines" above. This is a mandatory field.
Destination City and County	Drop-down List/Numeric	Complete this field if the inspection activity involves a destination other than a location identified in the "From City/State/County" field. It is not necessary to complete this field when inspections are contained within a single location, but follow instructions for "From City/State/County." Enter, in the field, the State and city codes of the inspection point as shown in the GSA. If the inspection point is not near a city, substitute the county name and code from the RISPC table lookup menu. When using the county code, the letter "C" will precede a three-digit number (e.g. C021 or C131 for counties, respectively). Do not record an inspection extending into more than one State on the same form. Use a separate report form to record an inspection for each State. In order to more fully describe inspected track that is limited by borders, a system has been devised to indicate that the inspection actually extended to a State line rather than having terminated at some point within the boundary county, as would be the case using simply a county code.

F6180.96 Field	Format	Instructions/Special Features
Milepost: From & To	Text	When conducting a track inspection or performing another inspection activity, i.e., all ATIP surveys, and train riding, it is mandatory to show a starting milepost identifier in this field. Record, in the "To" field, the milepost of the farthest point your inspection extended over the segment of track inspected. Record the numeric portion of the milepost in an NNNN.NN format. The computer can accommodate a maximum of 10 characters, but only two to the right of the decimal point. For example, 1234.56 and 12.15 are acceptable identifiers of a milepost location (maximum 10 characters). If the railroad uses an alphabetic identifier in conjunction with a milepost number, they should precede the numeric value and not exceed three characters in length. Acceptable field entries include SL12.25, R218.5, YL12.50, ABB146.55, and X12.45. If a portion of track cannot be inspected between "From" and "To" fields, then tracks inspected should also be indicated in the "Inspection Point" field or if necessary a separate line item "comment." For example: If inspecting from milepost BF1 to BF22 and BF7 to BF9 was inaccessible, enter BF1 to BF7 and BF9 to BF22 in the "Inspection Point" field and only claim miles actually inspected. Capture only one set of milepost ranges on the database.
Inspection Point	Text	As an elective, enter the name of the site, branch or the milepost location limits of the track inspected (e.g., a repair facility, train yard, interlocking plant, single or double main track). The field has a maximum of 50 characters.
Activity Codes (1)	Drop-down List/Text	Pick activity code(s) from the RISPC lookup table. See Appendix A–Activity Codes.
Units	Drop-down List/Numeric	Each mile of track, turnout, record, crossing at-grade, and derail, as inspected, should be counted as a unit. The number of track miles inspected is limited to 125, per report. The number of railroad track records inspected is limited to 650, per report. For additional instructions concerning units see Appendix A–Activity Codes.
Source Code	Drop-down List/Text	Enter one of the available letter codes to identify the source of (why or purpose for) the inspection. Only one letter may appear on the inspection report. If the required information is missing or invalid, the report will be "incomplete," pending inspectors' verification and correction. See Appendix B–Source Codes.

F6180.96 Field	Format	Instructions/Special Features
File Number	Text	A file number is required for ATIP activities (source codes I & J), complaint investigations with assigned numbers (source code B) and waiver investigations (source code E). For an inspection without a file number or it is not a reinspection, leave this space blank. When conducting a reinspection, inspectors are to type in their ID and report numbers of the previous inspection.
Accompanied Inspectors	Numeric	Use this field when conducting a joint inspection (two or more track inspectors). Complete one F6180.96 inspection report. Insert the accompanying inspector ID number.
Item	Numeric	A track inspection is limited to not more than 999 line items (maximum three digits). Note: the following fields repeat for each line item.
Initials/Milepost	Numeric	Indicate the location of the defect to the nearest one hundredth of a mile (52.8-feet). In this field it is necessary to use the same milepost criteria as described in the "Milepost: From & To" field as shown above.
Equipment/Track #	Text	Indicate the track number where the defect exists. For a track with a name (no number), enter an abbreviation (maximum three digits or characters).
Type/Kind	Drop-down List/Text	Enter the appropriate type code listed at the bottom of the form (maximum one digit). "M"–defects located on controlled and non-controlled main tracks. However defects in turnouts, see "T" and "X" below. Use care in distinguishing the type of track distinctions among main and other than main trackage identified in §213.233(c). "S"–defects located on controlled and non-controlled sidings identified in timetables or other pertinent information conveyed to allow opposing trains to pass (but, not where defects are located in the turnout). "Y"–defects located within yard classification tracks or other tracks designated to store or make-up trains. For tracks such as industrial spurs and auxiliary tracks designated other than main tracks use "I." "I"–defects located on industrial track (i.e., grain elevator tracks, spur and back tracks owned and maintained by the railroad). "T"–defects located within a turnout area, whether on the straight side or the turnout side. The turnout area extends from the point of a switch to the heel of the frog. "X"–defects located on a track that is between the two turnouts (heel of the frog to heel of the frog) of a crossover, independent of track centerline distance.
49 CFR/USC	Drop-down List/Numeric	Refers to the Code of Federal Regulations (CFR) Parts pertaining to the TSS, under Part 213; Roadway Workplace Safety, under Part 214; etc.
Defect (Rule)	Drop-down List/Numeric	Refers to the defect codes explained and listed in Chapter 5 of this manual. The defect code or "Rule" refers specifically to the digits to the left of the decimal point.

F6180.96 Field	Format	Instructions/Special Features
Subrule (Defect Code)	Drop-down List/Numeric	Subrule refers specifically to the digits to the right of the decimal point. Some defect codes have fewer than six digits, therefore use zeros as fillers. For example, defect code 7.1 would be recorded as 0007 (Defect) and 01 (Subrule).
Speed	Numeric	Speed, in miles per hour, is for the track as authorized by the railroad. If freight and passenger speeds differ, show only the speed that establishes the highest track class under §213.9(a). Do not attempt to show more than one speed.
Class	Numeric	Class of track for the speed designated is under the speed field above and in accordance with §§213.9(a) and 213.307(a) of the regulations that prescribe the maximum allowable operating speed for each track class. If the railroad has designated the track as excepted, insert "X."
Train #/Site	Text	This is an option to capture additional descriptions of defect locations.
SNFR	Dropdown (Y/N)	Use when issuing a Special Notice for Repairs (SNFR), FRA F6180.8.
RCL	Drop-down (Y/N)	This field will indicate whether the line item relates to remote control locomotives.

F6180.96 Field	Format	Instructions/Special Features
# of Occ. (Occurrences)	Numeric	**Special instructions.** Inspectors can record multiple defects of the same type in this field as long as the number of times the defects occur is on a specific unit of inspection. Defects captured in this field will be the number entered. For no entry, use a single defect count of one (1). Normally, Inspectors look for noncompliance in a 528-ft (tenth of a mile) segment of track. Some subpart defects are divided into smaller areas (i.e., alinement 31, 62, 124-ft; crossties in 39-ft and curve limitations in a 155-ft segment). Other noncompliance items (i.e., missing track bolts) are recorded by a point-by-point basis and summarized. However, reference all defects to the one-tenth (528-ft) of mile segments. For example, nine recurrent crosstie defects (213.109.01) found in 351-ft. Those nine defects can be captured by completing a single defect item and recording “9" in the “# of Occ.” field, because the 39-ft (9×39=351) track segment (unit of inspection) does not exceed 528-ft. Another example would be if while inspecting a railroad’s track records, and there are 10 instances where the signatures (213.241.03) on the reports are missing. Similarly, show “10" in the “# of Occ.” field. Do not itemize the total number of loose or missing frog bolts because the unit of inspection is the body of the frog in a turnout. Likewise, missing cotter pins are a component of a switch (regardless of the number or location of cotter keys it would be one occurrence). It is often helpful to include a reference to the quantity in the narrative description such as, “5 missing cotter pins” but remember, the “# of Occ.” would be one in this field. Other multiple defective items that constitute one unit in a switch include, rail braces, bolts/nuts, guardrail bolts, and clamps/wedges. Each defective item that constitutes a separate occurrence in a switch includes switch rod, switch heel, switch point, frog, guardrail, switch stand, stock rail, switch clip, and switch stop. With respect to joint bars, a loose joint bar assembly is to be counted as one occurrence, whereas a joint with two broken or cracked joint bars would be two occurrences. Except as indicated below, when recording multiple occurrences such as loose joint bars, the precise location of each pair of loose bars must be included in the description. Each joint bar pair bar identified by location would be an occurrence. If a systemic condition (e.g., loose joint bars) is found over an area in addition to identification of specific identified defects/locations, inspectors may add a comment in the last noted defect and indicate that the above defects are “representative conditions.” In such a case, the specific limits and track number/name of the respective conditions should be noted. An occurrence would only be taken for each item identified. Only record an occurrence for each item specifically identified by location. An acceptable alternative method of identifying each occurrence would be where all items between two specific locations are defective. For example, all the joints between frog of two opposing switches are all loose, then it would be acceptable to indicate “all 10 joints are loose between the frog of switch A and the frog of switch B” (10 occurrences).

F6180.96 Field	Format	Instructions/Special Features
Activity Code (for each line item)	Drop-down	Choose a code that matches the activity occurring when observing the defect. Must match one the activities listed in the activity code field in the form header.
Description (type)	Check Box	Choose: 1) Defect, 2) Non-FRA Defect or Observation, or 3) Comments to Railroad/Company. Non-FRA defects include items of concern that are not regulated by FRA, such as rough highway/rail grade crossing surfaces, items that are imminently close to becoming an FRA defect, etc. Observations include information such as noting an inspection with “no defect found.”
Description	Text	Provide a description of the defect in this space. It must include actual field dimensions of the defect, when applicable, and a description of physical conditions associated with defects not involving numbers or dimensions. Confine any comments concerning the defect to the description field. If necessary, use more than one line to describe the nature and location of defects. Brevity is desirable, but it is essential that the railroad representative understand the defect and its precise location to take corrective action. Record dimensions or adequate description of the defect to evaluate the appropriateness of the railroads’ reported followup action. For example, a joint tie defect is “located 10 joints south of under-grade bridge at milepost 110.19 on the west rail.” Field expands from 250 to 1000 characters. See options.
Latitude/Longitude	Numeric	GPS coordinates, where applicable (e.g., ATIP program), may be used in addition to standard location descriptive in description field. General use is anticipated for the future.
Written Notification to FRA of Remedial Action	Drop-down (Y/N)	Railroads, under §213.5(a), must bring the track into compliance when any defective condition is discovered. In addition, railroads must inform FRA in writing of the remedial action taken to abate those track conditions identified as violations whenever the “Yes” block is entered or checked in the “Violations Recommended” section of the header (as per §209.405). All line entries must contain an “X” or check mark in the “Required” block field. It is optional, not mandatory, to return the report to you when the “No” block is checked in the “Violations Recommended” section of the header.

F6180.96 Field	Format	Instructions/Special Features
Railroad Action Code	Date/Text	When an inspection report indicates that an inspector recommends a violation, the codes on the reverse side of the form are for the railroad representative to record what remedial action was taken to correct the defect and the date it took place. The railroad should provide a brief description of corrective action according to the list of codes on the reverse side of the Form 96. Enter the comment regarding the corrective action opposite the item number; it does not have to be confined to one line. The railroad must correct the defects immediately and should report the corrective action taken within 30 days following the end of the month the inspection took place. A responsible railroad employee should sign and date the report in the space provided on the back before returning it to the Inspector. Remember, the return of this form is mandatory when a violation ("Yes" box checked) is recommended with notations of railroad corrective action, which is strictly voluntary and no violation of law or regulation is incurred for the railroad's refusal to submit forms when defects are cited for correction ("No" box checked). However, railroads should be encouraged to return the form as requested. Two alternatives in the RISPC program exist: print the backside after printing the F6180.96 report or have a supply of copies of the back of the page of the first and continuation sheet available to print reports on.

Appendix D - Instructions, F6180.111 Track Violation

Field #	F9180.111 Field	Editable	Auto in 96	Format	Instructions/Special Features
1	Inspectors Name	No	Yes	Text	Mandatory field.
2	Inspector's Violation Number	Yes	No	Numeric	Inspector to type in the first number–subsequent sequential numbers generated automatically. Mandatory field.
3	Annual F6180.96 No.	No	Yes	Numeric	Mandatory field.
4	Inspection Date	No	Yes	Date	Mandatory field.
5	Violation Date	Yes	Yes	Date	RISPC populates this field with the same date as field 4. However, this date-formatted field is editable to allow the inspector to place a date of the violation report if that date is not the same as the inspection. Mandatory field.
6	Violation Report Number	Yes	Yes	Date	Same as field No. 5. Mandatory field.
7	RR/Co. Initial	No	Yes	Text	Mandatory field.
8	Railroad/Company Name	Yes	Yes	Text	RISPC populates this field with the full name of the company only, if available, otherwise type in for entities such as a contractor. Mandatory field.
9	Division	No	Yes	Text	Mandatory field.
10	Subdivision	No	Yes	Text	Mandatory field.
11	Inspection Point	No	Yes	Text	Mandatory field.
12	Track Type	No	Yes	Text	Mandatory field.
13	Track Number/Name	No	Yes	Text	Mandatory field.
14	Initials/Milepost	No	Yes	Text	Mandatory field.
15	Speed	No	Yes	Text	Mandatory field.
16	Track Class	No	Yes	Text	Mandatory field.
17	MGT (Million Gross Tons)	Yes	Yes	Text	Optional field (e.g., MGT may not be known at some locations such as a yard track or may be a track inspection record violation).
18	HazMat	Yes	No	Drop-down (Y/N)	Check box. Since an activity might be a record inspection, this is an optional field.

Field #	F9180.111 Field	Editable	Auto in 96	Format	Instructions/Special Features
19	Method of Operation	Yes	No	Drop-down List/Text	Drop down list: Manual Block; Traffic Control System; Automatic Block System (ABS); Yard/Restricted Limits; Automatic Block Signal with Manual Block; Interlocking Rules; and Other Than Main Track. Since an activity might be a record inspection, this is an optional field.
20	Line Item	No	Yes	Numeric	RISPC automatically populates in the F6180.96 line item number. Since an activity might be a record inspection, this is an optional field. Mandatory field.
21	Part No.	No	No	Text	RISPC automatically populates in “213.” Mandatory field.
22	Part Title	No	Yes	Text	RISPC automatically populates in “Track Safety Standards.” Mandatory field.
23	Section No.	No	Yes	Text	RISPC automatically populates “defect” No. from the F6180.96. Mandatory field.
24	Section Title	Yes	Yes	Text	RISPC automatically generate the title based on No. 23 above (e.g., 53 = gage, 109 = crossties, etc.). Mandatory field.
25	Paragraph Code	No	Yes	Numeric	RISPC automatically populates from the F6180.96 the subrule field. Mandatory field.
26	# of Occ.	Yes	Yes	Text	RISPC automatically populates the field from “# of Occ.” from the F6180.96. This is a numeric field allowing three characters. Mandatory field. Note, fields 12 through 26 will repeat as a block group in the F6180.111 for multiple line items on an F6180.96 recommended for civil penalty.
27	Text of Violated Paragraph	Yes	Yes	Text	RISPC populates in the entire subrule paragraph text corresponding to No. 25. If the paragraph includes a table, RIPC will not populate the table. Insert only the applicable table information from the TSS for the defect/tack class of the line item. Mandatory field.
28	Synopsis of Violation	Yes	No	Text	The synopsis is an opening paragraph that briefly describes what the report is about and includes: 1) who, what, where, when, the date of the inspection, 2) who was involved; railroad, contractor, FRA, and others, 3) what regulation was violated, and the actual violated condition (what did you find?), and 4) where found. Mandatory field.

Field #	F9180.111 Field	Editable	Auto in 96	Format	Instructions/Special Features
29	Geographic Condition/Location	Yes	No	Text	The intent of this field is for the reader to get a mental picture of the location and track leading to the violation. Include a statement, such as the accompanying railroad representative supplied all information regarding milepost locations, track names, switch numbers, or any other identifiable information of defect location. GPS identification, if available, would eliminate any conflict for a followup inspection. Conclude by introducing the F6180.96 that recommends violation as exhibit A. Mandatory field.
30	Seriousness/Reasons for Violation	Yes	No	Text	Use this field to establish the reason for recommending civil penalty. Begin with the type of inspection (hi-rail, walking), describe the conditions and introduce photographs of the defective condition, including your measurements as an exhibit. State how much the defective condition exceeds the TSS for class of track. Mandatory field.
31	Prior Constructive Knowledge	Yes	No	Text	Use this field to show how the railroad or company should have known of the defect prior to the FRA inspection. Review previous railroad inspection records for a reasonable time frame prior to your inspection for similar defects or failure to record defects. Consider the number and type of defects found during your inspection. Establish and state the inspection frequency for the track, and state only what is required. The text of the rule does not need to be included. Determine if this condition is something that could happen within a short time frame, or one that develops over time (that previous railroad inspections failed to note). Introduce FRA ATIP geometry data, if applicable, and railroad geometry/internal rail defect data, if applicable. Mandatory field.
32	Other Items Found During Inspection (not recommended for violation)	Yes	No	Text	List other defects in the noted during your inspection that are not recommended for civil penalty. List the defects found in association with your inspection. Enter the additional inspection report as an exhibit.

Field #	F9180.111 Field	Editable	Auto in 96	Format	Instructions/Special Features
33	Background /Special Circumstances	Yes	No	Text	Use this field to include other pertinent information, such as: 1) population of the area, 2) proximity to schools, airports, waterways, etc., 3) provide specific information about hazardous material movement, 4) are hazardous materials transported over this section of railroad? If so, list the type of materials observed, 5) recent compliance, and 6) previous violations. Mandatory field.
34	Attachment List	No	No	Text	Use this field to identify and list all attachments to be used as evidence that are included in the violation narrative: 1) FRA Inspection Reports–exhibit ‘A’ & ‘B’, 2) photographs, 3) exhibit ‘C’, 4) railroad Inspection reports, 5) railroad timetables, and 6) other items referred to in your violation report. Mandatory field.
35	Inspector Signature	No	No	n/a	Blank field for signature (no database link).
36	Date Signed	Yes	Yes	Date	Mandatory field.
37	FRA Inspector No. 2	No	Yes	Numeric	Import name from first ID number of accompanying inspector on F6180.96. Optional field.
38	Name (Railroad/Company Representative)	Yes	Yes	Text	RISPC populates with data from the F6180.96. Optional field.
39	Title (Railroad/Company Representative)	No	Yes	Text	RISPC populates with data from the F6180.96. Optional field.
40	Accompanied FRA During Inspection	Yes	No	Drop-down List/Check Box	Indicate if the railroad representative to whom No. 38 and 39 is referenced was the same person who was present during the inspection. Optional field.

Appendix E - Instructions, F6180.8 Special Notice for Repairs

Field #	F9180.8 Field	Editable	Auto in 96	Format	Instructions/Special Features
1	Name of Inspector	No	Yes	Text	Mandatory field.
2	ID Number	No	Yes	Numeric	Mandatory field.
3	SNFR Report Number	No	No	Numeric	RISPC populates the field based on the number assigned when the program is initially opened. SNFR reports are numbered sequentially for life.
4	Region	Yes	No	Numeric	Drop-down menu containing a predefined table identifying regions 1 through 8, then, click on the region desired to complete this field. Completion of this field is mandatory.
5	Inspection Report Number	No	Yes	Numeric	Mandatory field.
6	Operating Railroad	No	Yes	Text	Mandatory field.
7	RR Initials	No	Yes	Text	Mandatory field.
8	City	No	Yes	Text	Mandatory field.
9	State	No	Yes	Text	Mandatory field.
10	County	No	Yes	Text	Mandatory field.
11	Date	No	Yes	Text	Mandatory field.
12	Time	Yes	No	Time	Enter the time when the segment of track is reduced to a lower track class (eight-character limit). The time entered should be the time the appropriate railroad official notified of this action. Completion of this field is mandatory.
13	Railroad Official Name	Yes	Yes	Text	RISPC populates this field from the F6180.96 Inspection Report (30-character limit). However, make manual entries as necessary. Completion of this field is mandatory.
14	Railroad Official Title	Yes	Yes	Text	Same as No. 13.
15	Railroad Division	No	Yes	Text	Mandatory field.
16	Railroad Subdivision	No	Yes	Text	Mandatory field.
17	Equipment				MP&E use only.
18	Initial & No.				MP&E use only.
19	Track No. (or name)	Yes	No	Text	This field requires manual entry. Enter the appropriate track number or name (three-character limit). Completion of this field is optional.

Field #	F9180.8 Field	Editable	Auto in 96	Format	Instructions/Special Features
20	Track Class	Yes	No	Numeric	This field requires manual entry (one-character limit). Enter the appropriate track class. Completion of this field is optional.
21	MPH Passenger	Yes	No	Numeric	This field requires manual entry (three-character limit). Enter maximum authorized speed for passenger trains. Completion of this field is optional.
22	MPH Freight	Yes	No	Numeric	This field requires manual entry (three-character limit). Enter maximum authorized speed for freight trains. Completion of this field is optional.
23	Reference Measurement	Yes	No	Text	This field requires manual entry (20-character limit). The restricted limits indicated in both, “location from” and “location to” must be referenced to a known fixed point such as a mile post, road crossing, switch point, etc. Completion of this field is optional.
24	Track Description	Yes	No	Text	This field requires manual entry (20-character limit). Enter the name of the track, yard, branch or other designation that identifies the railroad location of the track to which the order applies.
25	Location from City, State, Mile Post	Yes	No	Text	This field requires manual entry (45-character limit). Enter city, State and milepost. Completion of this field is optional but required for Track.
26	Location to City, State, Mile Post:	Yes	No	Text	Same as No. 25.
27	Line Item Number	No	Yes	Text	A variable number of line item entries from the F6180.96 may be populated onto the SNFR, (e.g. 27a, 27b, 27b, etc.).
28	CFR, Rule, & Subrule	Yes	Yes	Text	Since not all defect codes used in RISPC correspond to the actual CFR section, be sure to cite the specific section in the CFR that corresponds to the defect(s) listed (10-character limit).

Field #	F9180.8 Field	Editable	Auto in 96	Format	Instructions/Special Features
29	Defects	Yes	No	Text	This field is not populated by the RISPC and inspectors may type in a reference to the F6190.86 and its corresponding line item. Only SNFR items should exist on a corresponding F6180.96 or the line item numbers will not correspond. This field will support cut-and-paste functions from other programs, and there is a 350-character limit. It is acceptable to indicate how the defects repeat over large area. In such a case, include a description of the beginning and end limits of such a representative condition. Field 27, 28, and 29 repeat as a group for multiple line items on an F6180.96 that have the "SNFR*" field checked yes.
30	Movement Restrictions				MP&E use only.
31	Regional Administrator Name and Address			Drop-down List	This field will feature a drop-down menu containing the name and address of the appropriate Regional Administrator. Click on the name desired to complete this field. Completion of this field is mandatory.

Appendix F - Instructions, F6180.8a Special Repair Remedial Action Report

Field #	F9180.8a Field	Editable	Auto in Part I	Format	Instructions/Special Features
1	Name of Inspector	No	Yes	Text	Mandatory field.
2	ID Number	No	Yes	Numeric	Mandatory field.
3	SNFR Report Number	No	No	Numeric	RISPC populates the field based on the number assigned when the program is initially opened. SNFR reports are numbered sequentially for life.
4	Region	Yes	No	Numeric	Drop-down menu containing a predefined table identifying regions 1 through 8. Click on the region desired to complete this field. Completion of this field is mandatory.
5	Inspection Report Number	No	Yes	Numeric	Mandatory field.
6	Operating Railroad	No	Yes	Text	Mandatory field.
7	RR Initials	No	Yes	Text	Mandatory field.
8	City	No	Yes	Text	Mandatory field.
9	State	No	Yes	Text	Mandatory field.
10	County	No	Yes	Text	Mandatory field.
11	Date	No	Yes	Text	Mandatory field.
12	Time	Yes	No	Time	Mandatory field.
13	Railroad Official Name	Yes	Yes	Text	RISPC populates this field from the F6180.96 (30-character limit). However, manual entries may also be made. Completion of this field is mandatory.
13	Locomotive or Freight/Passenger Car Initials and Number				MP&E use only.
14	Track Number Location, Description, Etc.	Yes	No	Text	Enter manually from the information provided by the railroad. Optional field because it may not be required in an MP&E report.

Field #	F9180.8a Field	Editable	Auto in Part I	Format	Instructions/Special Features
15	Location Repaired: City:	Yes	No	Text	Same as No. 14. This is information provided by the railroad on the SRRAP and sent to the Regional Administrator upon completion. The originating Inspector will not be able to fill in this, or any of the following fields.
16	State	Yes	No	Numeric	Same as No. 14.
17	Date Repaired	Yes	No	Numeric	Select from a pop-up calendar according to the Remedial Action Date provided by the railroad. This is a mandatory field.
18	Time Repaired	Yes	No	Text	Same as No. 14.
19	Remedial Action Codes	Yes	No	Text	Enter information provided by the railroad. It will allow up to three remedial action codes. Select the codes from the pop-up table of remedial action codes used in RISPC, or the codes may be entered manually. Mandatory field.
20	Line Item No	No	Yes	Text	This will be repeated from the Form F6180.8 for each line item contained there. A variable number of entries may exist.
21	CFR, Rule, & Subrule	Yes	Yes	Text	Same as No. 20.
22	Defects	Yes	No	Text	Same as No. 20
23	Repair Details	Yes	No	Text	Enter information to these fields manually from the information provided by the railroad concerning actions to correct the problems. These data entry blocks appear on the same screens as the line item information for the Form F6180.8. Field 20, 21, and 22 repeat as a group for multiple line items on an F6180.8.

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Federal Railroad Administration
Track Safety Standards
Compliance Manual

Chapter 3
Automated Track Inspection Program (ATIP)
Geometry Car Operation

Office of Safety Assurance and Compliance
Track and Structures Division

July 22, 2008

Table of Contents

CHAPTER 3

Track Geometry Inspection Car Operation

Background

This chapter provides functional understanding of the Automated Track Inspection Program (ATIP) in terms of operation, policy, on-track safety requirements, geometry measurement technology, and national deployment of the Federal Railroad Administration (FRA) railbound inspection cars. Under the statutes mandated by Congress, ATIP cars conduct operational surveys of the United States rail transportation network for the singular safety function of determining railroad compliance with *Federal Track Safety Standards* (TSS). Since 1974, the operation of ATIP cars serves an important role in FRA's overall compliance programs. FRA's Office of Safety manages the program and logistic support is provided under a contract.

ATIP Track Geometry Inspection Car Operation

All FRA Inspectors assigned to ATIP cars are to ensure applicable compliance with railroad operating rules, special instructions, and specific FRA policy and procedures by everyone on board when ATIP geometry cars are operated.

The seven ATIP cars are identified by UMLER[1] (listed as private equipment) and publicly recognized with the DOTX prefix on the car body above the truck. They are officially DOTX series 216, 217, 218, 219, 220, 221, and 223. ATIP cars DOTX 217, 218, and 219 are self-propelled; DOTX 216, 220, 221, and 223 require towing by a locomotive, but all the cars may be operated in tow mode, if necessary.

FRA policy defines the self-propelled ATIP cars as specialized maintenance equipment (SME) and they may not reliably shunt track signal circuits. As a result, certain operating restrictions apply. By policy, ATIP cars are not considered locomotives[2] (even though they have cab controls and couplers). Operating as an SME relieves ATIP contractors from maintaining locomotive engineer certification and hours of service regulations and other requirements. As an SME, self-propelled ATIP cars are not subject to Title 49 Code of Federal Regulations (CFR) Part 229, but are amenable and will act in accordance with the safety appliance section and other pertinent sections of the regulations.

ATIP cars operate safely in accordance with all railroad operating rules. ATIP self-propelled geometry car movement has one rule exclusion; opposing and following absolute block protection must be maintained and supersedes railroad operating rules or equivalent protection given to a train[3] or on-track equipment.

ATIP cars offer advances such as crashworthiness protection, high-speed trucks, satellite communication, and asset management—including innovations in ride-quality accelerometer measurement and the differential global positioning system (GPS) for precise location of track exceptions. FRA has developed a secure Web site accessible at http://atip.fra.dot.gov to facilitate and improve communications. The site contains survey schedules and operational information.

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[1] UMLER is a registered rail equipment reference, e.g., DOTX 217 is the same as T17, etc.

[2] 49 CFR Part 229 Subpart A - General § 229.50 (k) Definitions

[3] 49 CFR Part 236 Subpart G - Definitions § 236.832 - Train

On-Track and Onboard Safety

ATIP cars are required to operate safely in accordance with railroad rules, Federal regulations, and FRA policy. Safe ATIP inspection surveys are the responsibility of everyone on board. Assigned FRA personnel are responsible for the authority, enforcement, and control of this policy. Report any unsafe situation to FRA regional or Headquarters (HQ) managers.

ATIP contractor employees must conduct activities in accordance with the specific instructions conveyed in the *Safety Manual for FRA Survey Cars.* The Federal Track and Operating Practices (OP) Inspectors, in coordination with the Survey Director, will provide a job briefing on general geometry car safety, apparatus, and on-track protective procedures whenever anyone comes on board or leaves the ATIP car and fouls a track. The on-track safety job briefing will discuss at a minimum the following:

1. General communication methods and procedures during emergencies,
2. Location of geometry car safety apparatus (i.e., fire extinguishers, first aid kits, breathing apparatus, and identifying individuals on board who are trained in CPR),
3. Procedures for egress through specific doorways and windows, and
4. Applicable physical and operating hazards and procedures when fouling the track.

The FRA Track and OP Inspectors are responsible for ensuring that everyone on board the ATIP car is briefed and updated, as safety conditions or events change throughout the day. Before exiting the car and fouling the track occupied by the survey car, on-track safety is established by utilizing the ATIP car's exclusive authority to move on controlled track (train coordination). All train movements are coordinated with the Survey Director.

Whenever the ATIP car stops to evaluate a track condition, conduct instrumentation checks, or carry out repairs, FRA Track Inspectors will ensure the following:

1. A railroad employee in charge ensures appropriate on-track safety requirements and a job briefing before fouling the track.
2. FRA Track Inspectors, the railroad employee in charge, and ATIP car personnel are reminded that train coordination, as previously discussed, in coordination with the Survey Director, may afford on-track protection. Before fouling any other track protection such as train approach a warning must be used.

If a railroad employee is unavailable to assume the in-charge role, the FRA Track Inspector may afford on-track safety in accordance with FRA policy as follows:

1. Two FRA or State Inspectors may work together and use train coordination as protection on the track occupied by the survey car and on non-controlled track with one acting as a watchman/lookout for the other, if they know the operating characteristics of the railroad at that inspection point, including train speeds.
2. An FRA or State Inspector working alone is authorized to use train coordination on the track occupied by the survey car or individual train detection on non-controlled track. The individual Inspector's responsibility is to obtain the information necessary to provide proper on-track safety.

FRA or the railroad may invite guests on an ATIP car. However, guests are not authorized to occupy the track without the permission and protection afforded by either FRA or the railroad.

The term “guests” does not include ATIP contractor personnel who are agents of the Government.

Operations

ATIP crewmembers usually consist of a Survey Director and three others whose responsibilities include safe operation of the car, calibration and maintenance of the instrumentation, and collection of survey data. ATIP car survey operations generate a track geometry inspection report (TGIR) and include video charts and imagery in both hard copy and electronic format.

A survey schedule is distributed regionally. FRA Track and OP Specialists review the schedule outline and provide route feedback 4 months prior to an ATIP survey date. Upon regional acceptance, the schedule routes are applied to a monthly calendar format and accessible on the ATIP Web site at http://atip.fra.dot.gov.

As a contract requirement, an Office of Safety official notification letter and an operations plan are distributed to the respective railroads and applicable regions at least 3 months in advance of the survey. The content of the letter details FRA’s authority, operations geography, contact personnel, and other pertinent information. A daily ATIP schedule identifies normal railroad crew change points that estimate travel time that the ATIP car should achieve in a 12-hour day.

Daily Deployment

An active survey contract workday averages 13 hours per day with 1½ hours consisting of pre- and post-survey work. Survey on-duty time should not extend beyond 12 hours. However, it is understood that certain justifiable operating delays might occur from a variety of causes; unforeseen railroad operation, ATIP car equipment failure, or an emergency occurrence. Conditions that explain the reason for excessive delays beyond 12 hours require documentation by the contractor, concurrence by the Track Inspector, and preapproval by the regional and HQ managers, as necessary. Provable operational delays, which result in going beyond the hours of service because of subjective decisions to reroute and give priority to other traffic, must be well documented. If unreasonable delays occur due to differential priority treatment, the railroad may be subject to forfeiture of reimbursable costs and fined under the law or regulations.

Occasionally, the ATIP schedule may be altered to correspond with minor changes effecting daily start and stop times or locations. The distribution and coordination of necessary schedule modifications to the respective railroads and FRA regions, by way of earliest means, is essential. There should be no substantive changes to the final schedule 2 weeks prior to the survey, unless an unforeseen circumstance occurs. Last minute changes have an undesirable effect and are difficult to make and affect the overall schedule in other regions and railroads.

ATIP priorities and risk-based route scheduling preference involve primarily:

1. Inspector observations, regarding deteriorating or noncomplying track geometry, associated with structural conditions, e.g., crossties, ballast, etc.;
2. A railroads compliance history, exception repeatability, degradation rate, and track quality;
3. Duration between last inspections (i.e., between 2- and 4-year cycles where tonnage is more or less than 50 million gross tons, respectively);
4. Passenger operation (i.e., Amtrak and applicable commuter/freight territories, such as Southeastern Pennsylvania Transportation Authority (SEPTA), Metropolitan Rail

Corporation (METRA), Long Island Railroad (LIRR), Northeastern Illinois Regional Commuter Rail (NIRC), etc.);

5. Designated hazardous material and strategic rail corridor network (STRACNET) routes;
6. Railroad operating speeds greater than 20 mph, and
7. Other special regional needs or activities (e.g., the 2002 Winter Olympics in Utah).

Generally, DOTX 217 is assigned to regions west of the Mississippi River and DOTX 219 assigned to regions east of the river. DOTX 220 is primarily designated to survey passenger routes nationwide.

Regions located in the northern latitude are normally scheduled in late spring through early fall and those in the southern latitudes can expect the ATIP car through the winter months. ATIP's goal is to survey 100,000 miles of track per year and provide reliable track data.

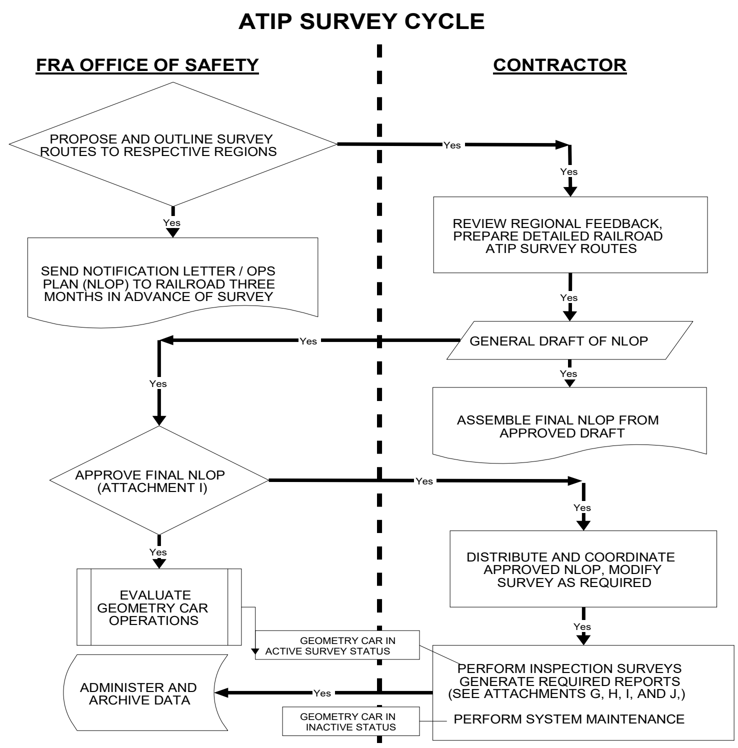

Figure 1

Track Geometry Measurement System (TGMS)

Onboard ATIP cars, TGMS instrumentation generates automated signals processed online by a computer, which produces a graphical record of detailed track geometry measurements. The measurements recorded are gage, left/right rail alignment and profile, crosslevel, Superelevation, warp, harmonic rock, run-off, and limiting speeds. ATIP cars measure and record existing track geometry conditions and compare those measurements to ensure compliance with TSS 49 CFR Part 213, Subpart C for the lower speeds (Class 1–5), as well as the Subpart G (Class 6–8) high speed to determine compliance with:

1. Run-Off in 31 feet;
2. Track gage in inches, measured ⅝ inch below top of rail[4];
3. Curvature;
4. Length of spiral portion of curved track and rate of elevation run-off or run-on;
5. Crosslevel on tangent track in inches;
6. Crosslevel deviation from uniformity on spirals and curved track in inches;
7. Warp using a variable base length up to 62 feet on tangent, spiral, and curved track, in inches, and a 31-foot section on spiral track;
8. Limiting speed (mph) in curves (based on amount of Superelevation and degree of curvature);
9. Left and right rail profile (humps and dips) deviation from uniformity of a 31-, 62-, and 124-foot midchord offset (Class 6 and above) in inches;
10. Harmonic rock, as created by six pairs of low joints, each pair exceeds 1¼ inch;
11. Left and right rail alignment deviation from uniformity of a 31-, 62-, and 124-foot midchord offset (Class 6 and above) in inches; and
12. Calculated unbalanced amount in inches.

TGMS Definitions

Crosslevel: Difference in height between opposing rails.

Gage: This is defined as the distance between the rails, measured at a right angle to the rails, in a plane ⅝ inch (1.59 cm) below the top of the rail.

Superelevation: A constant elevation of the outside rail over the inner rail maintained on curves, as well as a uniform rate of change on spirals, and measured in the same manner as crosslevel.

Warp: This is the rate of change in crosslevel along the track and is the difference in crosslevel between any two points (tangent, spiral, or curve) 62 feet (18.90 m) apart or less.

Twist: The difference in crosslevel between the fixed lengths of 11, 22 and 31 feet (3.35, 6.71, and 9.45 m). TGMS is capable of determining a value for twist at the same rate that crosslevel and Superelevation is determined.

Profile: (Vertical surface) as crosslevel relates to transverse plane in track elevation, profile relates to elevation along the longitudinal axis, which is an adherence to an established grade and the incidence of dips and humps.

Alignment: Alignment is the projection of the track geometry of each rail or the track center line onto the horizontal plane.

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[4] Excessive vertical and horizontal rail headwear loss or rail section design may produce errors, unless properly adjusted.

Curvature: Both tangent and curve track alignment are defined as the deviation of the mid-offset from a 62-foot chord

Run-Off: Elevation (ramp) difference of a line along the top of the rail is used for the projection.

Exception Detection

The exception detection process compares the geometry data to the exception thresholds. When an exception is detected, the exception detection process provides the type of exception, the location (start of exception, end of exception, and peak location), and the value of the exception.

Stripchart (Oscillograph)

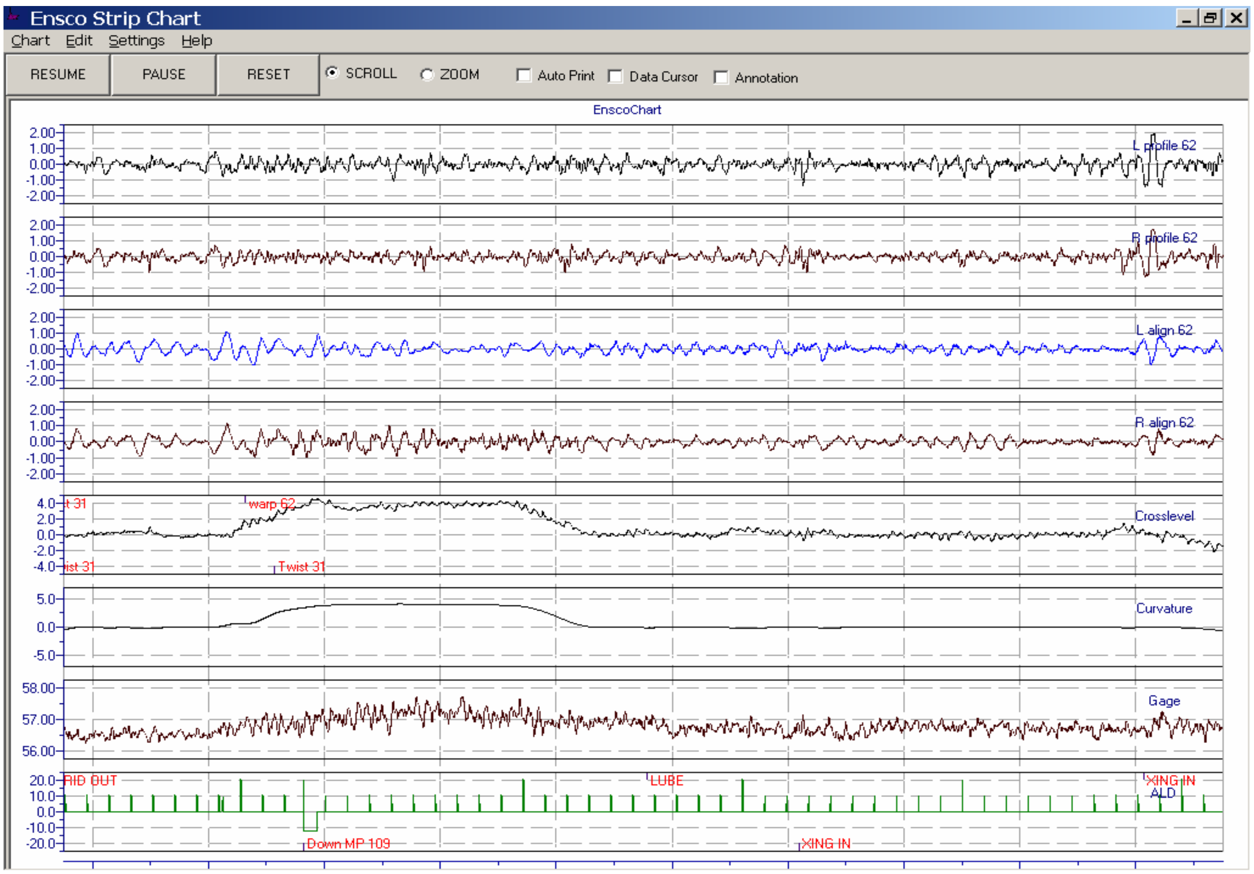

Figure 3

The multichannel video stripchart (illustrated in Figure 3 top to bottom) continuously displays geometry values, i.e., left and right rail profile or run-off, left and right rail alignment, crosslevel or curve Superelevation, degree of curvature, gage, and automated track event location detection (ALD) references.

When viewing the stripchart, the ATIP car direction is always from the left-hand margin toward the right-hand margin. Representative lines, drawn on the stripchart, infer statements of track quality. The dash lines represent the upper and lower class limits. The exception trace lines differentiating noncomplying conditions may indicate operational and/or maintenance remedial action is necessary. Electronic and paper copies of the stripchart defects are provided on demand so that noncompliance with Federal regulations receives immediate attention. In an effort to reduce paper consumption, Inspectors can view ATIP geometry information electronically on GeoEdit software via CD-ROM or it is viewable on the Track Data Management System ATIP Web site. The eight channels are selectable in any order on GeoEdit. Exception limits are shown in the left-hand margin. The video stripchart no longer needs a scale to measure analog readings because listed exceptions are displayed on the video stripchart.

The profile channel combines left and right profiles and shows run-off. Exception limits are shown in the left-hand margin. The centerline is equal to zero, profile measurements above the centerline indicate a dip, and profile measurements below the centerline indicate a hump.

The alignment channel displays left and right rail alignment. Exception limits are shown in the left-hand margin. On tangent track, the centerline is equal to zero; alignment exceptions above the centerline are considered outward from the track center, and measurements below the centerline are considered inward to the track center.

The crosslevel channel combines to illustrate crosslevel deviation, warp, rockoff hazard, and Superelevation. Exception limits are shown in the left-hand margin. A line plotting to the top of the centerline indicates the left rail is the high rail, and plotting to the bottom of the centerline indicates the right rail is the high rail.

The curvature channel displays three scales, which are 5, 10, and 20 degrees of curvature. Exception limits are shown in the left-hand margin. Correct selection of curvature (5, 10, or 20 degrees) is dependent upon the physical layout of the track. Exception trace lines plotting to the bottom of the centerline are left-hand curves and plotting to the top of the centerline are right-hand curves, as viewed in the direction of travel (such as left to right).

The gage channel displays wide and narrow gage. Exception limits are shown in the left-hand margin. Nominal gage is 56½ inches. The centerline is equal to 57 inches, measurements above and below the centerline is read directly as either wide or narrow gage, respectively.

The ALD channel is usually illustrated on the very bottom. Each milepost marking, track number, and current class of track tested is reported and assists in locating track exception. The curvature scaling with the file number (in the year, month, day, and file number format [yymmddxx]) is posted on the right border. Location references consist of event message numbers that clearly indicate mileposts and other wayside features such as road crossings, bridges, and trackside detection devices (e.g., hot boxes and clearance devices) are detected and manually entered in the data stream by the contractor. Small and larger vertical lines indicate 100- and 1,000-foot track segment division, respectively.

Other features may be marked automatically on the chart when ALD equipment senses their presence magnetically (i.e., turnouts and wayside detection devices). This allows Inspectors and host railroad representatives to easily locate exceptions from either the analog or video chart references at the time of occurrence.

Video Stripchart

A video stripchart outline begins with a header that contains the following information:

- Date,
- Railroad name, division, subdivision, and line code segment,

- Geometry car (i.e., DOTX 219),
- Survey number,
- Movement authority,
- Track class,
- Location from,
- Location to,
- Posted speed,
- Milepost start/end,
- Track,
- Type (single, multiple, double main, etc.),
- Track direction (north, south, east, or west),
- Scan rate, and
- Video number.

The stripchart is a continuous printed output of the following information:

- Wayside features (bridges, turnouts, etc.),
- Left profile,
- Right profile,
- Left alignment,
- Right alignment,
- Crosslevel/Superelevation,
- Gage,
- Warp, and
- Speed.

The information is arranged as a plot where each of the measurements, with the exception of the wayside features data, forms a continuous line moving to the left or right as the measurement changes.

Track Geometry Inspection Report (TGIR)

The TGIR contains a list of all exceptions identified during a survey. The report header includes:

- Location and name of events, including speed and class of track changes,
- Header information,
- Exception,
- Start location and footage,
- End location and footage,

- Length of exception,
- Differential GPS locations,
- Maximum value,
- Maximum value location,
- Exception limit,
- Track,
- Maximum train speed,
- Posted class (timetable),
- Complying track class (differentiating one class or more than one class drop),
- Space for date corrected, and
- All other outputs from additional measuring devices (rail profile and corrugation).

Manual or automatic entry supplemental information is required to properly evaluate and locate track geometry exceptions. Therefore, provisions are incorporated to permit the Data Specialist to enter other exceptions, such as:

- Milepost number,
- Track class (FRA TSS 1 through 8),
- Track type (passenger, freight, or both),
- Track number, and
- Track or wayside features.

Number of Channels

At least eight channels can be displayed that may be selected from all stored data from the TGMS or the Ride Quality Measurement System (known as RQMS). All appropriate scales for each channel are marked on each chart. At a minimum, the following channels are displayed:

- Left profile,
- Left alignment,
- Right profile,
- Right alignment,
- Superelevation,
- Curvature,
- Gage,
- Location,
- Car body lateral acceleration,
- Car body vertical acceleration,
- Truck frame lateral acceleration, and

- Truck frame vertical acceleration.

Standard Operating Procedures (SOP)

Test Speed Classification

ATIP cars always comply with the operational speed requirements, but FRA policy does not necessarily recognize all “slow orders” in terms of track classification. Railroads place general order (GO), or track bulletins (TB), for a variety of justifiable reasons, i.e., operational, structural, and geometry, which are substituted for the maximum authorized train speed. Railroads also may elect to reduce train speed to expedite train and ATIP car movement in advance of ATIP surveys by placing a temporary or provisional slow order (TSO), so-called “blanket slow orders,” over long segments of track. Geometry data may be reprocessed to the maximum authorized train speed. An FRA Track Inspector has discretion and the final authority to accept a TSO, but not a valid and verifiable GO or TB.

For example, a timetable authorizes freight trains to operate at 40 mph, or Class 3 classification. However, a valid and verifiable TB reduces freight speed to 25 mph, a Class 2 classification, because of a crosstie condition. As a result, Inspectors will allow ATIP cars to inspect and record noncompliance to the Class 2 safety limits. In another example, on the day of the survey a railroad issues a slow order reducing train speed from 70 mph (Class 5) to 60 mph (Class 4) for operational reasons, such as anticipating multiple slow orders. This lowered speed will be less disruptive to the dispatcher and actually increase cooperation with ATIP car movement. Inspectors will accept the lower classification operating speed but will allow the ATIP car to inspect to the posted higher classification in accordance with the timetable speeds.

Any ATIP exception location and value discovered may only be edited by the Inspector (through the Survey Director) from the TGIR because of precision, accuracy, repeatability, and reproducibility (PARR) uncertainty. However, track exceptions are only deleted from the TGIR and not exclusively removed from TGMS storage. Thus, exceptions are always available for subsequent review, analysis, and reprocessing.

FRA Inspectors are not permitted to allow ATIP track inspection testing at a higher class of track than the maximum authorized or posted operating speed contained in a current timetable without HQ approval. If a railroad requires this type of track quality analysis, a request should be forwarded and, as resources are available, the request will be processed and forwarded to the railroad.

Clearance Restrictions

Prior to the survey, FRA Inspectors will coordinate with the Survey Director regarding current track number(s), current authorized operating train speeds, and track charts (curvature) input information for the survey. For TGMS to correctly plot the degree of curvature on video or stripchart, FRA Inspectors will advise the Survey Director in advance on where curvature varies or differs from those established on a track chart in groups of 5, 10, or 15 degrees.

ATIP geometry cars comply with Association of American Railroads interchange rules, however track curvature greater than 13 degrees presents certain clearance issues and may govern or restrict car operation when towed by a locomotive. Self-propelled cars or towed operation of cars on curves greater than 20 degrees is prohibited. Clearance diagrams and restrictions of all ATIP cars are provided on the ATIP Web site.

Use of Additional Locomotive(s)

Self-propelled ATIP geometry cars operate independently; however, they may need towing occasionally. FRA Inspectors (in agreement with the Survey Director) are authorized to request a tow locomotive and crew, if one or more of the following occur:

1. The propulsion system and/or the braking capabilities fail to operate properly or,
2. The railroad's operating rules require onboard automatic cab signal, automatic train stop, or automatic train control systems. Consequently, the ATIP geometry cars do not have these features and must be towed by a railroad-owned and -equipped locomotive, in accordance with railroad signal rules or the maximum authorized track speed, whichever is lower.

In all other cases, FRA HQ will authorize, and must be notified in advance, the lease of a locomotive(s), the use of essential railroad crewmembers, and the reimbursement of the cost service to the railroad.

Track Designation

For the purpose of ATIP surveys, the TGIR designates Tracks 1 through 4 as standard notations for double or multiple controlled track configuration, unless otherwise numbered by the railroad (alphanumeric [ABCD.1234] format). For example, a track may be designated as YL10.45. A single main track is designated as Track 5. A controlled siding is designated Track 6, and Track 7 notations represent all "other than main" noncontrolled tracks and includes excepted track.

Operational Delays/Surveys Beyond 12 Hours

FRA Inspectors are to report excessive delays greater than one-half hour and cumulative delays resulting in time exceeding the hours of service law. For example, hours of service time begins when the ATIP car conducts its brake test. Inspectors will ensure the Survey Director reports recurring or prolonged operational and repair delays, and determine the reason for the delays and/or operating constraints that are placed by the railroad (e.g., dispatching and crew delays or personnel hours of service restrictions). Inspectors are to notify regional and HQ managers if any unusual occurrence significantly affects ATIP daily schedules. The use of the onboard telephone(s) to communicate with railroad officials to expedite movement and advise regional and HQ managers is authorized.

Although normal survey hours are expected to be conducted during daylight, operations may require surveying before sunrise and after sundown. Inspectors should address any safety concerns in a safety briefing. Personnel on board ATIP cars must know their individual limit for physical fatigue beyond 12-hours of on-duty time. At any time an unsafe circumstance exists that does not conform to railroad or ATIP procedures and instructions, the situation will be immediately addressed, resolved, and reported to FRA regional or HQ managers.

Regardless of day or night, the TGMS will always record the track conditions and produce a TGIR, unless TGMS equipment malfunctions, as specified below.

Measurement Equipment Malfunction

In collaboration with the Survey Director, Inspectors will monitor the stripchart exceptions and verify that all channels are within scale and reading properly. Inspectors will convey this information to railroad maintenance-of-way representatives ensuring a complete understanding of the data presented. A single-point failure or combination that exhibits questionable value or information of any exception, is justification to stop the survey at that location until it is repaired. A survey will not continue until the conditions are resolved. If repairs cannot be made to the geometry measurement system, ATIP surveys are not to be continued. The track segment affected will be declared as an invalid survey. Track segments identified as invalid will be rescheduled for an ATIP inspection at a later date.

Certain conditions are known to produce small variations in measured track geometry during automated surveys. These differences affect geometry measurement and are mainly caused by:

1. TGMS calibration tolerance.
2. Transition in the applied track load between survey run dates caused by speed, acceleration, or weather conditions.
3. Difference of 1-foot data sample locations.
4. Changes in track position caused by:
    - prevailing rail traffic
    - rail temperature variations
    - physical conditions: rail and wheel
    - certain types of guardrails
    - flangeway obstructions.

Under the rail profile system, specific rail sections (headfree rail) and special track work may affect where the ⅝ point on the gage side of the rail is measured automatically. Extreme vertical headwear loss (greater than 40 percent) also presents problems associated with proper measurement. This rail condition may influence the accuracy of the TGMS and is identified on the TGIR. Under International Organization for Standards (ISO) certification, the conditions are minimized and controlled. Significant lengths of this type of rail condition may warrant an adjustment to the gage sensor by the Survey Director, but these adjustments must be authorized by FRA HQ. Where a significant amount of headwear loss is prevalent, FRA Inspectors are to advise and discuss the rail condition with the railroad. Headwear loss values can be viewed with the Rail Profile System and on GeoEdit.

Valid and Invalid Surveys

ATIP cars inspect and produce a TGIR of all applicable mainline tracks, controlled sidings, and ”other than main track” when scheduled, warranted, or the opportunity is practicable. For example, occupying a main track and directed to occupy a siding to meet another train would present an inspection opportunity on the siding track. Unplanned inspection of main or yard track, including “excepted track” designations is discretionary, however, care must be taken to prevent possible ATIP car damage from a variety of sources. Producing a TGIR is mandatory for a valid survey and will not be produced for invalid surveys or certain track segments thereof.

For ISO quality reasons, ATIP cars record geometry data when moving above a certain speed, except where conditions exist to cause damage or as designated by FRA HQ. Anywhere the ATIP car operates the TGMS instrumentation on board will record applicable track geometry measurements. An authorized or valid survey operation occurs on the condition that the following prerequisites are in place:

1. The railroad is officially notified by FRA in writing,
2. A qualified railroad locomotive engineer/pilot is on board (self-propelled or towed),
3. Both contractor crewmembers and FRA Inspectors are on board,
4. Authorized track speed is greater than 5 mph, and
5. TGMS is online, functional, and can produce a TGIR.

An unauthorized or invalid survey (segment thereof) operation is declared if the following circumstances occur:

1. TGMS failure resulting in instrument inaccuracy,
2. TGMS instrument impairment due to snow, vegetation, high ballast levels or excessive debris, mud, and grease/oil causal factors,
3. The geometry car is “deadheading” in a train, and TGMS is offline,
4. Performing PARR testing, undergoing scheduled or unscheduled maintenance.

Producing a TGIR is mandatory for all valid surveys. A TGIR will not be produced for invalid surveys. When valid TGIRs are produced they will be provided to the host railroad by the Inspector only. Those locations where certain track segments were deemed to be invalid, the Inspector will NOT provide geometry data to the host railroad.

Geometry Car Exception Levels

Discovered exceptions by ATIP cars are categorized into three noncompliance levels: first-level (class) noncompliance, second-level (serious) noncompliance, and third-level (unsafe) noncompliance. For example, a track that is tested at an operating speed of Class 4 but only complies with Class 3 is defined as a first-level noncompliant condition—a one-class drop. A track that is tested at an operating speed of Class 4 but only complies with Class 2 or less is defined as a second-level serious condition—a two-class drop or more.

Any track, regardless of classification, that does not comply with any safety standard (does not at least comply with Class 1 track) is defined as a third-level, unsafe condition. Without immediate and proper remedial action, an unsafe track condition, in all likelihood, will result in a derailment.

Exception Location

There are two basic methods of locating exceptions using the TGIR:

1. Download or enter GPS data (latitude and longitude) into a handheld GPS device such as a Digital Track Notebook (DTN). Follow GPS directions to the exception. GPS exception coordinates are listed in the TGIR, and
2. The geometry car exception paint marking system has been removed and no longer sprays paint on the crossties but Inspectors may use the Oscillograph (stripchart) and the TGIR to find the track number and footage beyond a milepost reference to locate exceptions. Use the stripchart information to also reference exceptions to other geographical features (turnouts, grade crossings, curves, etc.).

Sometimes detection problems are encountered for reasons such as erroneous manual entry from the ATIP car, missing mileposts, and “short” miles, which means a railroad may not measure exactly 5,280 feet in length. The rule is the exception distance is referenced in the direction of travel regardless of increasing or decreasing mileposts. The TGMS counts the number of feet from the last entered milepost. According to the TGIR, if the mileposts are increasing (e.g., 9, 10, 11, etc.), the footage from a milepost is added and directly read, i.e., an exception located at Milepost 10+1,584 feet would be interpreted as 1,584 feet from Milepost 10 (decimally Milepost 10.30) in the direction of travel.

If the mileposts are decreasing (e.g., 11, 10, 9, etc.), the footage on the report from a milepost is subtracted from the milepost. For example, an exception located at Milepost 10+1,320 feet (specifically between Milepost 10 and Milepost 9), would be interpreted as 1,320 feet from Milepost 10 or located at Milepost 9+3,960 feet (decimally Milepost 9.75) in the opposite direction of travel. An Appendix: Conversion Feet to Decimals of a Mile is available on board and at the end of this chapter to assist Inspectors. Dependent upon geometry car speed, a delay reaction time (translating to a distance of up to 400 feet) exists regarding exceptions.

Geometry exceptions, associated with a length (i.e., gage, warp, and harmonic rock), are measured from an exception reference point in the direction of travel. For example, a warp length of 56 feet is located at Milepost 9+3,960 feet, upon computer calculation, the other end to the warp is located at Milepost 9+3,904 feet (56 feet from the exception reference point, but in the opposite direction of travel). Use of the DTN or other GPS receiver accuracy is usually within 30 feet of the exception location “tagged” with the geometry car GPS coordinates.

Exception Verification

ATIP’s TGMS (instruments, algorithms, and SOPs) are certified by ISO 17025 standards and meets the quality procedures set by those standards for all ATIP cars. As part of ISO A2LA certifications, instrument verifications (IV) are made a minimum of three times per day and stripcharts are continuously monitored to ensure that TGMS is not out of allowable tolerances. Track gage conditions deemed as unsafe (in excess of 58½ inches) must be field verified. FRA Inspectors must stop the ATIP car when encountering an unsafe level condition and verify geometry car measurements. All other on-track verifications will be at the sole discretion of the Inspector. ATIP also conducts specialized random quality assurance field validations.

Railroads may question the accuracy of a reported exception. In those cases, the FRA Inspector may stop the car and substantiate the exception by conducting additional instrument verifications and/or direct track measurements, as long as the activity is supervised under proper on-track safety procedures. If track structure and operating circumstances warrant, Inspectors may assess and consider a violation citation, in accordance with Chapter 4.

ATIP satisfies 49 CFR § 213.13 requirements to measure track under load. ATIP cars normally apply a lateral and vertical dynamic load and correspondingly, TGMS calculates the geometry compliance. Speed and impact factors determine the level of rail movement under load. Measurement under load (dynamic) must always be considered—the only exceptions are narrow gage, and guard face and check gages. Car wheels forcing a narrow gage or guard check and face gage condition outward are not measurement-appropriate under load (49 CFR § 213.13).

It is important for the Inspector to verify (reinspect) geometry measurements following an ATIP survey (see Source Code J). Inspectors should be confident geometry measurements are correct and accurate, and they should be ready to disprove any contentions that the measurements aren’t accurate. Also keep in mind that static measurements will almost never exactly equal that of a dynamic (100-ton car) measurement.

Exception Remediation

Providing the ISO quality standards are met, Inspectors will recognize exceptions discovered by ATIP cars as abiding to FRA's constructive knowledge standard in accordance with 49 CFR § 213.5 responsibility and FRA policy. It is the railroad's responsibility to decide the remedial action when notice is given (ATIP survey), stating that their track does not comply with the safety standard requirements. Proper exception remedial action must be taken at the time of discovery by railroad representatives. Inspectors may not impose remedial action en route, except when stopping and verifying validity or in response to railroad remedial action. Inspectors may also consider citing violations when conducting an on-the-ground reinspection of an unsafe track condition (see Source Code J).
After an ATIP survey, reinspections determine if appropriate remedial actions have been taken and are at the sole discretion of the Inspector. Proper source codes for this are located in this section under "Reports." Prior knowledge is met when the railroad is given a TGIR and enforcement action should be considered when remedial action has not been taken.

Reverse Movement

To accomplish on-the-ground track exception verifications or for other purposes, ATIP car movement in the reverse direction will be conducted in accordance with railroad operating rules. Pilots will position themselves to oversee the reverse movement and communicate with the car operator in accordance with railroad operating rules. Only DOTX 217 and 218 have dual controls at each end. Reverse movements are limited by:

1. Operations through an interlocking,
2. Operations over multiple highway-rail grade crossings, or
3. Operations of a significant distance (usually 2 miles or more).

Speed Limitation on Curves

The V_{max} formula considers the average variable of actual elevation and curvature, and the amount of unbalanced elevation or cant deficiency in determining the maximum curving speed allowed. Curving forces become more critical if variations in track, equipment characteristics, or improper train handling conditions have not been abated. FRA Inspectors are to determine compliance with the track surface standard in 49 CFR § 213.63 or the alignment standard in 49 CFR § 213.55, which in some cases may be more restrictive than the V_{max} rule. For example, a single point alignment deviation that measures 1⅞ inch in Class 3 track may impose a greater speed restriction than the V_{max} rule. Under the V_{max} rule, the maximum speed on a curve is determined by averaging both the curve alignment and crosslevel measurements for 10 points (establishing 11 stations, 5 on either side of the point of collision) at 15½-foot spacing. A curve's elevation and the amount of curvature for each 155-foot track segment is calculated by the geometry car and produces a limiting speed using the V_{max} formula.

Curve speed calculated by ATIP cars are to be strictly enforced. For instance, if the calculated speed of a curve is 46 mph, speeds above 46 mph are not compliant. The reasoning for the strict interpretation is the allowance (compromise) of averaging elevation and curvature versus the more restrictive point-to-point method. In the body of the curve, an average of both the alignment and crosslevel measurements through 155-foot of track segment is a regulatory requirement and formula calculations are necessary to know the maximum authorized speed. The "average" approach recognizes the "steady-state" purpose of the formula.

If the length of the body of the curve is less than 155 feet, measurements should be taken for the full length of the curve body. Transient locations (point to point) are addressed by the alignment and track surface tables, a departure from the present averaging measurement technique.

The difference between the track angle and the car angle is called the roll angle. The less the roll angle, the better the comfort and safety obtained going around the curve. Although 4 inches of cant deficiency is usually applied to passenger trains, other types of equipment with comparable suspension systems, centers of gravity, and cross-sectional areas may perform equally well. Inspectors should be familiar with the different types of rail equipment operating over their assigned territory.

Inspectors may use Equation 1 to solve for unbalance:

$$U_b = E_a - ((V^2 \times D) \div 1{,}430) \quad (1)$$

Where:

U_b = Unbalance

E_a = Average Elevation

V^2 = Velocity Squared

D = Average Degree of Curvature

ATIP cars indicate the maximum allowable speed in the TGIR and list the condition as an exception. Inspectors will not usually consider recommending violations when the calculated operating speed produces marginal differences (the ⅓ unbalance rule) above the approved unbalanced level. At locations where minimal Superelevation and curvature produce more than 3 inches but less than 4 inches of unbalance, the TGIR lists the exception for correction—no violation is usually recommended. For example, a 3-inch unbalance exception would include values of elevation (E_a) 4⅛ inches, curvature (D) 2¾ degrees, and the designated train speed (V) is 50 mph. Calculating the values U_b = 4⅛ – ([50×50×2¾] ÷ 1,430) equals 3⅝ (3.625) inches [21 percent more, but less than 33 percent]) of the 3 inches of unbalance allowed.

Inspectors' knowledge is important regarding the various types of freight and especially that the operating passenger equipment and associated unbalance levels are authorized within their respective regions. Where FRA has approved certain equipment types for curving speeds producing more than 4 inches of unbalance and specific locations confirm operating speed on curves creates more than 33 percent (1⅜ inches) more unbalance, and if the railroad has not initiated remedial action, Inspectors will consider recommending a civil penalty. For example, a 4-inch unbalance violation would include values of elevation (E_a) 2 inches, curvature (D) 3.125 degrees, and the designated train speed (V) is 60 mph. Calculating the values U_b = 2 – ([60×60×3.125] ÷ 1,430) equals 5⅞ inches (1⅞ inch or 47 percent more) of the 4 inches of unbalance allowed.

Geometry Car Security

Track Inspectors are responsible for proper security of the ATIP car and must use good judgment and discretion in the application and placement of protective devices and train control signs (e.g., red or blue flags), as circumstances warrant. To prevent undesired access when the geometry car is unoccupied, FRA Inspectors will ensure contractor personnel always provide protective measures. FRA Inspectors will notify both regional and HQ staff if conditions exist that do not allow protective devices to be applied.

Highway-Rail Grade Crossings

All occupants in the controlling compartment of the geometry car are responsible for ensuring the way is clear when approaching highway-rail grade crossings equipped with either passive or automatic warning signal system devices as detailed below:

1. The rate of deceleration on self-propelled geometry cars must be controlled to speeds deemed appropriate, based on the local conditions (e.g., gradient, visibility, individual rail surface stopping conditions) and approach a highway-rail grade crossing at reduced speed, be prepared to stop, if necessary, until it is known that automatic warning devices actuate,
2. If signal system failures disrupt the proper function of the warning devices, the occupants must be able to respond immediately,
3. The railroad representative reports warning system malfunctions to the Dispatcher according to 49 CFR Part 234, and
4. Take precautions not to interfere with the normal function of the automatic warning signal system devices. The exception to this is on condition that proper flag protection against highway vehicles is provided by railroad or contractor personnel when automatic warning devices fail to fully activate or when the host railroad's rules require an exception, Part VI of the FRA Manual on Uniform Traffic Control Devices provisions, or FRA regulations.

Reports

Document and Data Control

To ensure ATIP reports are delivered to those persons FRA authorizes, the Survey Director only delivers the TGIR reports to FRA Track Inspectors. It is the responsibility of the FRA Track Inspector to authorize distribution of a sufficient quantity of reports (paper or electronic) to the railroad representative on board. Additionally, the Survey Director enters into the survey log the name, contact information, and the number of reports the railroad representative receives. The survey log is retained and kept on file with the daily survey documentation.

FRA Track Inspection Report

Inspectors are to prepare an FRA Track Inspection Report (Form F 6180.96) for each ATIP survey with appropriate source codes and the survey number. See Chapter 2 of this manual for instructions on preparing Form F 6180.96. Inspection surveys may involve multiple reports on a given day. Inspectors may complete multiple 96 report forms and assign among themselves different railroads surveyed during the day and reinspection activities. To avoid duplication and distorting the FRA database, only one 96 report form will be completed for each survey segment or railroad, even though more than one Inspector may be on board.

Source Code

I **ATIP ACTIVE AND INACTIVE SURVEYS**

Use Source Code I with the reporting marks of the railroad followed by an Office of Safety assigned ATIP survey file number, e.g., XXXX_0123. Source code I will be used when inspecting track in conjunction with ATIP active surveys. The report header on the 96 report form is to be filled out during this inspection activity and exception(s) listed by the geometry car are to be appended and recorded on the 96 report form line items. Enter all units of inspection in the activity code box. Ensure that the survey miles accurately correspond (verified by the Survey Director) with the daily number of miles operated by the geometry car. When conducting an inactive survey, use Source Code I, but list only the mileage operated by the geometry car.

J ATIP FOLLOWUP REINSPECTION

Use the ATIP number corresponding to the original survey files number (e.g., alpha-numeric XXXX_0123) assigned by the Office of Safety. Followup inspections should be conducted within 30 days. Also, if the ATIP car is stopped for verification during an active survey and noncompliance conditions are cited, the Inspector must initiate a Source Code J report separate from the Source Code I report mentioned above.

When conducting ATIP followup inspections (Source Code J), if track exceptions other than those reported by the geometry car are discovered, then another 96 report form with the appropriate source code must be completed. Do not combine ATIP exceptions with other exceptions on one 96 report form.

N ATIP INSPECTION OF STRACNET

The strategic rail corridor network (STRACNET) is a network of military routes important to national defense. Paper and electronic State maps are available to help identify these important routes.

End of Chapter 3

Appendix: Conversion Feet to Decimals of a Mile

Milepost Increasing up in feet	Decimal Mile	Fractional Mile	Poles	Fractional Mile	Down Feet	Milepost Decreasing Decimal Mile
0	0.000	0	0	1	0	0.000
132	0.025		1		-132	0.975
264	0.050		2		-264	0.950
396	0.075		3		-396	0.925
528	0.100		4		-528	0.900
660	0.125	⅛	5	⅞	-660	0.875
792	0.150		6		-792	0.850
924	0.175		7		-924	0.825
1056	0.200		8		-1056	0.800
1188	0.225		9		-1188	0.775
1320	0.250	¼	10	¾	-1320	0.750
1452	0.275		11		-1452	0.725
1584	0.300		12		-1584	0.700
1716	0.325		13		-1716	0.675
1848	0.350		14		-1848	0.650
1980	0.375	⅜	15	⅝	-1980	0.625
2112	0.400		16		-2112	0.600
2244	0.425		17		-2244	0.575
2376	0.450		18		-2376	0.550
2508	0.475		19		-2508	0.525
2640	0.500	½	20	½	-2640	0.500
2772	0.525		21		-2772	0.475
2904	0.550		22		-2904	0.450
3036	0.575		23		-3036	0.425
3168	0.600		24		-3168	0.400
3300	0.625	⅝	25	⅜	-3300	0.375
3432	0.650		26		-3432	0.350
3564	0.675		27		-3564	0.325
3696	0.700		28		-3696	0.300
3828	0.725		29		-3828	0.275
3960	0.750	¾	30	¼	-3960	0.250
4092	0.775		31		-4092	0.225
4224	0.800		32		-4224	0.200
4356	0.825		33		-4356	0.175

Milepost Increasing up in feet	Decimal Mile	Fractional Mile	Poles	Fractional Mile	Down Feet	Milepost Decreasing Decimal Mile
4488	0.850		34		-4488	0.150
4620	0.875	⅞	35	⅛	-4620	0.125
4752	0.900		36		-4752	0.100
4884	0.925		37		-4884	0.075
5016	0.950		38		-5016	0.050
5148	0.975		39		-5148	0.025
5280	1.000	1	40	0	-5280	0.000

Legend for Railroad Delays	
PS	Passenger Stop (Boarding or Detraining Personnel
RB	Red Block (Priority Dispatching other Trains in CTC Territory: Signal Malfunction)
MD	Mandatory Directives Dispatching Territory (TWC, DTC, Form D, Traffic, etc.)
P1...Px	(Unqualified, Unassigned Crew Call or Late Reporting, etc.)
TS Ev	Track Structure (Unsafe Geometry, Special Trackwork; Clearance; Excessive Vegetation, Ballast, etc., or Obstruction)
GX	Grade Crossing, Signal, or other Shunting Failures
Legend for ENSCO Delays	
G1	Primary Gage System
G2	Secondary Gage System
C1	LVDT
C2	RVDT
C3	CAS Package
P1	Profile Accelerometer Left
P2	Profile Accelerometer Right
RQ1	Ride Quality Car Body Vertical
RQ2	Ride Quality Car Body Lateral
RQ3	Ride Quality Truck Lateral
PT	Paint
CN	Computer or Printer Network
P (E,F,R)	Onboard Personnel Induce (ENSCO, FRA, or Non-Operating Railroad)
T	Tachometer Failure
E1	Engine One Generated Failure
E2	Engine Two Generated Failure
Environmental Delay Legend	
W	Weather-Related: (Any Material {Water Over Top of Rail, Blowing Snow, Leaves, Etc.}

Federal Railroad Administration Track Safety Standards Compliance Manual

Chapter 4
Exceptions to the Standards

Office of Safety Assurance and Compliance
Track and Structures Division

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Table of Contents

CHAPTER 4

Exceptions to the Standards

Introduction

Title 49 Code of Federal Regulations (CFR), Part 213 Track Safety Standards (TSS), contains the minimum requirements for safe track and roadbed. Railroads must comply with many separate requirements contained in the TSS. If a railroad deviates from these requirements and train operations continue without appropriate remedial action, consider enforcement action.

Each situation contains a multitude of factors. As such, each Inspector must exercise professional judgment, guided by the enforcement discretion criteria set forth in 49 CFR Part 209, Appendix A (Statement of Agency Policy Concerning Enforcement of the Federal Railroad Safety Laws), when deciding whether to recommend legal action for noncompliance with the TSS. Among those criteria are "the inherent seriousness of the condition or action," the "kind and degree of potential safety hazard the condition or action poses in light of the immediate factual situation," "the general level of current compliance," and the "recent history of compliance." This chapter will assist the Inspector in making enforcement determinations by providing guidelines for assessing the seriousness of any defect in the specific context of the TSS and the conditions observed during a particular inspection. This promotes FRA's policy of focused enforcement (i.e., the use of FRA's limited enforcement resources to attack the most serious and persistent compliance problems).

The FRA's primary purpose is to carry out the intent of Congress as stated in the Federal Railroad Safety Act of 1970: "to promote safety in every area of railroad operations and reduce railroad-related accidents and incidents." Improved safety performance, achieved by adherence to prescribed standards, accomplishes this objective. Therefore, obtaining compliance with the TSS satisfies the purpose of the act. It may be necessary to improve compliance to reduce the risk of accidents in a particular situation; this should be a primary factor in determining enforcement action, such as the imposition of civil penalties.

An Inspector can initiate enforcement action of various types (used individually or in combination). The enforcement tools available (in order of increasing severity) are:

1. Defect report (F6180.96).
2. Violation report recommending a civil penalty (F6180.111).
3. Special Notice for Repairs (slow order).
4. Compliance order recommendation.
5. Notice of track conditions (emergency order).

Each Inspector should remember that the purpose of the safety laws, the TSS, and enforcement activity is to reduce train accidents, casualties, and property damage resulting from defective conditions in tracks and roadbed. Whereas adherence to each requirement of the TSS will help lessen the risk of track-caused accidents, the Inspector must be able to distinguish the varying levels of safety risk presented by violations of different standards. Each condition identified in the TSS has a different effect on the performance of the track structure and, accordingly, different conditions have widely varying effects on the immediate hazard to train operations. For example, in most cases, a broken rail presents a greater immediate hazard to trains than vegetation adjacent to the roadbed.

When determining which of the five enforcement actions to pursue, an Inspector must consider the risk of an accident presented by the defect itself. In addition, the Inspector must consider the possible consequences of an accident caused by the condition, if the railroad representative knew the defective condition existed, previous track-caused accident performance on the particular rail line, and the railroad's track standards compliance program. Train speed at the particular location, type of traffic handled on the line (hazardous materials, passengers), population proximity, and terrain all can influence the consequences of an accident.

Defect Reports

All enforcement activity begins with an inspection, during which the Inspector will record all defects on an F6180.96. (See Chapter 2 of this manual for instructions.) Defect reporting constitutes the most frequently used enforcement action and may lay the groundwork for more severe enforcement action, if necessary. Exercise care to conduct a thorough inspection, recording the location, type, and size of each defect discovered. Whereas defect reporting is usually sufficient to bring about compliance, the Inspector must remember that every defect report may become part of a violation report if defects remain. It is imperative that these reports are legible, accurate, and complete. The description and location of each defect should be concise enough that persons not present during the inspection could locate the defects. Sound performance during inspections and reporting ensures sound legal action in the future, if needed.

Violation Reports

In the 1970s and 1980s, the railroad industry experienced a significant reduction in track-caused accidents. In recent years, the trend has leveled off, but the number of rail and rail joint type track-caused accidents is increasing. Therefore, it is important that Inspectors use all the enforcement tools, including the track violation, to help ensure compliance. It is the responsibility of each Regional Supervisory Track Safety Specialist to ensure effective violation report utilization.

A defect is a condition not in compliance with the TSS. Defects noted on inspection reports, serve as notification to the railroad of FRA's awareness of the defect's existence. Defects may also serve as evidence of the railroad's knowledge of the defect (see the discussion below of the knowledge standard). An FRA Inspector may choose to also recommend a civil penalty (violation) for a defect, and so note the decision on the inspection form. A violation serves two purposes: 1) it notifies the railroad that FRA has concluded that a condition does not comply with the TSS, and 2) it notifies the railroad that the Inspector has reviewed the circumstances associated with the condition(s) of noncompliance and is recommending a civil penalty.

In many cases, documenting conditions of noncompliance is sufficient to achieve compliance with the TSS. However, there are many instances in which a condition warrants a violation. When recommending a violation, the Inspector must prepare a well-documented narrative report describing the seriousness of the condition.

Once the Inspector has determined that a civil penalty should be recommended, all facets of the conditions and circumstances must be carefully considered to make a judgment as to the degree of the violation. Any person (see 49 CFR § 213.15(a) for definition of a person) who violates, or causes the violation of, any requirement of Part 213 is subject to a civil penalty of at least $500, and up to $11,000, per violation. A penalty, not to exceed $27,000, may be assessed under conditions described in § 213.15(a). Therefore, the Inspector must present the facts of the situation in the narrative report and a recommendation for prosecution should leave no doubt as to the degree of seriousness of the violation.

The Inspector should be familiar with the penalty amount normally assessed for a particular violation under the penalty schedule for Part 213 (see Chapter 5, Appendix B–Defect Code/Penalty Schedule). If the circumstances seem to warrant a higher penalty and/or the assessment of penalties for multiple days that a violation continued, the Inspector should discuss these factors with the Regional Specialist. If both agree that the extraordinary penalties are appropriate, they should prepare a cover memorandum for a Regional Manager to send to FRA's Office of Chief Counsel. The memorandum should explain the factors that warrant higher-than-normal penalties and/or an assessment for multiple days, note what the amount of the recommended assessment would be, and explain why such an extraordinary assessment is needed in this situation.

Knowledge Standard

Section 213.5 requires that any track owner who "knows or has notice that the track does not comply" with the TSS must bring the track into compliance or halt operations over that track. This knowledge standard has been in the TSS since its creation, and FRA decided to retain the standard when revising the TSS in 1998. The standard holds a track owner liable for violations of which it has actual knowledge or of which it would have known if the owner had exercised reasonable care (e.g., violations of which it has constructive knowledge). The standard is thoroughly discussed in the preamble to the 1998 final rule, found at 63 Federal Register 33992, 33995–33996 (1998).

In submitting a violation report recommending the issuance of a civil penalty, the Inspector must fully support the conclusion that the track owner had actual or constructive knowledge of the defect at a time when operations occurred over the track. One way to establish actual knowledge is for the Inspector to record and notify the track owner when the defect is found, then reinspect later to see if the track owner has taken appropriate remedial action. If the track owner has not taken appropriate action, the Inspector should cite the track owner for a violation of the TSS. Another method to demonstrate actual knowledge is to show that the defect has been noted in the track owner's inspection records, including records of automated inspections. In demonstrating actual knowledge, the violation report should clearly trace each defect to a specific item in an FRA inspection report and/or railroad inspection records. Additionally, a citizen complaint or concern directed to a railroad would fulfill the knowledge standard.

In some situations, the defect has not been noted on a previous FRA inspection report or the railroad's own inspection records. Citing such a defect as a violation requires that the Inspector demonstrate the track owner's constructive knowledge. Establishing constructive knowledge of a defect requires proof that the track owner would have known of the defect if the owner had conducted its previous inspection with reasonable care. A track owner cannot simply wait for FRA to provide notice of defects that the track owner should find. The track owner's duty to inspect its track gives it notice of any defect that such a required inspection would reveal, whether or not the railroad detected it. With demonstrated constructive knowledge and a civil penalty recommended, the Inspector should attach a copy of the railroad's last required report of inspection. The Inspector should explain why the defect is of such a nature that it would have had to exist at the time of the last inspection. For example, crossties generally deteriorate slowly over time, so a crosstie condition found by an FRA or State Inspector probably was defective when the track owner last inspected the track. Similarly, rust on the surface of a component that would be exposed to moisture only when it is in noncomplying condition (e.g., on the broken surface of a joint bar) may demonstrate that the defect must have existed at the time of the last inspection.

Criteria Affecting the Seriousness of a Noncomplying Condition

A noncomplying condition under one set of circumstances may warrant a defect, while the same condition under a different set of circumstances may warrant a violation. The enforcement discretion considerations in Part 209, Appendix A, require the Inspector to consider the inherent seriousness of the condition. For example, in the TSS context, is the defect among the leading causes of track-caused accidents nationwide? Does the nature of this particular defect (e.g., wide gage of a particular dimension) substantially increase the risk of an accident? Application of these criteria requires that the Inspector be generally familiar with the leading causes of accidents in his/her discipline. Consult the FRA Office of Safety's accident/incident database for more detailed information about accidents on a particular railroad.

In addition to the inherent hazard posed by the defect, the enforcement discretion considerations also require the Inspector to consider factors present in the immediate factual situation that may exacerbate or lessen the risk of serious consequences should an accident occur due to the inherent hazard posed by the defect. The Inspector must also consider the track owner's compliance history at this location; repeated noncompliance is generally more deserving of enforcement action than is a rare noncomplying condition. Some examples of criteria for consideration when making a decision whether or not to recommend civil penalty include:

- Passenger trains.
- Hazardous materials.
- Population density (urban or residential areas).
- Speed.
- Tonnage.
- Involvement of a bridge or bridge approach.
- Proximity to schools and highway-rail grade crossings.
- Compliance history.
- Accident history.
- Potential for negative environmental impact.
- Strategic Rail Corridor Network (STRACNET) Route.

A violation report should stress the importance of the violation in light of the immediate circumstances, as well as the inherent hazard posed by the condition.

As discussed above, each Inspector must exercise good professional judgment and weigh the enforcement discretion criteria when deciding whether to recommend a violation. However, the Inspector must exercise discretion on behalf of the Agency, not his or her personal discretion. Accordingly, the Inspector's exercising of discretion is subject to supervisory review. Moreover, as an Agency, FRA has the duty to guide the exercising of that discretion and, when necessary, the authority to exercise that discretion above the level of the individual Inspector to ensure properly focused enforcement on important compliance problems.

In determining which instances of noncompliance merit penalty recommendations, the Inspector considers (49 CFR Part 209, Appendix A):

1. The inherent seriousness of the condition or action;
2. The kind and degree of potential safety hazard the condition or action poses in light of the immediate factual situation;
3. Any actual harm to persons or property already caused by the condition or action;
4. The offending person's (i.e., railroad's or individual's) general level of current compliance as revealed by the inspection as a whole;
5. The person's recent history of compliance with the relevant set of regulations, especially at the specific location or division of the railroad involved;
6. Whether a remedy other than a civil penalty (ranging from a warning on up to an emergency order) is more appropriate under all of the facts; and
7. Other factors that the immediate circumstances make relevant.

Certain circumstances concerning the TSS most likely warrant recommendation for civil penalty. These criteria (listed below) are a general application of the enforcement discretion applied to common factual patterns involving defects known to be leading causes of track-caused accidents, extremely persistent noncompliance, and/or willful noncompliance. Although it is not possible to list all circumstances that most likely warrant a civil penalty, these conditions should result in a violation unless the Track Inspector determines that special circumstances are present that indicate otherwise. Such special circumstances may include immediate and comprehensive remedial action or factors that lessen the severity of the defects (e.g., dramatic reductions in traffic volume or changes in the railroad's management). Unless the Inspector and Regional Specialist agree that circumstances dictate otherwise, civil penalty is recommended for the following situations:

- When followup inspection(s) disclose that unsatisfactory remedial action (or no action) was taken for conditions of noncompliance previously noted by Track Inspectors for FRA or the track owner. This includes ATIP reinspections.
- Systemic defects (should have been known to the track owner) are part of a pattern of repeated, similar substandard conditions on the same line, same subdivision, same yard, or within the same supervisor's territory. For example, a center-cracked or broken joint bar that the railroad knew, or should have known, existed (as shown by specific evidence) and that is part of a track segment that has an excessive number of center-cracked or broken joint bars. For such situations, it may be appropriate to utilize a Special Notice for Repairs Report (SNFR).
- Multiple defective conditions occurring at the same location (e.g., joint tie defect with a center-cracked bar, a geometry defect with defective ties, etc.). In such cases, Inspectors shall confer with their Specialist to determine the civil penalty or penalties to be cited.
- A rail documented as defective by the railroad's continuous rail flaw inspection with the absence of required remedial action.
- A "breakout in rail head" (§ 213.113) that has obviously existed since the last required railroad inspection.

- A track defect caused by improper repairs (deliberate installation of a joint bar that is not of a structurally sound design and dimension for the rail on which it is applied, or failure to drill holes in rail ends not complying with TSS).
- Defective turnout ties or poor support causing a spring rail frog to have excessive clearance between the hold-down housing and the horn(s). (Note: include a description of gouging or contact by the outside of the wheels against the gage side of the wing rail).
- Excessively chipped or worn switch points that are so chipped or worn as to present a significant derailment hazard.
- Any track geometry defect that clearly existed since at least the last required railroad inspection. Therefore, when these types of defects do not comply with the designated class of track and are found by an Inspector, it is obvious the railroad was not following due diligence in inspecting the track (i.e., constructive knowledge).
- A switch stand or derail that can be thrown with the lock or hasp in place.
- The noncompliance of requirements under excepted track. For example, the track at a highway-rail grade crossing does not meet Class 1 requirements when the railroad is moving hazardous material placarded cars in trains over the track.

The list above does not in any manner constitute an all-inclusive list of items that should result in a violation. However, if Inspectors consistently address these situations through enforcement action, we will effectively focus enforcement where it counts the most. This will be an important catalyst in helping the industry make significant reductions in track-caused accidents. If no civil penalty recommendation occurs for any situation described above, discuss the special circumstances with the Track Specialist. This review is necessary to achieve a reasonably uniform and consistent enforcement policy. Refer to Chapter 2 for instructions on preparing a violation report (F6180.111).

A regular cycle of inspection, notification by Form F6180.96, and reinspection is the best and most desirable means of promoting compliance and acquiring evidence of deliberate noncompliance. Take care to cite the same defects in the original report and the report recommending a civil penalty. The original report should be included as background information supporting the material forwarded for legal action. In addition, individually reference each item number in the original report.

Complaint and Accident Investigations

If allegations of noncompliance with FRA's TSS are substantiated during a complaint investigation, and if consideration of the criteria discussed above indicates that it is the appropriate course, a violation report should be submitted.

During an accident investigation in which a track condition not in compliance with FRA's TSS is determined to be a causal factor and the knowledge standard can be satisfied, a violation report must be submitted. In such a situation, explain the causal relationship in detail, and a cover memorandum noting the causal relationship and recommended aggravated penalties should be submitted to the Office of Chief Counsel with the violation report.

Special Notice for Repairs–Track Class

Section 216.15 of 49 CFR deals with written notification issued to the railroad when track does not comply with the requirements for the class at which the track is being operated as defined in the TSS. The notice will describe the conditions requiring the track to be lowered in class, specify the exact location of the affected track segment and state the highest class and corresponding maximum speeds at which trains may operate over that track. This slow order will remain in effect until repairs are completed. Consider an SNFR, Form F6180.8, for a lack of voluntary compliance by the railroad.

Section 213.5 holds a track owner liable for violations of which it has actual knowledge or of would have known had it exercised reasonable care (e.g. violations of where it had constructive knowledge.) When other circumstances warranting issuance of a SNFR may exist, Track Inspectors are advised to be judicious in their decisionmaking and to seek counsel with their respective Regional Specialist prior to or immediately after issuing a SNFR, when practicable.

If, during an inspection, a Track Inspector determines that the track does not comply with the requirements of the TSS, make every attempt to encourage the carrier to take the proper remedial action to correct the existing defects. A Track Inspector should consider issuing an SNFR when:

- The carrier refuses to take appropriate remedial action for the defective conditions found by the Track Inspector.
- Finding defective conditions and determining that a pattern of noncompliance exists over an extended period of time.
- Observing evidence of repeated violations, which demonstrates a disregard of comprehensive inspections and taking appropriate remedial action.

The Inspector should evaluate the seriousness of the defects. If it is determined that the existing defect(s) presents a threat to safety, the Inspector may issue an SNFR, requiring the carrier to reduce the maximum authorized operating speed over the affected track.

If issuing an SNFR to the carrier, compile complete documentation. This will include field measurements, photographs, location of defects in relation to known fixed points, and a written narrative. The narrative will give details concerning the track structure, the amount and type of rail traffic, and what type of condition is found. In addition, note conditions or defects throughout the inspection area. Furthermore, note the reaction and response of the railroad and any other information that may affect the SNFR.

Complete the SNFR in the field. The track description must indicate track number or another designation that will specify the track to which the order applies. The location of the defects must be indicated and referenced to a known, fixed point (e.g., a milepost, road crossing, switch, etc.).

The SNFR must be in writing and personally presented to the appropriate carrier official. This will eliminate the possibility of a misinterpretation of the information being received by someone who does not have the authority or ability to carry out the provisions of the notice.

If encountering a delay in this action, a telephone warning can be used to advise the railroad that an SNFR is to be issued. The Track Specialist and/or the Regional Administrator will be notified by phone as soon as possible. Less serious conditions that do not meet the requirements of the TSS may not warrant issuing an SNFR. Consider this when determining the seriousness of the condition.

Make a thorough description of each defect on the SNFR form using the language of the TSS and measurements made in the field. It must be exact and contain sufficient detail to describe each defect. Make reference to the completed F6180.96 at the time of inspection. Section

213.5 holds a track owner liable for violations that it had actual knowledge of or would have known had it exercised reasonable care (e.g., violations that it had constructive knowledge.)

Compliance Orders and Compliance Agreements

General Instructions

Under 49 U.S.C. § 20111, FRA has the authority to issue compliance orders when the agency has reason to believe that the respondent is engaging in a continuing pattern of conduct that involves violations of the TSS. Procedures for issuing a compliance order are found in 49 CFR Part 209, Subpart C.

A compliance order normally will require remedial actions necessary to assure compliance with the regulations, and may impose restrictions until compliance is achieved. A compliance order involving the TSS may include a requirement that the track owner make specified repairs by a specific deadline. The compliance order does not necessarily remove track(s) from service. If the railroad does not comply with the terms of the order, FRA may seek penalties for violation of the order or seek enforcement of the order in Federal court.

Procedures

If, during an inspection, a Track Inspector determines that a railroad is engaging in a continuing pattern of conduct that involves repeated violations of the TSS, the Regional Administrator, through the Track Specialist, should be notified. General guidelines for determining this continuing conduct or pattern are as follows:

- A number of inspections have been made.
- These inspections continue to reveal defects and repeated noncompliance.
- The carrier refuses to bring the track into compliance with the standards.
- The Inspector has made every attempt to have the carrier take remedial action through actions such as:
  - Repeated inspections.
  - Submission of violation reports.
  - Meetings with carrier officials explaining the seriousness of the existing conditions.
  - Slow order through the use of an SNFR.

If it is determined by the Regional Administrator, with technical guidance from the Track Specialist, that there is a pattern of repeated noncompliance and conditions present a threat to safety, consideration should be given to recommending the issuance of a compliance order. The Track Division Chief (RRS-15) in the Office of Safety Assurance and Compliance and the Assistant Chief Counsel for Safety (RCC-10) should be notified and consulted at this time. The recommendation containing the information noted below under “documentation” must be forwarded to both of those offices.

Documentation

Complete documentation of the entire area must be developed and included with the Regional Administrator’s recommendation. This documentation will include the following:

- Location of all defects including measurements, where required. This is to be recorded on Track Inspection Report Form F6180.96.
- Copies of Track Inspection Report Form F6180.96 for relevant previous inspections at this location.
- Copies of all relevant violation reports concerning the area in question.
- List of all track-caused accidents, reportable and nonreportable, that occurred during the previous 12 months.
- Copies of carrier inspection reports for the previous 6 months.
- A written narrative should be prepared detailing, but not limited to, the following:
  - Amount and type of rail traffic.
  - Proximity of tracks to homes, schools, stores, etc.
  - The carrier's inspection and maintenance programs and procedures.
  - The seriousness of the defects.
  - The basis for the determination that a pattern of noncompliance exists.
  - Details of each meeting held with carrier officials including dates, names and titles of those in attendance and items discussed.

Based on the information submitted, the Office of Safety and the Office of Chief Counsel will decide whether to recommend to the Administrator that a compliance order proceeding be initiated. With the Administrator's approval, the Office of Chief Counsel would then issue a notice of investigation based on the documentation submitted. If the railroad requests a hearing, FRA's hearing officer would preside over a trial-type hearing where FRA would have the burden of proving its factual allegations and the reasonableness of the remedial action sought. The hearing officer's decision could be appealed to the Administrator, and the Administrator's decision could be challenged in court. At any time during this process, FRA and the railroad could agree to a consent order and present it to the Administrator for signature. A consent order would impose requirements on the railroad and preclude further litigation of the issues.

In recent years, FRA has developed a simpler way of using the compliance order authority. Under a compliance agreement, the railroad agrees to take certain remedial actions; should those actions not occur to FRA's satisfaction, the railroad agrees not to oppose issuance of a compliance order or an emergency order imposing those conditions. Whereas the preparatory work necessary for a compliance agreement is substantially the same as for a compliance order (outlined above), the agreement presents FRA and the railroad with certain advantages. FRA can obtain remedial action quickly and informally, and if the terms of the agreement are not met, FRA can issue a compliance order or an emergency order without the time, expense, and litigation risk of a formal proceeding. Therefore, the railroad achieves improved compliance without being subject to an actual order unless it fails to meet its obligations under the agreement. In some agreements, FRA waives its right to pursue civil penalties for specified violations if the railroad meets all conditions of the agreement. In other agreements, the railroad will pay civil penalties on certain extremely serious violations that FRA may find while the agreement is in effect. If a compliance problem appears to be an appropriate situation for such an agreement, Regional Managers should contact RRS-15 and RCC-10.

Emergency Orders

Under 49 U.S.C. 20104, FRA has authority to take special remedial action to handle emergency situations. If, through testing, inspection, investigation, or research, FRA decides that "an unsafe condition or practice, or a combination of unsafe conditions and practices, causes an emergency situation involving a hazard of death or personal injury," FRA may immediately issue an emergency order. The order may impose restrictions or prohibitions necessary to bring about the abatement of the emergency situation. The authority to issue such an order rests with the FRA Administrator.

Unlike a compliance order, FRA may issue an emergency order without first providing the opportunity for a hearing. This is an extraordinary power. Accordingly, FRA has used the authority sparingly, and issued only 22 orders from 1970 through 2000. Although the statute does not define the emergency situation that must be present for FRA to issue such an order, FRA believes it refers to conditions and/or practices that present an imminent hazard of death or injury. The authority can be used to address conditions that are not in compliance with FRA's rules and conditions that are not addressed by those rules.

General Procedures

FRA has issued procedures for issuance of track-related emergency orders (49 CFR Part 216, Subpart C). Those procedures require that an Inspector who detects an apparent emergency situation begin by issuing a notice of track conditions. The Regional Administrator then decides, based on that notice, whether to recommend that the FRA Administrator issue an emergency order removing the track from service. Those procedures (§ 216.27) also note that the Administrator can issue an emergency order without following this process. Ordinarily, in a true emergency, a cumbersome process is unacceptable. Therefore, we leave it to the discretion of the region to determine the degree of urgency, and for more urgent situations, dispense with the process set forth in Part 216.

An Inspector who discovers or is informed of conditions that may constitute an emergency situation shall immediately contact the regional office. During an inspection, if an apparent emergency situation is brought to the Inspector's attention, the Inspector shall immediately inspect the alleged condition or practice to determine whether an emergency situation exists. If, during an inspection, the Inspector discovers an emergency situation or determines after inspecting that an emergency does or may exist, the Inspector must immediately follow the procedures outlined in this chapter. If the Inspector has any doubt as to whether a condition or practice constitutes an emergency, the Inspector must consult the Track Specialist.

- The Track Specialist shall immediately ascertain if there is a reasonable basis for the allegation and alert the Regional Administrator and FRA Headquarters to the situation. The Regional Administrator will keep FRA Headquarters advised.
- The Track Specialist shall make a preliminary determination as to whether further inspection is necessary.
- If the allegation of an emergency situation appears to have merit, the Track Specialist shall contact the track owner immediately, ascertain as many pertinent details as possible concerning the situation, and attempt to obtain immediate voluntary abatement prior to the inspection. The Track Specialist should ascertain and evaluate the steps, if any, that the track owner indicates should be used to abate the danger. An investigation shall then be conducted in accordance with the procedures outlined in this chapter.

Technical Considerations

After the determination to investigate has been made, the inspection should be thoroughly planned to the extent time permits. The Track Specialist and Inspector should review the known facts and decide what technical equipment and personnel may be necessary to conduct the inspection.

Scheduling

Any allegation of an emergency situation received by a regional office, whether written or oral, must be handled as a high priority. Other commitments, weekends, holidays, leave, and other considerations must not interfere with the expeditious and thorough handling of these cases.

If it is determined that an inspection should be made, it will be scheduled and conducted at the earliest possible time. Except in extraordinary circumstances, the inspection should be conducted within 24 hours of the receipt and preliminary evaluation of the alleged emergency situation.

Inspection

In an inspection conducted because of an allegation of an emergency situation, the alleged situation shall be inspected first.

Any additional inspection activity should take place only after resolution of the emergency situation. After the emergency situation has been resolved, a complete inspection of the facility may be conducted.

Voluntary Corrective Action

As soon as it is concluded that conditions exist that constitute an emergency situation, the Inspector shall attempt to have the situation immediately corrected through voluntary corrective action by the carrier. The track owner or a representative of the owner should be promptly advised that such a situation exists.

The track owner is ultimately responsible for determining the manner in which they will correct the dangerous condition. Before leaving the premises, FRA or State personnel must determine that the emergency situation has been resolved and will not recur.

The track owner shall be deemed to have resolved an emergency situation if they eliminate exposure to the situation, or eliminate the condition or practice that resulted in the situation.

If corrective action is taken voluntarily, the Inspector shall make the appropriate notation on the FRA Track Inspection Report.

Refusal to Correct

If conditions that are of a serious nature are not corrected, the Inspector shall immediately notify the regional office. Depending on the degree of urgency, the Regional Administrator will decide whether to proceed directly to recommend to Headquarters that an emergency order be issued, or to have the Inspector issue a notice of track conditions to the appropriate railroad official, thus informing the carrier that the track does not comply with the requirements of the TSS. Whichever route is chosen, the Inspector will issue a Track Inspection Report.

The Inspector has no authority to order the closing down of an operation or to direct employees to leave an area in the case of imminent danger. His/her only authority is to inform the Regional Administrator of the conditions observed and provide the basis on which the Regional

Administrator can make a recommendation to the FRA Administrator through the Associate Administrator for Safety.

The Notice of Track Conditions

Where the region decides to use the notice of track conditions process set forth in Part 216, the following procedures must be followed:

- The notice shall set out and describe in detail the conditions found and specify the location, track number, and any other information necessary to properly describe the defects and the track involved.
- A copy of the notice of track conditions given to the carrier along with a written narrative must be provided to the Regional Administrator within three calendar days of the issuance of the notice. A copy of this notice will also be sent to the Office of the Associate Administrator for Safety, attention RRS-15, as soon as possible.
- The written narrative with complete documentation will include:
  - Field measurements.
  - Photographs.
  - Location of defects referenced to a known fixed point.
  - Details concerning the track structure.
  - The amount and type of rail traffic not only at the location of the emergency order but also throughout the entire inspection area.
  - The reaction and response of the railroad.
  - Other information that may affect the order.
- Copies of Notice of Track Conditions shall be distributed as follows:
  - Original and first copy–mail promptly to the Track Specialist.
  - Second copy–retained by the Inspector.
  - Last copy–issue to the carrier representative.

The Track Specialist will review the report, retain the first copy for regional records, and forward the original to the Office of Safety Assurance and Compliance, RRS-15.

Information Needed to Support Issuance of an Emergency Order

The Regional Administrator considers the Inspector's report, input from the Track Specialist, and any material submitted by the railroad in developing a recommendation to the FRA Administrator. If the Regional Administrator decides that emergency action is necessary, the recommendation should be supported by ample documentation of the imminent safety hazard and previous attempts to address related safety issues on the particular railroad. Time permitting, the supporting documentation should include all of the following information.

General information required:

- Track Inspection Report Form F6180.96 for the entire segment recommended for the emergency order showing each defect found during the inspection. (Repetitive entries may be summarized if a significant number of specific conditions are itemized and portray an accurate view of overall conditions.)

- Previous inspection reports served on the carrier for the particular line segment, including returned reports showing corrective action.
- Relevant violation reports filed with Chief Counsel (by report number and date of transmittal; FRA case number if known) and waiver investigation reports, if any.
- Description of method of operation.
- Operating speeds, temporary and permanent (copies of timetable, special instructions, slow orders).

Facts demonstrating that the defect poses an imminent hazard of death or injury to persons:

- ATIP data (including summary) if available.
- Narrative report of discussions with carrier representatives in chronological sequence, providing dates, locations, names, and titles.
- Number of trains (passenger through freight, local, by category) and annual tonnage.
- Motive power employed on line, maximum train lengths, carrier-imposed limitations on axle loads or particular equipment.

Hazardous materials information:

- Volume of hazmat traffic over the line, based on review of waybills or consists for a period of 2 to 4 weeks prior to the date of the investigation.
- Type of hazmat traffic (illustrative listing of recent hazmat data identifying number of cars carrying explosives, poison gas, flammable gas, chlorine, anhydrous ammonia, etc.).
- Hazmat violation history on line as related to derailment risks (train placement, etc.).

Demographic information:

- Towns and cities along the line by name, referenced by railroad milepost and approximate population.
- Illustrative description of the area (including homes, schools, businesses, hospitals, etc.), indicating proximity to rights-of-way, railroad mileposts, and estimated number of persons affected. Include major highway-rail grade crossings and railroad bridges over public streets. Provide photographs showing track in foreground and areas potentially at risk in background and street maps, if readily available.

Topographic information:

- General description of curves and grades. (Provide track charts, if available).
- Railroad bridges and sharp dropoffs adjacent to rights-of-way. (Photographs, as appropriate).
- Clearances with reference to other active track and structures along rights-of-way. (Photographs, as appropriate).

Accident history:

- Rail equipment accident/incident reports for the past 6 months, regardless of carrier-identified cause (affected line only).
- FRA accident investigation reports, if any (affected line only).
- Carrier internal reports of accidents not reported to FRA.

Special factors:

- Abandonment plans and status, if applicable.
- State agency interest in rail service continuation, if applicable.
- Planned rehabilitation efforts, if any.
- Involvement of State in inspections/investigations, if any.
- Press reports, complaints from public officials and/or union officers, etc.
- Economic impact of proposed order (only readily available information).
- List of major industries on line (with indication of hazmat traffic, if known), obtained from the railroad, and likely effect that order will have on their business.

Railroad response:

Current information on planned remedial action, adequacy of response, projected completion dates, resources actually committed, progress of work to date of recommendation.

FRA actions needed to support issuance of an emergency order:

- Inspector serves Notice of Track Conditions to railroad representative. (Note: the Regional Administrator can choose to bypass this step and instead simply inform the railroad that he/she intends to recommend issuance of an emergency order based on the inspection results).
- Regional Administrator makes assignments of responsibilities to complete field investigation.
- Track Specialist alerts Track Division (RRS-15) requesting assistance, as needed. Track Division alerts Assistant Chief Counsel for Safety.
- Track Division (RRS-15) assists in the development of accident history information.
- Office of Chief Counsel and Office of Safety Assurance and Compliance, Track Division, work together to draft emergency order.
- Administrator issues order.

Wherever an emergency order has been issued by FRA, the Track Specialist shall arrange to immediately make a followup investigation to determine if the track owner is complying with the terms of the order. The Regional Administrator arranges followup inspections, as requested by railroad, to determine whether conditions for lifting the order have been fully met on all, or a portion, of the line affected.

Where followup inspections indicate that relief from the order is fully or partially warranted, the Regional Administrator notifies RRS-15 and RCC-10. Those offices draft Federal Register notices necessary to grant relief from the order.

These procedures are intended to provide general guidance. Additional information may be required in some instances. If there is any delay in the development of any elements pertaining to an emergency order, such as typing field reports, the Office of Safety Assurance and Compliance, Track Division, RRS-15, should be consulted.

Violation of FRA Emergency Order or FRA SNFR

When an Inspector's investigation, inspection, or surveillance activity discloses that a carrier has violated a provision of an FRA emergency order or SNFR, the Inspector will immediately report the circumstances of the violation to the Regional Administrator. The Regional Administrator will promptly transmit this information to the Associate Administrator for Safety and Office of Chief Counsel for advice as to what action should be taken and what information will be required to support that action.

An emergency order or SNFR violation report shall be made in memorandum form. The subject at the heading of the memorandum should read, "Violation Report Concerning Emergency Order No. (fill in number of order) Issued Against (fill in name of railroad)" or "Violation Report Concerning Special Notice for Repairs (fill in number of notice) Issued Against (fill in name of railroad or other track owner)." The first paragraph of the memorandum report should refer to the order or notice involved and provide a brief summary relative to the circumstances and evidence to support the violation report in accordance with the advice and instructions provided by the Office of Chief Counsel.

Enforcement of the Safety Laws and Regulations Against Individuals

For further discussion of individual liability, see the General Manual, Part 3, Chapter 3.

Under 49 U.S.C. 21311, substantial criminal penalties may apply to individuals or companies who "knowingly and willfully" falsify records or reports required to be kept or submitted under the railroad safety laws. The TSS contains specific recordkeeping requirements (e.g., section 213.241) and a specific reference to the criminal provision (§ 213.15(b)). The "knowingly and willfully" standard essentially requires that the Government be able to demonstrate that the person knew what they were doing was wrong and did it anyway with a criminal intent. The Government would need to be able to prove all elements of its case beyond a reasonable doubt. Because of the high standard for knowledge and difficult burden of proof in such cases, these are not easy to prosecute. Moreover, failure to record track defects on a railroad's inspection records is most often the result of incompetence, negligence, or haste, rather than willful conduct. Nevertheless, if an Inspector has reason to believe that a railroad might purposely be falsifying its inspection records, the Inspector should contact regional staff, who should notify the Office of Safety at Headquarters and the Office of Chief Counsel. Where appropriate, those offices will make the necessary referrals to request a criminal investigation.

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Federal Railroad Administration
Track Safety Standards
Compliance Manual

Chapter 5
Track Safety Standards
Classes 1 through 5

Office of Safety Assurance and Compliance
Track and Structures Division

April 1, 2007

Table of Contents

CHAPTER 5

Track Safety Standards Classes 1 Through 5

Introduction

This chapter provides the necessary information for FRA Inspectors to properly apply the Track Safety Standards (TSS) during inspection activities (the term "FRA Inspector" also includes State Inspectors that are participants in the Federal program). This manual is not to be construed as a modification, alteration, or revision of the published TSS.

Any legal proceeding instituted against a railroad must be based on the regulations found in 49 CFR Part 213. Inspectors should refer to this manual as often as necessary to understand the intent of any particular rules, thereby assuring to the extent practicable, the nationally uniform application of these rules as intended by Congress in the Federal Railroad Safety Act of 1970.

Inspectors will not, under any circumstances, adjust, correct, or repair track, or appurtenances, nor authorize, suggest, or recommend any movements over any track. Full responsibility for these matters rests with the railroad. The Inspector will immediately inform the railroad of any track condition not in compliance with the TSS.

This manual is based on the TSS published on June 22, 1998 (see 63 FR 33992), the Gage Restraint Measurement System (GRMS) amendments published on January 10, 2001 (see 66 FR 1894), and the continuous welded rail (CWR) Final Rule published on October 11, 2006 (see 71 FR 59677).

Inspectors are encouraged to provide suggestions for enhancement of future editions of this manual.

Appendix B contains the defect codes for each subsection of the regulation. Defect codes are important analytical tools for FRA's data collection. If an Inspector cannot find a defect code corresponding to a violation of the TSS, the Inspector may still submit the violation.

This chapter addresses track Classes 1 through 5. Chapter 6 addresses Classes 6 through 9.

Text in italic font of this manual is regulatory language, whereas indented paragraphs provide field guidance for FRA Inspectors. Indented paragraphs are not to be construed as regulatory language in any manner.

Subpart A - General

§213.1 Scope of part

(a) This part prescribes minimum safety requirements for railroad track that is part of the general railroad system of transportation. The requirements prescribed in this part apply to specific track conditions existing in isolation. Therefore, a combination of track conditions, none of which individually amounts to a deviation from the requirements in this part, may require remedial action to provide for safe operations over that track. This part does not restrict a railroad from adopting and enforcing additional or more stringent requirements not inconsistent with this part.

Guidance. It is important to note that the TSS are minimum safety requirements and are not appropriate for track maintenance purposes.

This section also notes that, while the TSS address specific track conditions that exist in isolation, there can sometimes be a combination of track conditions (none of which individually amounts to a deviation of the TSS) that require remedial action to provide for safe operations over that track. Experience has shown that such an event occurs only rarely, but if an Inspector should encounter such a condition, the Inspector should immediately bring the condition to the attention of the accompanying railroad official, explain the hazard of such a condition, and encourage its rapid removal. Where the Inspector is not able to convince the railroad to initiate some action, the Inspector should refer to the Regional Track Specialist for assistance.

(b) Subparts A through F apply to track Classes 1 through 5. Subpart G and §§213.2, 213.3, and 213.15 apply to track over which trains are operated at speeds in excess of those permitted over Class 5 track.

Guidance. With the introduction of high-speed passenger train operations in the Nation, the TSS was revised in 1998 to provide two sets of requirements a) low speed/Classes 1 through 5, and b) high-speed/Classes 6 through 9. The high-speed standards include specific requirements for such operations, which also prescribe a number of track-vehicle interaction tests. Sections 213.2 (Preemptive effect), 213.3 (Application), and 213.15 (Penalties) apply to both high and low speed track.

§213.2 Preemptive effect

Under 49 U.S.C. 20106, these regulations generally preempt any State law, regulation, or order covering the same subject matter, except an additional or more stringent law, regulation, or order that is necessary to eliminate or reduce an essentially local safety hazard; is not incompatible with a law, regulation, or order of the United States Government; and that does not impose an unreasonable burden on interstate commerce.

Guidance. States cannot adopt or continue to enforce laws related to the matter covered in this rule, unless such laws are needed to address a local safety or security hazard and they impose no undue burden on interstate commerce. Although the courts ultimately determine preemption in any particular factual context, this section provides a statement of Agency intent and promotes national uniformity of regulation in accordance with the statute.

§213.3 Application

3(a) Except as provided in paragraph (b) of this section, this part applies to all standard gage track in the general railroad system of transportation.

Guidance. This applicability section specifically excludes from Part 213, track located inside an installation that is not part of the general railroad system of transportation. Additional language regarding plant trackage can also be found in 49 CFR Part 209, Appendix A, which explains that the track owner of any plant railroad trackage over which a general system railroad operates is responsible for the condition of track used by the general system railroad. Part 209 Appendix A is not meant to imply that all of the requirements of the TSS, including inspection frequencies and record keeping, become applicable to a plant railroad once a general system railroad enters the property. Rather, it is a statement meant to convey FRA's intent that plants should maintain, in a safe condition, that portion of their trackage used by a general system railroad.

3(b) This part does not apply to track - 1) Located inside an installation which is not part of the general railroad system of transportation; or 2) Used exclusively for rapid transit operations in an urban area that are not connected with the general railroad system of transportation.

Guidance. FRA does not have the manpower or resources to regularly inspect trackage within industrial installations. However, since the enactment of the Federal Railroad Safety Act of 1970, FRA has had at its disposal statutory authority to issue emergency orders to repair or discontinue use of industrial or plant trackage should the FRA find that track conditions pose a death or injury hazard. See 49 U.S.C. §20901. In other words, if FRA learns that a particular plant is in such disrepair so as to pose a threat of death or injury to a plant employee, a railroad employee, or the public at large, FRA has the option of exercising its authority. FRA may issue an emergency order ordering the plant to discontinue using the track until specified repairs are made. It is FRA's opinion that this emergency order is sufficient power to ensure track safety within plants. If conditions or events in the future tend to demonstrate that track safety within plants or installations should be more regulated, FRA will seek to change the track safety regulations accordingly.

Because it is a policy statement, Appendix A of Part 209 cannot override the text of the TSS, which clearly excludes plant railroads from the reach of the track regulations. Therefore, while the requirements of the TSS do not apply within plant railroads, those operations should use them as a guide to ensure that their tracks are capable of carrying rail traffic safely.

As a practical application of this policy, FRA expects that the trackage in a plant railroad, at a minimum, meet Class 1 standards on the segments where the general system trains operate in the facility. FRA does not expect that the plant comply with inspection requirements but only the geometric and structural elements of the TSS for Class 1 track. The TSS excludes urban area rapid transit systems that are not a part of the general system.

The regulations are not intended to make the TSS applicable to certain rapid transit systems whose only connection to the general system is a switch permitting receipt of shipments of non-revenue materials from the general system. Any questions concerning the applicability of the TSS must be referred to the Regional Track Specialist who will consult with the Office of Safety Assurance and Compliance and the Office of Chief Counsel for guidance concerning the particular entity.

§213.4 Excepted track

A track owner may designate a segment of track as excepted track provided that:

4(a) The segment is identified in the timetable, special instructions, general order, or other appropriate records which are available for inspection during regular business hours;

Guidance. The intent of this section is to permit portions of certain low density main tracks and associated yard tracks and sidings to be allowed "excepted status" and not comply with Subparts B, C, D, and E of the TSS unless otherwise expressly stated. However, by designating a track as excepted, the owner must restrict all train movements to a maximum of 10 m.p.h., restrict the number of placarded hazardous material cars in a train to five, and prohibit the movement of occupied passenger trains.

4(b) The identified segment is not located within 30-feet of an adjacent track which can be subjected to simultaneous use at speeds in excess of 10 m.p.h.;

Guidance. This paragraph prohibits excepted track designation of any track located within a 30-foot envelope of a track that can be subjected to simultaneous use at speeds in excess of 10 m.p.h. As shown in Figure 1, the 30-foot dimension is measured between track centerlines and applies to all tracks within that envelope (e.g., tracks converging at turnouts and rail crossings). Simultaneous use means movement of cars or locomotives on both tracks at the same time.

Operation on any track(s) located within 30-feet of excepted track may be restricted to 10 m.p.h. by the physical layout of the tracks, or by definite restrictions placed by the track owner by rule, timetable, special instruction, or other positive instruction or order. This criterion provides the positive protection of trains on higher speed track against a collision with fouling equipment from a potential derailment on the excepted track.

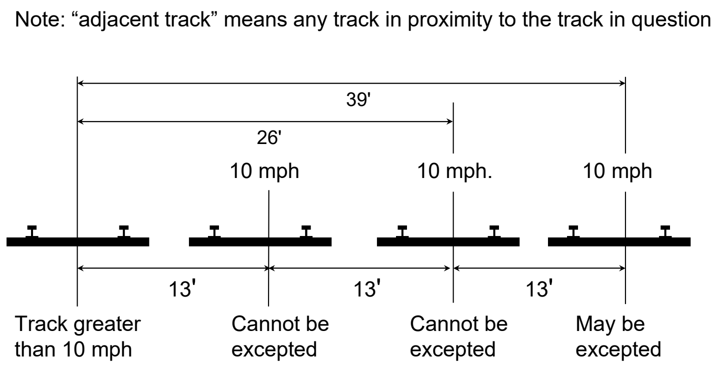


Figure 1

The term "train" is defined in 49 CFR §236.832 as, "A locomotive or more than one locomotive coupled, with or without cars." That definition applies to this rule.

A designation of excepted track need only be recorded by the track owner and implemented by issuance of appropriate instructions to all affected employees. The designation need not be filed with FRA. The TSS do not specify which employees the railroads must notify of excepted track designations; however, in order to ensure maximum safety and to ensure compliance with the requirements of this part, FRA recommends that railroads notify all employees who are involved with the operation of trains or with engineering functions on excepted track.

4(c) The identified segment is inspected in accordance with §213.233(c) and §213.235 at the frequency specified for Class 1 track;

Guidance. Pursuant to §213.5(b), a railroad may continue train operations on track segments designated as excepted track without complying with Subparts B, C, D, and E of Part 213. However, a railroad must still comply with the inspection requirements found in Subpart F for track segments designated as excepted track. Railroads must inspect excepted track in accordance with §213.233(c) and §213.235 at the frequency specified for Class 1 track.

4(d) The identified segment of track is not located on a bridge including the track approaching the bridge for 100-feet on either side, or located on a public street or highway, if railroad cars containing commodities required to be placarded by the Hazardous Materials Regulations (49 CFR Part 172), are moved over the track; and

Guidance. In the application of this paragraph, a public street or highway is defined as a roadway that is open to the public and is owned and maintained by a public entity. This paragraph includes both crossings of public roadways at grade and longitudinal running of the track for extended distances in a public roadway (street trackage).

Under §214.7, a railroad bridge is defined as follows: 1) a railroad bridge is any structure supporting one or more railroad tracks with a span length of 12 feet or more measured along the track centerline, and 2) the term "bridge" shall apply to the entire structure between the faces of the backwalls of abutments or equivalent components, regardless of the number of spans. The term shall include all structures, whether of timber, stone, concrete, metal, or any combination thereof.

4(e) The railroad conducts operations on the identified segment under the following conditions:

(1) No train shall be operated at speeds in excess of 10 m.p.h.;

(2) No occupied passenger train shall be operated;

(3) No freight train shall be operated that contains more than five cars required to be placarded by the Hazardous Materials Regulations (49 CFR Part 172); and

(4) The gage on excepted track shall not be more than 4'10¼ inches. (This paragraph (e)(4) is applicable September 21, 1999.)

Guidance. In reference to (e)(1) through (4), a well-documented pattern of repeated or widespread deviations from these requirements by a track owner, including train operations in excess of 10 m.p.h., will effectively terminate the privilege afforded by this section. The affected track would then become subject to all requirements of the TSS.

The word ''occupied'' in (e)(2) refers to paying and non-paying passengers. It does not include train crew members, track maintenance crews, and other railroad employees who must travel over the track to attend to their work duties.

The gage requirement only applies to the actual measurement itself under load, and does not extend to the evaluation of crossties and fasteners that provide the gage restraint. In the case of non-compliance with the gage requirement in excepted track, the railroad may invoke §213.9(b) as remedial action. [See §213.9(b) for restrictions.]

4(f) A track owner shall advise the appropriate FRA Regional Office at least 10 days prior to removal of a segment of track from excepted status.

Guidance. The track owner is required to notify the appropriate FRA Regional Office 10 days before removing trackage from excepted status. A railroad may not move the track from excepted to non-excepted status to operate an occupied passenger train or a train containing more than five cars placarded in accordance with 49 CFR Part 172, unless proper notification procedures are followed.

Inspectors will continue to inspect excepted track and report these inspections on the F 6180.96 form. If serious deficiencies are discovered, they will be shown on the inspection form, noting that the track is in excepted status. The track owner would not be legally obligated by the TSS to correct the deficiencies noted, except for gage deviations in excess of 4-feet 10¼-inches (defect code 213.53.05). However, if the condition of the track continues to constitute a hazard to life and limb and the track owner fails to alleviate the hazard, the Inspector should notify the Regional Track Specialist immediately. Issuance of an emergency order would be appropriate to address any serious defects that would pose an immediate safety threat to railroad employees or the public.

This notification provision is intended to prevent the practice FRA has witnessed in the past by some railroads. Specifically, those who remove trackage from excepted status only long enough to move a passenger excursion train or a train with more than five cars containing hazardous materials.

The following examples are provided to Inspectors to determine compliance with the provision of excepted track.

<u>Example One</u>. On January 15, 1998, a railroad designates a 2 mile segment of its yard track number 1, which is Class 1 track, as excepted track. The excepted track segment is located within 25 feet of an adjacent track over which simultaneous operations at speeds up to 20 m.p.h. are authorized. On January 25, 1998, an Inspector finds five locations in that segment at which Class 1 gage requirements are not being met.

> Result: The segment of yard track number 1 involved is ineligible for designation as excepted track because it violates §213.4(b) simultaneous use restriction. Therefore, the segment remains subject to all provisions of the TSS. FRA may cite any deviation from the TSS discovered in the segment, such as the five gage defects, for violation. The railroad may also be cited, at the FRA Inspectors' discretion, for a violation of section 213.4(b). If the Inspector determines that violations are warranted, normally the substantive defects (e.g., gage, alinement, crossties) should be cited.

<u>Example Two</u>. A railroad designates yard track number 6, which is classified as Class 1 track, as excepted track on November 30, 1998. The railroad does not conduct any inspections over the track during December.

> Result: Yard track number 6 loses its eligibility for designation as excepted track on January 1, 1999, and remains ineligible thereafter until the inspections required by §213.4(c) begins. Starting January 1, 1999, the track becomes subject to all provisions of the TSS; it remains subject to those requirements until such time as the inspections begin. Violation citations arising from inadvertent violations of the inspection requirement ordinarily should be issued only where safety was impaired or there is evidence of continued non-compliance.

In contrast to violations of the definitional requirements, the unit of violation for non-compliance with the operational limitations is the train. We refer here to occasional and inadvertent non-compliance with operational limitations. A persistent and well documented pattern of non-compliance with respect to a particular segment may cause the railroad to lose its privilege of designating the segment as excepted track (i.e., the track would no longer qualify for such designation), or force FRA to use more drastic enforcement remedies such as emergency orders. The following examples illustrate this concept.

<u>Example Three</u>. A railroad properly designates a track segment as excepted track, 10 days later it operates a freight train containing 10 placarded tank cars over the track segment.

> Result: One violation of §213.4(e)(3) by the railroad has occurred, not five, because the unit of violation is the train rather than each of the placarded cars exceeding the five car limit. The segment continues to be excepted track because a violation of an operational limitation does not render the track ineligible for excepted track status.

Example Four. Railroad A properly designates one of its track segments as excepted track. Railroad B's freight train 2425, using the segment pursuant to a trackage rights agreement with Railroad A, operates over the segment at a speed of 20 m.p.h.

Result: One violation has occurred of §213.4(e)(1) by Railroad A. The track owner is the responsible party for illegal operations over the excepted track. The segment continues to be excepted track.

§213.5 Responsibility for compliance

5(a) Except as provided in paragraph (b) of this section, any owner of track to which this part applies who knows or has notice that the track does not comply with the requirements of this part, shall -

(1) Bring the track into compliance;

(2) Halt operations over that track; or

(3) Operate under authority of a person designated under §213.7(a), who has at least one year of supervisory experience in railroad track maintenance, subject to conditions set forth in this part.

Guidance. This paragraph describes the action that must be taken by track owners once they know that the track is not in compliance with the TSS. The track owner must:

(1) Bring the track into compliance by either repairing the defects or imposing an appropriate speed restriction; or

(2) Remove the track from service; or

(3) Operate under authority of a qualified person designated under §213.7 in accordance with one the following provisions:

- §213.9(b) Class of track – 30-day provision;
- §213.11 Restoration or renewal of track under traffic conditions;
- §213.113 Rail defects.

For additional information concerning the required corrective action for defects, see the guidance under §213.9 (Classes of track; operating speed limit).

5(b) If an owner of track to which this part applies designates a segment of track as "excepted track" under the provisions of §213.4, operations may continue over that track without complying with the provisions of Subparts B, C, D, and E, unless otherwise expressly stated.

Guidance. The owner may designate the track "excepted," provided it meets the requirements of §213.4.

5(c) If an owner of track to which this part applies assigns responsibility for the track to another person (by lease or otherwise), written notification of the assignment shall be provided to the appropriate FRA Regional Office at least 30 days in advance of the assignment. The notification may be made by any party to that assignment, but shall be in writing and include the following --

(1) The name and address of the track owner;

(2) The name and address of the person to whom responsibility is assigned (assignee);

(3) A statement of the exact relationship between the track owner and the assignee;

(4) A precise identification of the track;

(5) A statement as to the competence and ability of the assignee to carry out the duties of the track owner under this part; and

(6) A statement signed by the assignee acknowledging the assignment to him of responsibility for purposes of compliance with this part.

Guidance. Section 213.5(c) gives a track owner the responsibility to notify the FRA, through the appropriate Regional Office, when the responsibility for compliance with this part is assigned. Notification must contain the specific information required in this paragraph and shall be made 30 days before the assignment of the responsibility.

5(d) The Administrator may hold the track owner or the assignee or both responsible for compliance with this part and subject to penalties under §213.15.

Guidance. This section concerns situations where the track is not owned by the operating railroad through an arrangement such as a lease agreement. When recommending civil penalties typically the operating railroad will be cited. However, it may be appropriate to recommend civil penalties against the operating railroad and the owner when both parties contributed to the deficiency. Inspectors must determine the responsible party when recommending civil penalties for non-compliance and alert FRA's Chief Counsel when violation reports involve parties other than the track owner.

This paragraph also provides that the party responsible for compliance can be other than the actual owner of the track through assignment of responsibility or if the Surface Transportation Board (formerly Interstate Commerce Commission) has issued a directed service order. FRA may hold responsible any party contracted by the track owner to ensure compliance with this part. The FRA may hold the track owner, the assignee, or both responsible.

5(e) A common carrier by railroad which is directed by the Surface Transportation Board to provide service over the track of another railroad under 49 U.S.C. 11123 is considered the owner of that track for the purposes of the application of this part during the period the directed service order remains in effect.

Guidance. On rare occasions, such as a cessation of service by a railroad, the Surface Transportation Board has directed a railroad other than the track owner to provide service. In such cases, the designated operator shall be considered as the owner for the purposes of compliance of the TSS.

5(f) When any person, including a contractor for a railroad or track owner, performs any function required by this part, that person is required to perform that function in accordance with this part.

Guidance. This paragraph specifies that both employees of railroads and track owners, and contractors to railroads, are subject to the requirements of the TSS when they perform functions required by the TSS.

§213.7 Designation of qualified persons to supervise certain renewals and inspect track

7(a) Each track owner to which this part applies shall designate qualified persons to supervise restorations and renewals of track under traffic conditions. Each person designated shall have -

(1) At least -

(i) 1 year of supervisory experience in railroad track maintenance; or

(ii) A combination of supervisory experience in track maintenance and training from a course in track maintenance or from a college level educational program related to track maintenance;

(2) Demonstrated to the owner that he or she -

(i) Knows and understands the requirements of this part;

(ii) Can detect deviations from those requirements; and

(iii) Can prescribe appropriate remedial action to correct or safely compensate for those deviations; and

(3) Written authorization from the track owner to prescribe remedial actions to correct or safely compensate for deviations from the requirements in this part.

7(b) Each track owner to which this part applies shall designate qualified persons to inspect track for defects. Each person designated shall have -

(1) At least -

(i) 1 year of experience in railroad track inspection; or

(ii) A combination of experience in track inspection and training from a course in track inspection or from a college level educational program related to track inspection;

(2) Demonstrated to the owner that he or she -

(i) Knows and understands the requirements of this part;

(ii) Can detect deviations from those requirements; and

(iii) Can prescribe appropriate remedial action to correct or safely compensate for those deviations; and

(3) Written authorization from the track owner to prescribe remedial actions to correct or safely compensate for deviations from the requirements of this part, pending review by a qualified person designated under paragraph (a) of this section.

Guidance. Inspectors may request from a track owner verification of the experience and qualifications of his supervisory and track inspection personnel. The submission of a seniority roster or job awarding bulletin is not to be considered as satisfactory identification of qualified employees or as a basis for their designation. The owner should make specific names of individuals and their qualifications available in writing. If the Inspector is in doubt as to the qualifications of the owner's supervisory or inspection personnel, the Inspector should examine the owner's inspection records. The TSS requires the retention of required track inspection reports for one year at the owner's division office. Should the records consistently fail to reflect the actual track conditions, questions can be raised as to the competence and/or qualifications of the person(s) included in list.

When in doubt as to the qualifications of an owner's supervisors or inspectors, the Inspector should discuss the matter with the railroad.

7(c) Persons not fully qualified to supervise certain renewals and inspect track as outlined in paragraphs (a) and (b) of this section, but with at least one year of maintenance-of-way or signal experience, may pass trains over broken rails and pull aparts provided that --

(1) The track owner determines the person to be qualified and, as part of doing so, trains, examines, and re-examines the person periodically within two years after each prior examination on the following topics as they relate to the safe passage of trains over broken rails

or pull aparts: rail defect identification, crosstie condition, track surface and alinement, gage restraint, rail end mismatch, joint bars, and maximum distance between rail ends over which trains may be allowed to pass. The sole purpose of the examination is to ascertain the person's ability to effectively apply these requirements and the examination may not be used to disqualify the person from other duties. A minimum of four hours training is adequate for initial training;

(2) The person deems it safe and train speeds are limited to a maximum of 10 m.p.h. over the broken rail or pull apart;

(3) The person shall watch all movements over the broken rail or pull apart and be prepared to stop the train if necessary; and

(4) Person(s) fully qualified under §213.7 of this part are notified and dispatched to the location promptly for the purpose of authorizing movements and effecting temporary or permanent repairs.

Guidance. Paragraph (c) allows employees to be qualified for the specific purpose of authorizing train movements over broken rails or pull aparts. This section requires the employees to have at least one year of maintenance-of-way or signal experience and a minimum of four hours of training plus an examination on requirements related to the safe passage of trains over broken rails and pull aparts. The purpose of the examination is to ascertain the person's ability to effectively apply these requirements. A railroad may use the examination to determine whether or not a person should be allowed to authorize train movements over broken rails or pull aparts.

The maximum speed over broken rails and pull aparts shall not exceed 10 m.p.h. However, movement authorized by a person qualified under this subsection may further restrict speed, if warranted by the particular circumstances. The person qualified under this paragraph must be present at the site and able to instantly communicate with the train crew so that the movement can be stopped immediately, if necessary.

Fully qualified persons under §213.7 must be notified and dispatched to the location promptly to assume responsibility for authorizing train movements and effecting repairs. The word "promptly" is meant to provide the railroad with some flexibility in case there is only one train to pass over the condition prior to the time when a fully qualified person would report for a regular tour of duty, or where a train is due to pass over the condition before a fully qualified person is able to report to the scene. Railroads should not use persons qualified under §213.7(c) to authorize multiple train movements over such conditions.

7(d) With respect to designations under paragraphs (a), (b) and (c) of this section, each track owner must maintain written records of -

(1) Each designation in effect;

(2) The basis for each designation; and

(3) Track inspections made by each designated qualified person as required by §213.241.

These records must be kept available for inspection or copying by the Federal Railroad Administrator during regular business hours.

Guidance. Failure of the owner to have and maintain written records designating employees and the basis for each designation is a deviation from the TSS. Incomplete qualification records would also constitute a deviation from the standards. Designated employees include supervisors, inspectors, and those partially qualified to pass trains over broken rails and pull aparts. Inspectors are also instructed to note that incomplete qualification records may not reflect the actual qualification of an individual. As such, a record deficiency shall not be the sole basis for a defect or civil penalty recommendation for not having a qualified designated person performing these functions. If there are questions about the qualifications of an individual, it will be necessary for the Inspector to interview railroad or contractor employees.

§213.9 Classes of track: operating speed limits

9(a) Except as provided in paragraph (b) of this section and §213.57(b), 213.59(a), 213.113(a), and 213.137(b) and (c), the following maximum allowable operating speeds apply:

Over track that meets all of the requirements prescribed in this part for	*The maximum allowable speed for freight trains is*	*The maximum allowable speed for passenger trains is*
Excepted	*10*	*N/A*
1	*10*	*15*
2	*25*	*30*
3	*40*	*60*
4	*60*	*80*
5	*80*	*90*

Table 1

Guidance. The TSS classifies track solely on the basis of authorized speeds for freight and passenger trains. Tolerances are specified in the TSS for each class of track. A deviation beyond the limiting tolerances for Classes 1 through 5 requires repair, or reduction of speeds to the appropriate class. The only structural or geometry defect that is applicable on excepted track is gage exceeding 4-feet 10¼-inches.

The initial speed of any track is based on the design characteristics of the track. FRA does not set the speed, and railroads are required to keep track in compliance with the requirements of Part 213. In addition to track design characteristics, speeds may be set by other factors such as the type of signal apparatus. Maximum speeds are also limited if a signal system is not in place on a track (refer to 49 CFR §236.0 for further information).

If a deviation exceeds Class 1 standards, operations may continue for not more than 30-days over the deviation not exceeding Class 1 speeds. This is only permitted after a person designated in §213.7(a), with at least one year of supervisory experience in railroad track maintenance, determines that operations may safely continue and specifies limiting conditions, if any. The designated person must have personally seen and evaluated the deviation. This section may also govern a deviation exceeding allowable gage on excepted track.

As described in paragraph (a), the maximum allowable operating speed for each class of track is shown in the table. However, the maximum allowable operating speed on a curve is limited by the geometry parameters contained in §213.57(b) [Unbalance] and §213.59(a) [Superelevation]. For example, a speed for a passenger train based on the elevation at a curve may be only 18 m.p.h., even though the track may otherwise comply with a higher class.

One loose frog bolt out of several would seldom constitute an immediate hazard, provided that the frog was otherwise secure. On the other hand, a missing cotter pin in a critical location such as in a connecting rod could have serious consequences.

One or two loose braces are usually not considered to be an immediate hazard, provided that the other braces are in acceptable functional condition to support the stock rail. On the other hand, several consecutively loose braces, especially in the higher track classes, could be much more serious.

Intermittent patches of vegetation that brush the sides of rolling stock may not be an immediate hazard, but more severe vegetation might have the potential of contributing to the injury of an employee who is riding on the side of a car or looking out locomotive cab windows. The specific description for this type of defect is “vegetation brushing sides of rolling stock that prevents employees from visually inspecting moving equipment from their normal duty stations” (defect code 213.37.09).

As the above examples illustrate, non-class-specific defects must be considered in the context of the specific circumstances involved. The existence of a non-class-specific defect under one set of circumstances may not be serious, while the identical condition under other circumstances may constitute a serious safety concern.

Although some non-class-specific defects may not present an immediate hazard, these conditions will only degrade under train traffic. Therefore, it is important for the carrier and FRA Inspectors to record these defects so that they will not be left un-repaired. In summary:

(1) Record all non-complying conditions, including non-class-specific defects such as loose or missing frog bolts or switch braces. Care must be taken to conduct a thorough inspection, recording the location, type, and size of each defect discovered.

(2) Evaluate the remedial action taken by the carrier. If an Inspector becomes aware that the remedial action, or lack thereof, for a non-class-specific defect is not sufficient based on the circumstances, the Inspector should seek a more appropriate action from the carrier. For a non-class-specific defect that is an imminent hazard, such as a missing nut on a connecting rod, the Inspector should immediately inquire as to the remedial action planned by the carrier.

(3) If the railroad does not initiate an appropriate remedial action, the Inspector should consider recommending a violation. If the railroad has been advised that a violation has been recommended and has not initiated appropriate remedial action, the Inspector should be prepared to issue a Special Notice for Repairs, under the guidelines described in Chapter 4 of this manual.

(4) In the case of a non-class-specific defect that did not pose an immediate hazard when the defect was recorded and the Inspector discovers that no action was taken within a reasonable time frame after the carrier had knowledge of the defect, the Inspector should consider the enforcement options described in item 3 above. In any case, if no appropriate action was taken within a 30-day period, the Inspector should consider the enforcement tools outlined above.

When a railroad inspector discovers a non-class-specific defect (as with all defects) the railroad inspector must initiate immediate action in accordance with §213.233(d). The remedial action taken by the railroad inspector must be recorded in accordance with

§213.241(b). For non-class-specific defects, the record must show a reasonable explanation of the action taken. For example, "repaired before next train" would be appropriate for serious conditions. On the other hand, a notation for a defect such as vegetation that indicates it is scheduled for cutting by a weed mower by a specific date within 30-days may be appropriate.

When a railroad representative places a slow order on a segment of track for a defect for immediate corrective action, any other items within the same slow order segment would be "protected." For example, a FRA Inspector finds a defect at MP 5.5 and railroad immediately places a slow order from MP 5.0 to MP 6.0. During the same inspection, the FRA Inspector also finds a condition at MP 5.8 that would be a defect without the speed restriction. While the defect at MP 5.8 is under the slow order just imposed, it was obviously a defect prior to the placement of the temporary restriction. The FRA Inspector can record a defect at MP 5.8.

A non-class-specific defect may not pose an immediate hazard for one train movement, but the condition may deteriorate to become a hazard to following trains. It is reasonable to expect that conditions such as loose or missing frog bolts or braces be repaired as quickly as possible. However, a qualified railroad representative under §213.7 may determine that the condition is not an immediate hazard and decide to call for assistance to make the repairs, or the representative may decide to end the inspection, retrieve the necessary repair materials, and return later to make the repairs. In some cases, the representative may determine that a speed restriction is appropriate.

When non-class-specific defects are scheduled for repair, railroad inspectors shall continue to report the defect on their inspection reports until it is corrected. However, the 30-day limit for any given defective condition cannot be exceeded.

9(b) If a segment of track does not meet all of the requirements for its intended class, it is reclassified to the next lowest class of track for which it does meet all of the requirements of this part. However, if the segment of track does not at least meet the requirements for Class 1 track, operations may continue at Class 1 speeds for a period of not more than 30-days without bringing the track into compliance, under the authority of a person designated under §213.7(a), who has at least one year of supervisory experience in railroad track maintenance, after that person determines that operations may safely continue and subject to any limiting conditions specified by such person.

Guidance. A track segment must meet all the requirements for its designated class. Where a track segment does not meet all the requirements, railroads can reclassify the segment for the next lowest class for which it complies. For example, on a Class 3 track, where the alinement measured off a 62-foot chord in a tangent is 2 inches, the railroad can elect to reduce the speed equivalent to Class 2 track.

Trains may continue to operate over a non-complying condition under §213.9(b). However, the 30-day limit for any given condition cannot be exceeded. The 30-day period commences when:

- An FRA Inspector notifies the carrier or issues notice with a F 6180.96 form;
- A person designated under §213.7 records the defect on a track owner's record of inspection;
- Notices of substandard conditions are received from third parties; or

- The track owner is deemed to have constructive knowledge if the defects were discoverable through properly performed track inspections required by the TSS, even if the defects are not reported on the owner's record of inspection.

Several other points concerning §213.9(b) should be noted:

- FRA Inspectors should not attempt to predict an exact date on which a sub-Class 1 defect first existed. In most cases, a reasoned approximation (with accompanying explanation of the basis for the Inspector's conclusions) will be sufficient to show that §213.9(b) is not available to the track owner. Because of the serious enforcement problems presented by application of the constructive knowledge test, Inspectors should use this authority judiciously.
- Once a determination has been made that operations may safely continue over a segment, the 30-day period applies to all sub-Class 1 defects present in the segment at that time. The 30-day period is an appropriate remedial action for sub-Class 1 defects and the 30-day period can only be applied one time. At the expiration of the 30-day period the defects(s) must be repaired, track placed into excepted track status, or the track must be removed from service.
- The limiting conditions, if any, placed on operations must be in a form generally used by the track owner to communicate operating restrictions to its personnel and to any other railroads authorized to use the track involved. If a train operating over the track fails to comply with any such condition, one violation of §213.9(b) by the track owner has occurred, regardless of the identity of the operator of the train.
- Section 213.9(b) does not apply where defective rails are involved. Section 213.113 exclusively governs further operations over defective rails.

The following table shows examples of those sections in the TSS that are "class specific," "speed defined" and "non-class-specific." This table is not all-inclusive and is only a reference instrument. Inspectors should refer to the specific guidance under each section for further details and instructions on each item listed in the table.

Section	Topic	Class specific	Speed defined	Non-class-specific [1]
213.33	Drainage			X
213.37	Vegetation			X
213.57 (b)	Curves; elevation and speed limitations (V-Max)		X	
213.103	Ballast; general			X
213.109 (b)	Crossties not effectively distributed			X
213.110	Gage Restraint Measurement Systems	X		
213.113	Defective rails		X	
213.119	Continuous welded rail; general			X
213.121 (a)	Each rail joint, insulated joint, and compromise joint shall be of a structurally sound design and dimensions for the rail on which it is applied			X

Section	Topic	Class specific	Speed defined	Non-class-specific [1]
213.121 (c)	If a joint bar is cracked or broken between the middle two bolt holes it shall be replaced	X[3]		
213.121 (d)	In the case of conventional jointed track, each rail shall be bolted…, and with at least one bolt on Class 1 track	X		
213.121 (e)	In the case of continuous welded rail track, each rail shall be bolted with at least two bolts at each joint	X[3]		
213.121 (f)	Each joint bar shall be held in position by track bolts tightened to allow the joint bar to firmly support the abutting rail ends…..			X
213.127	Rail fastenings			X
213.133 (a)	Turnouts and track crossings generally			X[2]
213.133 (b)	Classes 3 through 5 … shall be equipped with anchors on each side of track crossings and turnouts…	X		
213.133 (c)	Each flangeway at turnouts and track crossings shall be at least 1½ inches wide	X		
213.135 (a)	Each stock rail must be securely seated in switch plates…			X
213.135 (b)	Each switch point shall fit its stock rail		X	X
213.135 (c)	Each switch shall be maintained so that the outer edge of the wheel tread cannot contact the gage side of the stock rail.			X[2]
213.135 (d)	The heel of each switch rail shall be secure….			X
213.135 (e)	Each switch stand and connecting rod shall be securely fastened….			X
213.135 (f)	Each throw lever shall be maintained so that it cannot be operated with the lock or keeper in place.			X[2]
213.135 (g)	Switch position indicator			X
213.135 (h)	Unusually worn or chipped switch points…			X[2]
213.135 (i)	Tongue and plain mate switches…	X		
213.137 (b)	If a frog point is chipped, broken, or worn more than ⅝ inch down and 6 inches back, operating speed over that frog may not be more than 10 m.p.h.		X	
213.137 (c)	If the tread portion of a frog casting is worn down more than ⅜ inch below the original contour, operating speed over that frog may not be more than 10 m.p.h. …		X	

Section	Topic	Class specific	Speed defined	Non-class-specific [1]
213.139 (a)	The outer edge of a wheel shall not contact the gage side of a spring wing rail.			X[2]
213.139 (b)	The toe of each wing rail shall be solidly tamped…			X
213.139 (c)	Each frog with a bolt hole defect or head-web separation shall be replaced.	X		
213.139 (d)	Each spring shall have compression…			X
213.139 (e)	The clearance between the holddown housing and horn…			X
213.141	Self-guarded frogs	X		
213.205	Derails			X

[1] Non-class-specific defects found during an inspection by a qualified railroad inspector and not immediately repaired must be noted on the track inspection form. If not immediately repaired, remedial action shall be taken by an individual qualified under §213.7 (a). The 30-day period represents the maximum duration that FRA permits any non-class-specific defect(s) to remain in the track. Furthermore, it is not intended to create a 30-day timeline for all types of defects as immediate repair or a more restrictive appropriate action may be required at the time of the defect(s) discovery.

[2] While Part 213 does not require the railroad to take the track out of service, due to the severity of these defects, FRA recommends that railroads take the track out of service. At a minimum, however, the railroad should invoke §213.9(b).

[3] This class specific defect requires remedial action 213.9(b).

Table 2

§213.11 Restoration or renewal of track under traffic conditions

If, during a period of restoration or renewal, track is under traffic conditions and does not meet all of the requirements prescribed in this part, the work on the track shall be under the continuous supervision of a person designated under §213.7(a) who has at least one year of supervisory experience in railroad track maintenance, and subject to any limiting conditions specified by such a person. The term "continuous supervision" as used in this section means the physical presence of that person at a job site. However, since the work may be performed over a large area, it is not necessary that each phase of the work be done under the visual supervision of that person.

Guidance. This section specifies that a person designated under §213.7(a) must provide continuous supervision during work periods when track with conditions not complying with the designated class is under traffic conditions. The section is specific in that each phase of the restoration or renewal need not be under the visual supervision of that person, but the person must be present at the job site in direct control of the work and have direct knowledge of the condition of the track over which they permit a train or trains to pass.

The qualified person at a work site may determine that it is safe to permit a train to pass through the work area at any speed up to the permanent speed on the track. For example, during a crosstie and resurfacing project, the qualified person may analyze the conditions present and authorize a speed higher than 10 m.p.h. through the limits of the work when temporary crosslevel conditions exceed the limits in §213.63 for Class 1 track. Similarly, a welder may permit a train to pass over a frog when the welding and grinding process temporarily removes the point more than 6 inches back and ⅝ inch down. At the end of the work period when the designated person leaves the work site, the track must be in compliance with the TSS. It is acceptable for the designated person to determine that the track is safe for operation at Class 1 speeds and use §213.9(b) as a remedial action.

Continuous supervision may be met if the work is broken into a number of segments over a large area. Inspectors must use judgment and experience in applying this limitation to the general rule. The essential questions are whether the specific circumstances of a given project actually permit effective supervision by the designated person, and whether such supervision is being properly exercised. An example of an acceptable application of this paragraph would be a large tie and surfacing unit that has cleared a track for a short period to allow the passage of a train based on the qualified person determining that the track is safe for operation. On the other hand, if a switch gang is working separately from the tie and surfacing crew in the same general vicinity, a qualified person must be with that work unit.

§213.13 Measuring track not under load

When unloaded track is measured to determine compliance with requirements of this part, the amount of rail movement, if any, that occurs while the track is loaded must be added to the measurements of the unloaded track.

Guidance. In addition to the static (unloaded) geometry measurements taken, the amount of visually detectable dynamic (loaded) deflection that occurs under train movement must be considered. This includes the amount of vertical or lateral rail deflection occurring between rail base and tie plate, a tie plate and crosstie, from voids between the crosstie and ballast section resulting from elastic compression, or any combinations of the above. Each deflection under the running rails must be measured and properly considered when computing the collective deviations under load. It is very important that consideration be given to both rails when measuring these deflections.

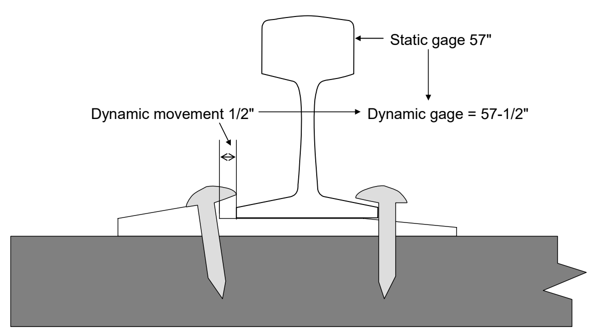


Figure 2

Vertical and lateral deflections may be found at locations such as rail joints and turnout locations with poor wooden crossties and conventional cut-spike fastening conditions or at bridge abutments and over culverts where the subgrade has settled.

§213.15 Penalties

15(a) Any person who violates any requirement of this part or causes the violation of any such requirement is subject to a civil penalty of at least $500 and not more than $11,000 per violation, except that: Penalties may be assessed against individuals only for willful violations, and, where a grossly negligent violation or a pattern of repeated violations has created an imminent hazard of death or injury to persons, or has caused death or injury, a penalty not to exceed $22,000 per violation may be assessed. "Person" means an entity of any type covered *under 1 U.S.C. 1, including but not limited to the following: a railroad; a manager, supervisor, official, or other employee or agent of a railroad; any owner, manufacturer, lessor, or lessee of railroad equipment, track, or facilities; any independent contractor providing goods or services to a railroad; any employee of such owner, manufacturer, lessor, lessee, or independent contractor; and anyone held by the Federal Railroad Administrator to be responsible under §213.5(d) or §213.303(c). Each day a violation continues shall constitute a separate offense. See Appendix B to this part for a statement of agency civil penalty policy.*

(b) Any person who knowingly and willfully falsifies a record or report required by this Part may be subject to criminal penalties under 49 U.S.C. 21311.

Guidance. This section covers all Subparts of Part 213 including a schedule of civil penalties found under Appendix B of this manual.

§213.17 Waivers

17(a) Any owner of track to which this part applies, or other person subject to this part, may petition the Federal Railroad Administrator for a waiver from any or all requirements prescribed in this part. The filing of such a petition does not affect that person's responsibility for compliance with that requirement while the petition is being considered.

Guidance. Inspectors have no authority under the TSS to grant waivers.

17(b) Each petition for a waiver under this section must be filed in the manner and contain the information required by Part 211 of this Chapter.

Guidance. Any petition for waiver must be filed by the owner or designated operator with the Docket Clerk, Office of Chief Counsel, in Washington, D.C. Refer to the General Manual for complete information regarding waiver procedures.

17(c) If the Administrator finds that a waiver is in the public interest and is consistent with railroad safety, the Administrator may grant the exemption subject to any conditions the Administrator deems necessary. Where a waiver is granted, the Administrator publishes a notice containing the reasons for granting the waiver.

Guidance. Inspectors must be notified of any waivers in effect in their assigned territory.

§213.19 Information collection

19(a) The information collection requirements of this part were reviewed by the Office of Management and Budget pursuant to the Paperwork Reduction Act of 1980 (44 U.S.C. 3501 et seq.) and are assigned OMB control number 2130-0010.

19(b) The information collection requirements are found in the following sections: 213.4, 213.5, 213.7, 213.57, 213.119, 213.122, 213.233, 213.237, 213.241, 213.303, 213.305, 213.317, 213.329, 213.333, 213.339, 213.341, 213.343, 213.345, 213.353, 213.361, 213.369.

Subpart B - Roadbed

§213.31 Scope

This subpart prescribes minimum requirements for roadbed and areas immediately adjacent to roadbed.

§213.33 Drainage

Each drainage or other water carrying facility under or immediately adjacent to the roadbed must be maintained and kept free of obstruction, to accommodate expected water flow for the area concerned.

Guidance. One of the most essential elements of track maintenance is a comprehensive drainage system. Drainage facilities (bridges, trestles, or culverts) should be given careful detailed consideration during inspections. Openings under the track are used to channel and divert water from one side of the roadbed to the other.

The rule specifies that each drainage structure shall be maintained and the Inspector should note conditions that would affect the integrity of the structure, such as culvert pull aparts or separations, crushing or uneven settlement due to failure of or lack of head walls (in conjunction with frost action), too steep a gradient, and insufficient support.

Drainage openings must also be inspected and notice given where debris has accumulated to such an extent that expected water flow cannot be accommodated.

Most railroad drainage structures have existed for many years and, if properly maintained and kept free of debris, they are considered adequately designed to accommodate expected water flow, even though recent high-water marks may be slightly above the inlet opening.

Culverts designed with submerged inlets are common. Where questions are raised concerning the adequacy of drainage structures, the Regional Track Specialist should be consulted.

Inspectors must take note of the conditions of:

- Right-of-way ditches;
- Culverts, trestles, and bridge inlets;
- Water carrying structures or passageways;
- Outlets or tail ditches;
- Berm ditches;
- Scouring of embankments, piling or piers in channels or at abutments; and
- Filling in of passageways from silting, sand wash, or debris.

Inspectors must notify the track owner of any drainage condition deemed hazardous, or potentially hazardous, to the safety of train operations over the track.

§213.37 Vegetation

Vegetation on railroad property which is on or immediately adjacent to roadbed shall be controlled so that it does not --

37(a) Become a fire hazard to track-carrying structures;

Guidance. Inspectors must be aware that live and dead growth, drift, tumbleweeds, debris, etc., can constitute fire hazards to timber bridges, trestles, wooden box culverts, and other track carrying structures.

37(b) Obstruct visibility of railroad signs and signals;

(1) along the right-of-way, and

(2) at highway-rail crossings;

Guidance. This paragraph includes a requirement to clear vegetation from signs and signals along railroad rights-of-way and at highway-rail grade crossings. Because the scope of Part 213 limits vegetation requirements to railroad property, this is not intended to be an attempt to dictate standards for surrounding landowners. This paragraph also requires signs and signals on railroad property at highway-rail grade crossings be kept clear of vegetation and is intended to provide adequate visibility of these devices for the traveling public. It is not intended to preempt State or local requirements for the clearing of vegetation on railroad rights-of-way at highway-rail grade crossings.

Obstruction of the visibility of railroad signs and signals by vegetation is a deviation from the TSS. Although all signals are important, the visibility of certain signals must be closely observed [i.e., block signals, interlocking signals, speed signs (or other signs affecting the movement of trains), close clearance signs, whistle posts, and mileposts].

37(c) Interfere with railroad employees performing normal trackside duties;

Guidance. Judgment must be exercised by the Inspector in determining whether trackside vegetation will interfere with the railroad employees' performance of normal trackside duties. Weeds covering the track that hinder the ability of an Inspector to see track structure components is not necessarily a non-complying condition.

37(d) Prevent proper functioning of signal and communication lines; or

Guidance. Before citing the railroad for vegetation interfering with signal or communication lines, the Inspector must confirm that the line is active. Occasionally Inspectors may observe vegetation in lines that they are unsure if they are functional. Communication between the Track Inspector and the FRA Signal and Train Control Inspector is necessary if the railroad representative cannot confirm the status of a signal or communication line. When interfering with active lines, vegetation may cause false signal indications and/or disrupt communications that are vital to safe train operations. When there are questions regarding vegetation and the signal lines, joint inspections by track and signal personnel are encouraged. The Track Inspector will issue violation reports, if necessary, with concurrence of the Signal Inspector.

37(e) Prevent railroad employees from visually inspecting moving equipment from their normal duty stations.

Guidance. There are several ways which vegetation can prevent railroad employees from visually inspecting moving equipment. For example, if vegetation is striking the window of the locomotive cab, that can interfere with a train crew's ability to observe rolling stock. Or, if vegetation is striking trains, that can interfere with a ground employees' ability to observe the rolling stock during switching operations.

Subpart C – Track Geometry

§213.51 Scope

This subpart prescribes requirements for the gage, alinement, surface of track, and the elevation of outer rails and speed limitations for curved track

Guidance. See Figure 3 for an illustration of basic track geometry concepts.

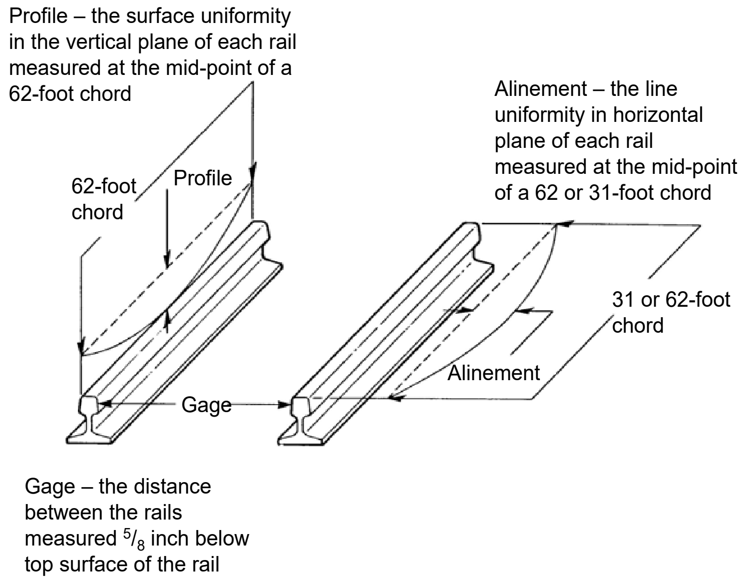


Figure 3

§213.53 Gage

53(a) Gage is measured between the heads of the rails at right angles to the rails in a plane five-eighths of an inch below the top of the rail head.

Guidance. See Figure 4 for an illustration of gage measurements.

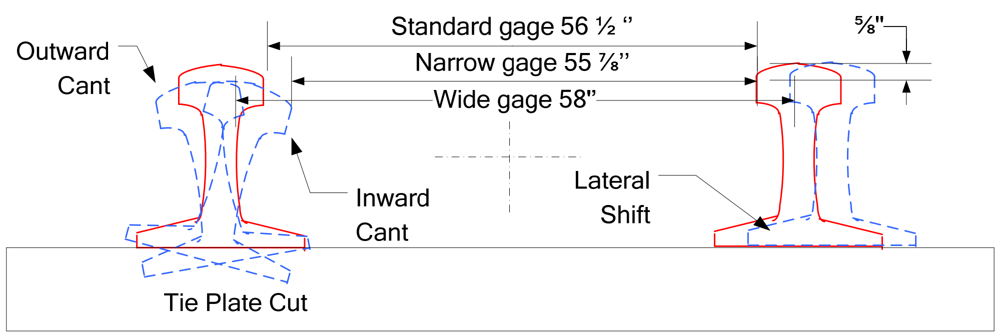


Figure 4

53(b) Gage must be within the limits prescribed in the following table:

Class of Track	*The gage must be at least*	*But not more than*
Excepted track	*N/A*	*4'10¼"*
1	*4' 8"*	*4' 10"*
2 and 3	*4' 8"*	*4' 9¾"*
4 and 5	*4' 8"*	*4' 9½"*

Table 3

Guidance. This rule establishes the minimum and maximum limits for gage on all tracks and differentiates with the authorized speed, including a maximum gage dimension of 4 feet 10¼ inches for track in excepted status under §213.4.

Inspectors will make measurements at sufficient intervals to assure that track is being maintained within the prescribed limits. Particular attention should be given to track gage in turnouts or locations where high lateral train forces are expected or evident. These areas include the curved closure rails, the toe and heel of frogs, the curved track behind the frog and several feet ahead of the switch points.

Where line or surface irregularities are observed by the Inspector, the gage should be measured. Remember to look for evidence of lateral rail movement as required in §213.13.

An accurate standard track gauge device or a rule graduated in inches is an acceptable measuring device. Gage not within the specified limits of the TSS is in non-compliance.

§213.55 Alinement

Alinement may not deviate from uniformity more than the amount prescribed in the following table:

Class of Track	*Tangent Track*	*Curved Track*	
	The deviation of the mid-offset from a 62-foot line [1] may not be more than—	*The deviation of the mid-ordinate from a 31-foot chord [2] may not be more than—*	*The deviation of the mid-ordinate from a 62-foot chord [2] may not be more than—*
1	*5"*	*N/A [3]*	*5"*
2	*3"*	*N/A [3]*	*3"*
3	*1¾"*	*1¼"*	*1¾"*
4	*1½"*	*1"*	*1½"*
5	*¾"*	*½"*	*⅝"*

[1] The ends of the line must be at points on the gage side of the line rail, five-eighths of an inch below the top of the railhead. Either rail may be used as the line rail, however, the same rail must be used for the full length of that tangential segment of track.

[2] The ends of the chord must be at points on the gage side of the outer rail, five-eighths of an inch below the top of the railhead.

[3] N/A - Not Applicable.

Table 4

Guidance. This rule establishes the maximum alinement deviations allowed for tangent and curved track in Classes 1 through 5 track.

Alinement (also spelled alignment) is the variation in curvature of each rail of the track. On tangent track, the intended curvature is zero, and thus the alinement is measured as the variation or deviation from zero. In a curve, the alinement is measured as the variation or deviation from the “uniform” alinement over a specified distance. The Inspector should note that the procedures for determining uniformity in Classes 6 through 9 are similar to the procedures described below. However, there are differences in the spacing of the stations and the application of the chord measurements.

The point of greatest alinement deviation usually can be detected visually or may be located by moving the chord along the track in increments until the point with maximum deviation is found. In curves, the mid-ordinate, alternatively called mid-chord offset (MCO), require “stations” to be marked at regular intervals on the high rail in both directions from the point in question. In tangent track, the MCO is measured directly with a 62-foot chord and graduated ruler. In curves, a 62-foot chord is used in Classes 1 through 5 and a 31-foot chord is also used in Classes 3 through 5. The term MCO is used interchangeably for “mid-ordinate” and “mid-offset” and represents the distance from the rail to the chord at the mid-point of the chord. For curves in Classes 3 through 5 track, an alinement defect may be in non-compliance with either the maximum limits for the 31-foot chord or the 62-foot chord, or both. A 31-foot chord is particularly necessary for determining short alinement deviations. Inspectors must be aware that a 62-foot chord may be “blind” to short alinement conditions, whereby a 31-foot chord can detect those non-complying conditions. See Figure 5.

In Classes 3 through 5, both the 31-foot and 62-foot chords must be used, and corresponding measurements must be calculated to determine compliance with the required alinement thresholds. If alinement defects are found using both the 31-foot and the 62-foot chord, the Inspector should report the item as one defect and note that the defect does not comply with the requirements for the second chord, e.g., “1¾ inches alinement deviation on curved track for 62-foot chord. Note: 1⅜ inches alinement deviation for 31-foot chord at this location.”

The chord line (string) will be stretched and held taut between two points on the rail, ⅝ inch below the top running surface of the rail. Measure the MCO between the rail and the string with a graduated ruler, using blocks to compensate for shallow curvature and special trackwork, if necessary.

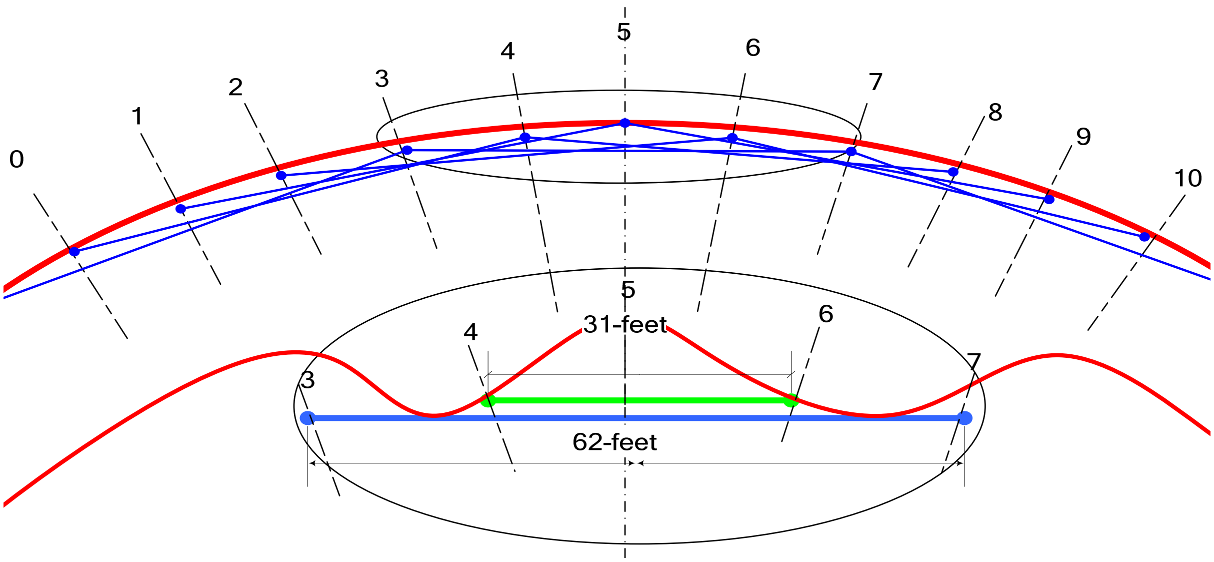


Figure 5

Since a true tangent has zero MCO, the measurement taken can be compared directly to the alinement table under §213.55 to determine compliance. On a curve of constant curvature or each arc of a compound curve, mid-ordinates at all station points are equal when measured from chords of equal length, exclusive of spirals. MCO’s, when measured from chords of equal length, are nearly proportional to the degree of curvature.

Degree of curvature is the angle subtended at the center of a simple curve by a 100 foot chord. Degree of curvature can be conveniently measured using either a 31 or a 62-foot chord. Obtaining the degree of curvature coupled with the average elevation in the area in question is necessary to determine maximum authorized speed. Please refer to §213.57 for a discussion on the determination of curvature.

Deviation of alinement on a curve requires determination of the MCO over a specified number of stations and the average of those values. The difference between the MCO at the point of concern and the average must not exceed the maximum deviation specified in the table in §213.55.

As shown in Table 5, an optional method to determine average alinement includes 17 stations spaced at 15-feet 6 inches. For curves in Classes 3 through 5, it is necessary to determine compliance with the requirement for the maximum deviation of the MCO from a 31-foot chord in addition to the 62-foot chord. Figure 6 illustrates the method to determine alinement deviation using both chords.

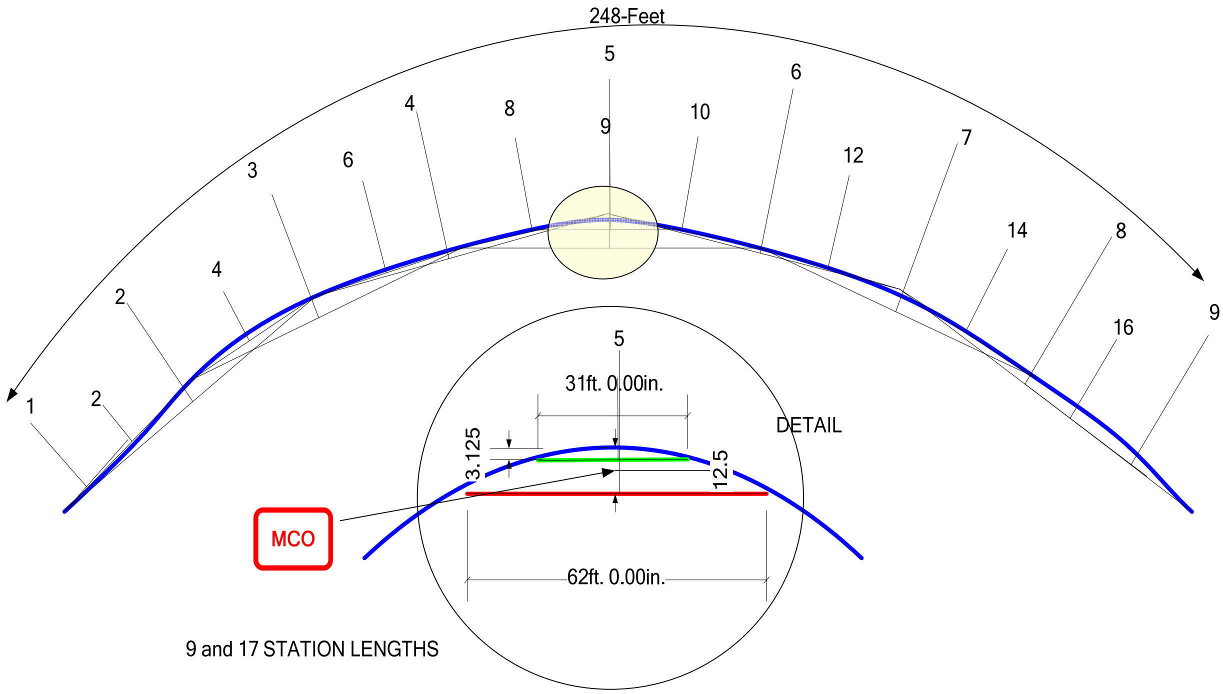


Figure 6

When using the above procedures, the distance between the first and last MCO will be 248 feet. However, note that in order to measure the MCO at the first and last stations, the Inspector must place the end of the string a station beyond the first and last one measured. As a reference, the following table summarizes the acceptable proper chords, station spacing, and number of stations to determine alinement compliance.

Alignment Stations					
Geometry	Class	Chord (feet)	Total No. Stations	Station Spacing (feet)	Curve Length (feet)
Curve	1-2	62	9 or	31	248
		62	17	15½	248
	3-5	31&	17	15½	248
		62	9 or	31	248
		62	17	15½	248
Tangent	1 - 5	62	1	n/a	n/a

Table 5

As previously indicated, the suspected alinement location in a curve body is calculated by measuring an equal number of stations on each side of the area in question. For the majority of occurrences, averaging the MCOs on both sides of the location in question will develop sufficient data to determine "uniform alinement." However, if the location in question is close to or in a spiral, uniformity must be determined in a different manner. If the location is located at the portion of a curve body close to a spiral, measure the stations in the curve body only. That is, shift the averaging area sufficiently so that none of the MCOs are in the spiral.

When measuring the body of a curve with a length that is less than the distance spanned by the required number of stations, reduce the numbers of stations accordingly. When measuring a compound curve, it will be necessary to measure the MCOs within a sufficient portion of the entire curve to determine where the curve bodies exist. Treat each curve body as a separate curve and be governed by the above instructions.

Over the years, railroads have traditionally used a 31-foot chord to determine MCOs for higher degree curves. Although it is more difficult to measure from the rail to the MCO at high degree curves, the Inspector must determine alinement compliance in accordance with both the 62 and 31-foot chords described in this section.

In spirals, the alinement gradually changes from tangent to the full degree of curvature at the curve body. Therefore, to determine an alinement deviation at a given point in a spiral, it will be necessary to determine the proper MCO based on the projected value at each point of concern. The best method to determine the projected value at each point is to measure the MCOs through the entire spiral in question. It is important to determine MCOs a sufficient distance into the adjoining curve body and tangent track to accurately determine the tangent to spiral (TS) and spiral to curve (SC). Place the measured values in a graph and plot the spiral. The deviation at the point of concern will be the difference between the MCO and the projected value. Use the curve values from the alinement table to determine compliance in spirals.

Figure 7 shows a spiral calculation for 62-foot chord with MCO units in $^{1}/_{16}$ inch increments. A similar analysis is required for 31-foot chord for Classes 3 through 5. At station 5, the existing value is 18 units (1⅛ inches) and the projected value is 12 units (¾ inch), therefore, the deviation from uniformity is 6 units (⅜ inch).

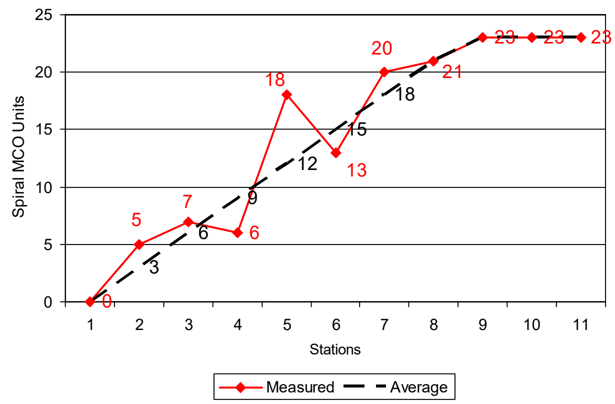


Figure 7

§213.57 Curves; elevation and speed limitations

57(a) The maximum crosslevel on the outside rail of a curve may not be more than 8 inches on track Classes 1 and 2 and 7 inches on Classes 3 through 5. Except as provided in §213.63, the outside rail of a curve may not be lower than the inside rail.

Guidance. Paragraph (a) does not imply that more than 6 inches of superelevation is recommended in a curve; rather the paragraph limits the amount of crosslevel in a curve to control the unloading of the wheels on the high rail, especially at low speeds. The crosslevel limits notwithstanding, this standard establishes the maximum crosslevel at any point on the curve, which may not be more than 8 inches on Classes 1 and 2 and 7 inches on Classes 3 through 5. In curves, crosslevel is measured by subtracting the relative difference in height between the top surface (tread) of the inside (low) rail from the tread of the outside (high) rail. Both §213.63 and this section limit the amount of reverse elevation (outside rail lower than the inside rail). While the table in §213.63 permits reverse elevation on a curve, the Vmax formula must also be checked when reverse elevation is encountered. The Inspector must substitute a negative number for the actual elevation in the formula as discussed below. The Vmax formula applies only in the body of a curve.

57(b) (1) The maximum allowable operating speed for each curve is determined by the following formula –

$$V_{max} = \sqrt{\frac{Ea + 3}{0.0007D}}$$

Where:

V_{max} = Maximum allowable operating speed (miles per hour).

E_a = Actual elevation of the outside rail (inches)[1].

D = Degree of curvature (degrees)[2].

[1]Actual elevation for each 15-foot track segment in the body of the curve is determined by averaging the elevation for 10 points through the segment at 15.5-foot spacing. If the curve length is less than 155-feet, average the points through the full length of the body of the curve

[2]*Degree of curvature is determined by averaging the degree of curvature over the same track segment as the elevation*

Guidance. Paragraph (b)(1) prescribes the formula to be used to determine the maximum train speed in curves based on average curve alinement in degrees, and the amount of superelevation at the same location. Several combinations of curvature and elevation resulting in speed limitations may exist and should be considered throughout the curve when determining compliance with this section.

A railroad car traveling around a curve is subjected to an outward horizontal centrifugal force that acts conceptually through a car's center of gravity away from the center of the curve and tends to overturn the car by directing its weight toward the outside rail. To counteract the centrifugal force, the outer rail is elevated over the lower rail, or super elevated. In effect, the combined effect of centrifugal force and weight produces a resultant force that is intentionally moved toward the center of the track. A balanced (equilibrium) condition implies the vertical forces on each rail are equal. Figure 8 illustrates the three types of balance conditions.

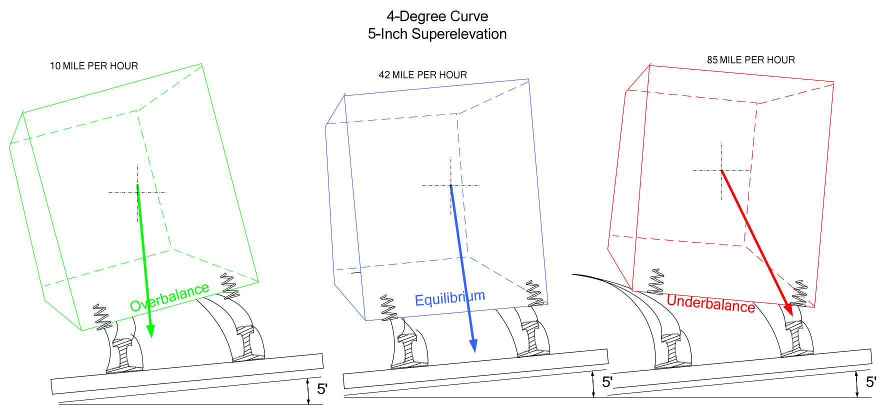


Figure 8

In practice, railroads generally do not operate trains at balanced speed; that is, train speeds are set to move the resultant force toward the outer rail, resulting in an unbalance typically less than 3 inches. Unbalance or cant deficiency is the theoretical amount of elevation that would have to be added to the existing elevation to achieve a balanced condition. The TSS for Classes 1 through 5 limits the amount of unbalance to 3 inches except that 4 inches is permitted for authorized and approved equipment types. Waivers have been granted for operation at even higher levels of cant deficiency.

Safe curving speeds are dependent on the engineering characteristics of the specific equipment involved, as well as the track conditions. Equipment factors such as center of gravity height, suspension characteristics, reaction to wind and other factors are considered when FRA makes a decision to approve a particular level of cant deficiency for specified equipment.

The application of the Vmax formula uses an averaging technique over a 155 foot "window." As indicated in sub-note 1, maximum train speed is based on values obtained from the curve body only. The actual elevation and curvature to be used in the formula are determined by averaging the elevation and curvature for 10 points, including the point of concern for a total of 11, through the segment at 15.5-feet station spacing (31 and 62-foot chords). If a curve's length is less than 155 feet, the measurements are averaged over the full length of the curve. In order to determine the average curvature, Inspectors must calculate the degree of curvature based on the chord length used (either 31 or 62-foot) and the mid-chord offset measured at each station. For a 31-foot chord, the degree of curvature is determined by multiplying the mid-chord offset by a factor of four (e.g., ¼ inch equals 1 degree). For a 62-foot chord, a one-to-one relationship exists (e.g., 1 inch equals 1 degree).

In addition to the limitations on reverse elevation contained in the table in §213.63, the Vmax formula limits the maximum authorized speed on a curve. Reverse elevation occurs when the inside rail is higher than the outside rail; that is usually the unintended consequence of track degradation. The condition can also occur where a turnout has been installed in a main track (e.g., an equilateral turnout constructed in a left-hand curve). Calculation of the maximum authorized speed for the curve with negative elevation is performed in the same manner as one with positive elevation. For example, the maximum authorized speed is approximately 13 m.p.h. for a curve segment with an average curvature of 4 degrees and 2½ inches of reverse elevation (both calculated over the 155 foot window or the length of the curve), the calculation for 3 inches of unbalance would be as shown below:

$$V\max = \sqrt{\frac{Ea+3}{0.0007D}} \quad V\max = \sqrt{\frac{-2.5+3}{0.0007*4}} \quad V\max = \sqrt{\frac{0.5}{0.0028}} \quad V\max = \sqrt{178.57} \quad \text{Vmax=13mph}$$

57(b)(2) Table 1 of Appendix A is a table of maximum allowable operating speed computed in accordance with this formula for various elevations and degrees of curvature.

Guidance. See Appendix A.

57(c)(1) For rolling stock meeting the requirements specified in paragraph (d) of this section, the maximum operating speed for each curve may be determined by the following formula –

$$V_{max} = \sqrt{\frac{Ea+4}{0.0007D}}$$

Where:

V_{max} = *Maximum allowable operating speed (miles per hour)*

E_a = *Actual elevation of the outside rail (inches)*[1]

D = *Degree of curvature (degrees)*[2]

Guidance. Paragraph (c) permits approved types of equipment that have been qualified and approved by FRA in accordance with paragraph (d), to operate at maximum allowable operating speeds based on 4 inches of unbalance (cant deficiency). Inspectors must be aware of those vehicles that have been approved by the Associate Administrator for Safety for operation at 4 inches of unbalance.

57(c)(2) Table 2 of Appendix A is a table of maximum allowable operating speed computed in accordance with this formula for various elevations and degrees of curvature.

Guidance. See Appendix A.

57(d) Qualified equipment may be operated at curving speeds determined by the formula in paragraph (c) of this section, provided each specific class of equipment is approved for operation by the Federal Railroad Administration and the railroad demonstrates that:

(1) When positioned on a track with a uniform four inch superelevation, the roll angle between the floor of the equipment and the horizontal does not exceed 5.7 degrees; and

(2) When positioned on a track with a uniform six inch superelevation, no wheel of the equipment unloads to a value of 60 percent of its static value on perfectly level track, and the roll angle between the floor of the equipment and the horizontal does not exceed 8.6 degrees.

(3) The track owner shall notify the Federal Railroad Administrator no less than 30 calendar days prior to the proposed implementation of the higher curving speeds allowed under the formula in paragraph (c) of this section. The notification shall be in writing and shall contain, at a minimum, the following information --

(i) A complete description of the class of equipment involved, including schematic diagrams of the suspension systems and the location of the center of gravity above top of rail;

(ii) A complete description of the test procedure[3] and instrumentation used to qualify the equipment and the maximum values for wheel unloading and roll angles which were observed during testing;

(iii) Procedures or standards in effect which relate to the maintenance of the suspension system for the particular class of equipment; and

(iv) Identification of line segment on which the higher curving speeds are proposed to be implemented.

[3]The test procedure may be conducted in a test facility whereby all the wheels on one side (right or left) of the equipment are alternately raised and lowered by four and six inches and the vertical wheel loads under each wheel are measured and a level is used to record the angle through which the floor of the equipment has been rotated.

Guidance. The engineering test described in paragraph (d) is known as the “static lean test” which has been used by FRA for several years to evaluate a vehicle’s curving performance.

For modern rail cars with a high center of gravity (90 to 98 inches), low speed curve negotiation under excessive levels of superelevation places the vehicle in an increased state of overbalance. This condition creates the possibility of wheel unloading and subsequent wheel climb when warp conditions are encountered within the curve, as explained by footnote 1 of the surface table in §213.63.

57(e) A track owner, or an operator of a passenger or commuter service, who provides passenger or commuter service over trackage of more than one track owner with the same class of equipment may provide written notification to the Federal Railroad Administrator with the written consent of the other affected track owners.

Guidance. Paragraph (e) states that a track owner, or an operator of a passenger or commuter service over trackage of more than one track owner with the same class of equipment, may provide written notification to the FRA with the written consent of the other track owner. Under paragraph (f) equipment presently operating at higher levels of unbalance by reason of conditional waivers granted by FRA is considered to have complied with the provisions of paragraph (d).

57(f) Equipment presently operating at curving speeds allowed under the formula in paragraph (c) of this section, by reason of conditional waivers granted by the Federal Railroad Administration, shall be considered to have successfully complied with the requirements of paragraph (d) of this section.

Guidance. Where FRA has approved higher levels of unbalance, it becomes imperative that the Inspector monitor the maximum authorized speeds based on the approved unbalance. The calculation of the maximum authorized speed for a particular segment of track involves the substitution of the approved unbalance in the Vmax formula. This calculation is based on

10 stations, plus the point of concern, for a total of 11 stations spaced 15-feet 6 inches apart for a 62 or 31-foot chord. For example, if FRA approved 5 inches of cant deficiency for a particular type of equipment, the maximum curving speed for a 6 degree curve segment with 4½ inches of elevation would be calculated as follows:

$$V\max = \sqrt{\frac{Ea+Eu}{0.0007D}}\ V\max = \sqrt{\frac{4.5+5}{0.0007*6}}\ V\max = \sqrt{\frac{9.5}{0.0042}}\ V\max = 47\text{mph}$$

To determine an enforcement action, it is also necessary for the Inspector to determine the actual unbalance based on the speed that the railroad is operating around the curve and the actual track conditions. In order to calculate the unbalance, the Inspector must solve the following formula, which is the same Vmax formula represented in a different form:

$$E_u = V\text{max}^2(0.0007)(D)-E_u$$

For example, if the railroad was operating around a curve at 100 m.p.h. and the Inspector determined, by field measurements, that the average curvature and average elevation for a particular curve segment was 2 degrees and 5½ inches of elevation, respectively. The unbalance would be calculated as follows:

$$E_u=(100)^2(0.0007)(2)-5.5$$

$$E_u=(10{,}000)(0.0007)(2)-5.5$$

$$E_u=14-5.5=8.5''$$

Where FRA has not approved more than 3 inches of unbalance and the operating speed on the curve produces more than 3 inches of unbalance, the Inspector will record the circumstance as a defect. However, the Inspector should consider writing a recommendation for civil penalty if the level of unbalance based on the maximum speed, elevation, and curvature exceeds 4 inches. When vehicle types have been approved by FRA for curving speeds producing more than 3 inches unbalance, Inspectors will not consider recommending a violation when operating speeds for that equipment only produce a marginal level of cant deficiency above the approved level. The Regional Track Specialist should be consulted when questions arise concerning limiting speeds in curves.

Figure 9 is an example showing the relationship between curvature, elevation, and speed.

Stations Spaced 15.5'

Points	Elev. Inches	MCO Inches	Degree
-5	0.625	1.000	1.000
-4	0.500	0.875	0.875
-3	0.500	1.000	1.000
-2	0.375	0.875	0.875
-1	0.750	0.750	0.750
0	0.250	0.625	0.625
1	0.333	0.875	0.875
2	0.375	0.875	0.875
3	0.375	0.875	0.875
4	0.375	1.125	1.125
5	0.375	0.750	0.750
Total	4.833	9.625	9.625
Average	0.439		0.875

10 points plus spot of concern = 11 points (Total/11 = average)

62' Chord Example (1" MCO = 1 Degree)

Unbalance when speed is known

$$\underbrace{3}_{\text{Unbalance}}=\underbrace{75}_{\text{Speed}}{}^2\times 0.0007\times\underbrace{0.875}_{\text{Average Curvature}}-\underbrace{0.439}_{\text{Average Elevation}}$$

$$\sqrt{(\underbrace{0.439}_{\text{Average Elevation}}+\underbrace{3}_{\text{Approved Unbalance}})/\underbrace{0.875}_{\text{Average Curvature}}\times 0.0007} = 75 \text{ mph}$$

Max. Speed

Note: For 31' chord each 1/4" equals 1 degree

Figure 9

57(g) A track owner or a railroad operating above Class 5 speeds, may request approval from the Federal Railroad Administrator to operate specified equipment at a level of cant deficiency greater than four inches in accordance with §213.329(c) and (d) on curves in Class 1 through 5 track which are contiguous to the high speed track provided that --

(1) The track owner or railroad submits a test plan to the Federal Railroad Administrator for approval no less than thirty calendar days prior to any proposed implementation of the higher curving speeds. The test plan shall include an analysis and determination of carbody acceleration safety limits for each rail car type which indicate wheel unloading of 60 percent in a steady state condition and 80 percent in a transient (point by point) condition. Accelerometers shall be laterally-oriented and floor-mounted near the end of a representative rail car of each type;

(2) Upon FRA approval of a test plan, the track owner or railroad conducts incrementally increasing train speed test runs over the curves in the identified track segment(s) to demonstrate that wheel unloading is within the limits prescribed in paragraph (g)(1) of this section;

(3) Upon FRA approval of a cant deficiency level, the track owner or railroad inspects the curves in the identified track segment with a Track Geometry Measurement System (TGMS) qualified in accordance with §213.333 (b) through (g) at an inspection frequency of at least twice annually with not less than 120 days interval between inspections; and

(4) The track owner or railroad operates an instrumented car having dynamic response characteristics that are representative of other equipment assigned to service or a portable device that monitors on-board instrumentation on trains over the curves in the identified track segment at the revenue speed profile at a frequency of at least once every 90 day period with not less than 30 days interval between inspections. The instrumented car or the portable device shall monitor a laterally-oriented accelerometer placed near the end of the rail car at the floor

level. If the carbody lateral acceleration measurement exceeds the safety limits prescribed in paragraph (g)(1), the railroad shall operate trains at curving speeds in accordance with paragraph (b) or (c) of this section; and

(5) The track owner or railroad shall maintain a copy of the most recent exception printouts for the inspections required under paragraphs (g)(3) and (4) of this section.

Guidance. Paragraph (g) permits a high-speed railroad (operating at Classes 6 through 9 speeds) with contiguous (within or next to) curves Classes 1 through 5 to operate at a higher level of unbalance on those curves provided that additional inspections and requirements are maintained. Inspectors should compute allowable speeds through curves to determine compliance with this section and report defects when train speed exceeds the allowable based on the formula.

In most cases, the high-speed railroad will accomplish the testing requirements for the Classes 1 through 5 curves during the qualification testing under §§213.345 and 213.329 over the entire route which includes both low and high-speed curves. In those cases, FRA approval will generally apply to all curves on the route. However, FRA may approve different speeds or cant deficiencies for different track segments, depending upon the results of the testing.

§213.59 Elevation of curved track; (runoff)

59(a) If a curve is elevated, the full elevation must be provided throughout the curve, unless physical conditions do not permit. If elevation occurs in a curve, the actual minimum elevation must be used in computing the maximum allowable operating speed for that curve under §213.57(b).

Section 213.59 is closely connected to §§213.57 and 213.63. When determining whether curved track is in compliance with the TSS, Inspectors should consider §§213.57, 213.59, and 213.63 in conjunction with one another. Because the language in §213.59 is explanatory in nature and intertwined with the requirements in §§213.57 and 213.63, §213.59 should not stand alone in support of an alleged violation. FRA Inspectors should cite either §213.57 or §213.63, whichever is most applicable. Accordingly, FRA has not included any defect codes for §213.59.

59(b) Elevation must be at a uniform rate, within the limits of track surface deviation prescribed in §213.63 and it must extend at least the full length of the spirals. If physical conditions do not permit a spiral long enough to accommodate the minimum length of runoff, part of the runoff may be on tangent track.

Items to consider with respect to runoff include the following:

- If elevation begins within the body of the curve rather than at the point of curve-spiral, the least average elevation that exists in the body of the curve will govern the allowable operating maximum speed throughout the full curve.
- Elevation at the end of curves, or between segments of compound curves, must be at a uniform rate within the limits of track surface deviations prescribed in the table under §213.63.
- Particular attention must be given to the prescribed limits for difference in crosslevel between any two points less than 62 feet apart on spirals.

- If physical conditions do not permit a spiral long enough to accommodate the minimum length of runoff, the runoff may be carried into the tangent. In these circumstances, the surface table parameters under §213.63 will govern.
- The actual minimum elevation and actual degree of curvature is determined by using the averaging techniques described under §213.57.

Figure 10 illustrates how a railroad can reduce superelevation in the body of the curve to accommodate a highway-rail grade crossing for unqualified equipment (3 inches unbalance).

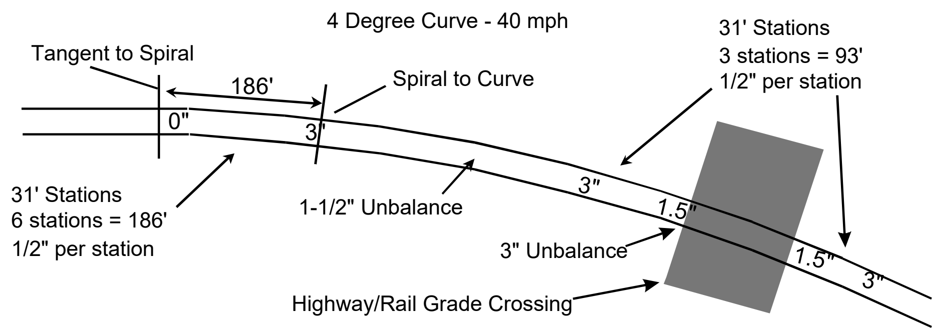


Figure 10

§213.63 Track Surface

Each owner of the track to which this part applies shall maintain the surface of its track within the limits prescribed in the following table

Track Surface	*Class of Track*				
	1	*2*	*3*	*4*	*5*
The runoff in any 31 feet of rail at the end of a raise may not be more than	*3½"*	*3"*	*2"*	*1½"*	*1"*
The deviation from uniform profile on either rail at the mid-ordinate of a 62-foot chord may not be more than	*3"*	*2¾"*	*2¼"*	*2"*	*1¼"*
The deviation from zero crosslevel at any point on tangent or reverse crosslevel elevation on curves may not be more than	*3"*	*2"*	*1¾"*	*1¼"*	*1"*
*The difference in crosslevel between any two points less than 62 feet apart may not be more than * [1], [2] .*	*3"*	*2¼"*	*2"*	*1¾"*	*1½"*
** Where determined by engineering decision prior to the promulgation of this rule, due to physical restrictions on spiral length and operating practices and experience, the variation in crosslevel on spirals per 31 feet may not be more than*	*2"*	*1¾"*	*1¼"*	*1"*	*¾"*
[1] Except as limited by §213.57(a), where the elevation at any point in a curve equals or exceeds six inches, the difference in crosslevel within 62 feet between that point and a point with greater elevation may not be more than 1½ inches. *[2] However, to control harmonics on Class 2 through 5 jointed track with staggered joints, the crosslevel differences shall not exceed 1¼ inches in all of six consecutive pairs of joints, as created by 7 low joints. Track with joints staggered less than 10 feet shall not be considered as having staggered joints. Joints within the 7 low joints outside of the regular joint spacing shall not be considered as joints for purposes of this footnote.*					

Table 6

Guidance. Track surface is the evenness or uniformity of track in short distances measured along the tread of the rails. Under load, the track structure gradually deteriorates due to dynamic and mechanical wear effects of passing trains. Improper drainage, unstable roadbed, inadequate tamping, and deferred maintenance can create surface irregularities. Track surface irregularities can lead to serious consequences if ignored.

Allowable deviations in track surface include runoff at the end of a raise, deviation from uniform profile, deviation from zero crosslevel at any point on tangent or reverse crosslevel elevation on curves, and the difference in crosslevel between any two points less than 62 feet apart, are specified in the track surface table. In addition, the table includes footnotes that address three special circumstances.

The first parameter in the table in this section refers to the runnoff (ramp) in any 31 foot segment at the end of a raise where the track is elevated as a result of automatic or manual surfacing or bridge work. Conditions created by track degradation (e.g., settlement or frost heaves) are to be addressed using the uniform profile parameter, under this section. Trains encountering a ramp (up or down) will experience a vertical pitch or bounce if the change in elevation occurs in too short a distance. As in the more general profile parameter, damage to car components, undesirable brake applications or derailments may occur; especially when the vehicle experiences a lateral force such as a buff force. Figure 11 illustrates the measurement of the runoff of raised track.

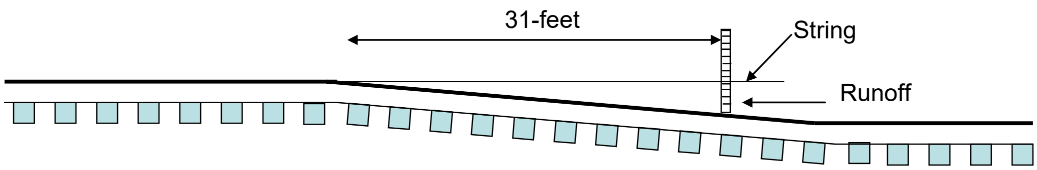


Figure 11

The second parameter, profile, relates to the elevation of either rail along the track. When trains encounter short dips or humps in the track it can result in vertical separation of couplers, broken springs, bolsters, and truck frames. Dips can result from mud spots, or develop at the ends of fixed structures (e.g., bridges, highway rail grade and track crossings). Profile is determined by placing the mid-point of a 62-foot chord at the point of maximum measurement, irrespective of vertical curves. Profile may also be a track "hump" cause by a frost heave or other occurrence. Figure 12 illustrates the measurement of profile conditions.

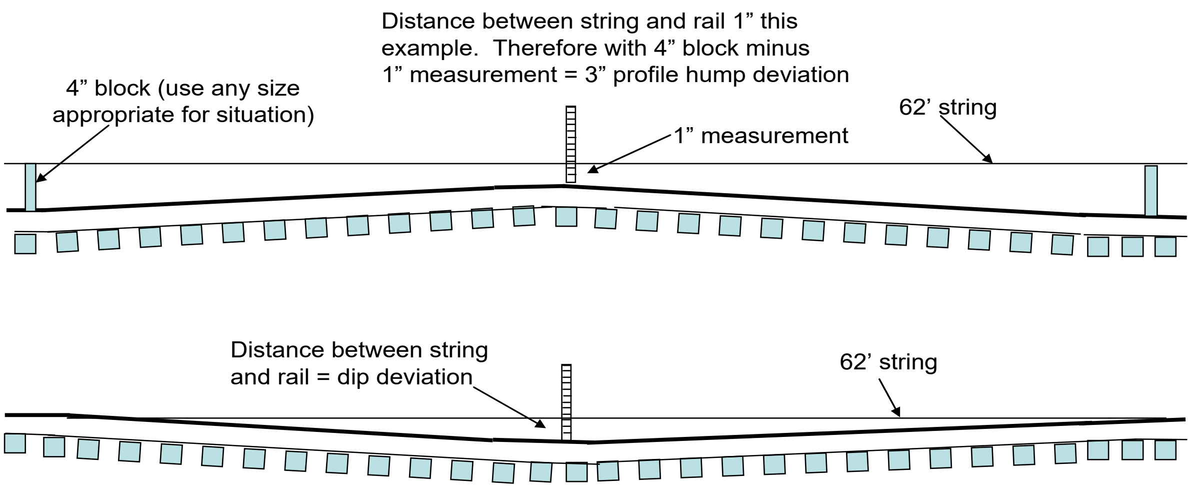


Figure 12

Remember to consider any combination of rail and tie plate or crosstie and ballast section voids to the mid-ordinate distance, according to §213.13 (dynamic loading).

When encountering a hump (e.g., frost heaves over culverts), place two uniform (reference offset) blocks on top of the running rail. Stretch (taut) a 62 foot string positioned over the blocks, with the observed highpoint at the midpoint of the string. Measure the distance from the string to the running surface of the rail. Subtract this distance from the height of the (offset) blocks to determine the mid-offset.

The third parameter in the table refers to the deviation from zero crosslevel at a point or reverse crosslevel in a curve. Crosslevel, utilizing a levelboard, is measured by subtracting the difference in height between the top surface (tread) of one rail to the tread of the opposite rail. On tangent track both rails by design should be the same height, a term known as zero crosslevel. On the spiral or body of a curve, the outer rail may not be lower than inner rail (reverse elevation) beyond the limits provided in the surface table. Also consider what implications, if any, Vmax (§213.57) may impose at a curve body where reverse elevation is encountered.

The parameter for the difference in crosslevel between any two points less than 62 feet apart is commonly referred to as the "warp" parameter. This parameter provides maximum change in crosslevel between two points within specific distances along the track. The warp parameter is, perhaps, the most critical of the surface parameters. Excessive warp contributes to wheel climb derailments. Figure 13 illustrates warp measurements.

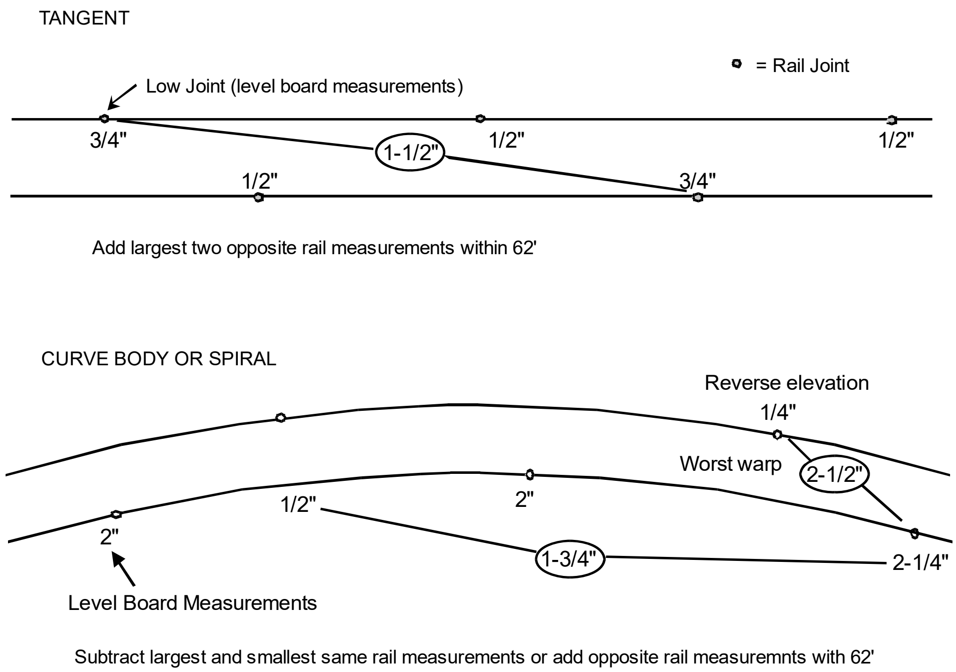


Figure 13

The threshold values for warp represent minimum safety standards and encompass the full range of rolling stock in present day operating fleets. Inspectors should be aware that some rolling stock, because of certain design and/or demonstrated performance characteristics, may be subject to additional operating restrictions and/or more restrictive warp thresholds as determined by individual railroads. The limits for warp, apply anywhere along the track, (curves, spirals, and tangent segments), except that the limits shown in footnote "*" of the

§213.63 table (Table 6) apply in the special case in spirals where physical conditions prevent the more restrictive limits in the general warp parameter.

The footnote designated by a "*" of the §213.63 table (Table 6) is an exception to the above warp requirement in spirals in those few situations where the railroad has made a prior engineering decision, due to physical restrictions, to design a shorter spiral that would be found in standard construction. When encountering a spiral that does not have a sufficient length to "runoff" elevation in accordance with the warp parameter, the Inspector must determine if the "short spiral" is a result of a man made or other natural obstruction. In short spirals, the amount of warp is determined by measuring the "variation" in crosslevel between two points 31-feet apart.

Examples of "short spiral" situations include rock cuts, tunnels, station platforms, etc. Figure 14 illustrates the application of the "*" footnote.

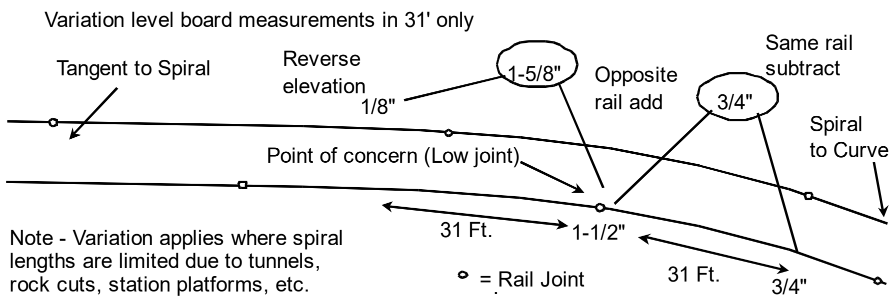


Figure 14

Railroads are expected to apply the variation parameter and thresholds only at locations where there is a clear history of restrictive physical characteristics.

When measuring track surface parameters remember the location of the transition points between tangent, spiral, and curve body are determined by actual physical layout and are not assumed to be synonymous with railroad markers, tags, curve charts, or similar information. Therefore, be governed accordingly when applying the "*" footnote or any other track geometry parameter.

Under footnote 1 of the §213.63 table (Table 6), where the Elevation At Any Point in a curve equals or exceeds 6 inches, the difference (warp) in crosslevel within 62 feet between that point and a point with greater elevation may not be more than 1½ inches regardless of track class. This footnote is included to address the condition where a vehicle is operating on a curve with a large amount of elevation and then encounters a warp condition. Since the vehicle is typically in an unbalanced condition, the warp may induce wheel climb. Slow speed curve negotiation is a particular concern since the wheels on the outside rail of the curve will tend to unload due to the overbalanced condition of the vehicle. Where this condition is found, the appropriate corrective action would be reduction to Class 1 speed under the provisions of §213.9(b).

Figure 15 illustrates a warp exceeding 1½ inches at a curve with 6 inches of elevation.

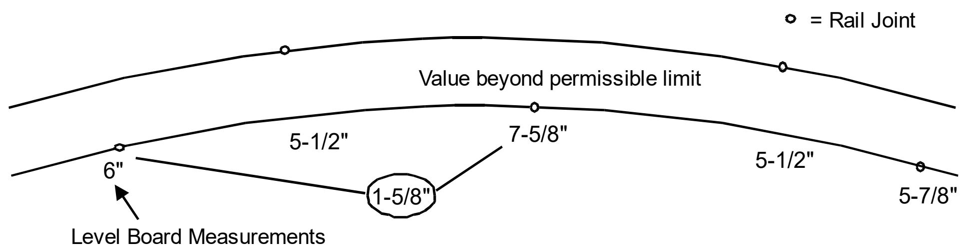


Figure 15

Footnote 2 of the §213.63 table (Table 6) addresses the critical harmonic rock-off condition that may result in the vehicle rocking back and forth and derailing following wheel climb. It is considered rare that this condition could occur in continuous welded rail (CWR), but it may occur where "joint memory exists." In this case, while the condition is not a defect unless it exceeds the warp limits specified in the table, the Inspector should call the condition to the attention of the railroad. The crosslevel difference (warp) may not exceed 1¼ inches on all six consecutive pairs of joints, under the conventional joint spacing (33, 36, 39-foot long rails). Each one of the six pairs must exceed 1¼ inches for this condition to be a defect. Additional joints that have been introduced outside of the regular joint spacing, characteristically as a result of rail repair, are not considered harmonic "joints" for the purposes of this footnote. Figure 16 illustrates a harmonic rock-off condition.

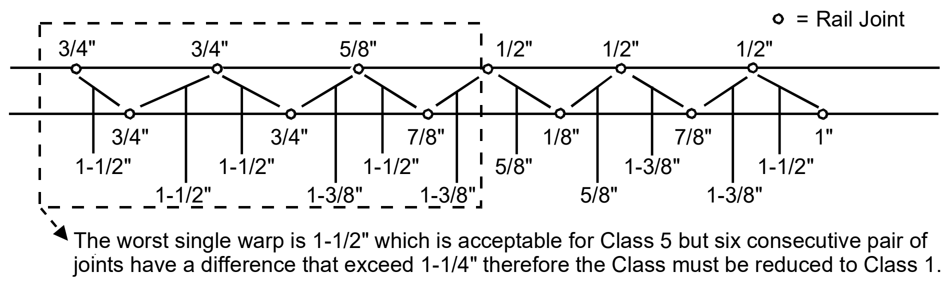


Figure 16

A condition with consecutive low bolted joints may be in non-compliance with either the warp limits specified in the table or the requirements of footnote 2 of the §213.63 table (Table 6). Inspectors shall consider any contiguous group of joints as one defect and note the number of joints. If the harmonic condition continues beyond the seven joints, the Inspector is not required to record another defect, but must note the number of consecutive joints that make up the harmonic condition.

Jointed rail stagger that is not identical from stagger to stagger, such as in a curve or when a rail slightly longer than the original construction is installed, shall be considered in the harmonic calculation. Additional joints introduced by the installation of short rails are ignored in evaluating a harmonic condition.

Construction consisting of 79 or 80 foot rails does not result in harmonic rock-off conditions since they occur outside of vehicle truck spacing. For 79 or 80 foot rails and staggered spacing less than 10 feet, this footnote is not applicable and Inspectors shall review the condition for compliance with other track surface parameters.

Inspectors shall carefully apply the provisions of footnote 2 of the §213.63 table (Table 6). An acceptable remedial action is to raise and tamp one or two joints in the middle of the consecutive low joints. This will break up the harmonics.

Subpart D - Track Structure

§213.101 Scope

This subpart prescribes minimum requirements for ballast, crossties, track assembly fittings, and the physical conditions of rails.

§213.103 Ballast; general

Unless it is otherwise structurally supported, all track shall be supported by material which will --

103(a) Transmit and distribute the load of the track and railroad rolling equipment to the subgrade;

103(b) Restrain the track laterally, longitudinally, and vertically under dynamic loads imposed by railroad rolling equipment and thermal stresses imposed by the rails;

Guidance. Ballast may consist of crushed slag, crushed stone, screened gravel, pit-run gravel, chat, cinders, scoria, pumice, sand, mine waste, or other native material, and is an integral part of the track structure. Ballast, regardless of the material, must satisfy the requirements stated in the TSS.

103(c) Provide adequate drainage for the track; and

103(d) Maintain proper track crosslevel, surface, and alinement.

Guidance. Inspectors should consider the overall condition of a track when citing fouled ballast. Because ballast conditions can be subjective in nature, Inspectors should also look to other indicators, such as a geometry condition. For example, a fouled ballast violation might be appropriate if the track has poor drainage and there is a geometry conditions.

The term “geometry condition” used here and elsewhere in this manual means a track surface, gage, or alinement irregularity that does not exceed the allowable threshold for the designated track class. It exists due to the reduced or non-existent capability of one or more track structural components to hold the track into its preferred geometric position.

§213.109 Crossties

109(a) Crossties shall be made of a material to which rail can be securely fastened.

109(b) Each 39-foot segment of track shall have –

(1) A sufficient number of crossties which in combination provide effective support that will -

(i) Hold gage within the limits prescribed in §213.53(b);

(ii) Maintain surface within the limits prescribed in §213.63; and

(iii) Maintain alinement within the limits prescribed in §213.55.

(2) The minimum number and type of crossties specified in paragraphs (c) and (d) of this section effectively distributed to support the entire segment; and

(3) At least one crosstie of the type specified in paragraphs (c) and (d) of this section that is located at a joint location as specified in paragraph (f) of this section.

Guidance. The TSS determines the adequacy of crosstie support by including its functional requirements to maintain track geometry within the limits specified in Subpart C. The failure of the crossties to meet any of the three above criteria constitutes a deviation from the TSS.

Effective distribution has not been defined, but must not be interpreted by the Inspector as synonymous with equally spaced. The language is intended to address situations where all of the non-defective or defective ties exist in a group at a short area of the 39-foot segment of track in question. Evidence that crossties are not effectively distributed includes, primarily, indications of an actual deviation or a geometry condition.

No criterion exists for the maximum distance between non-defective ties, and this measurement should not be used to describe a tie defect. If such a description is appropriate, it should be in terms of the number of consecutive defective ties in a group.

When citing defect code 213.109.03 (Crossties not effectively distributed to support a 39-foot segment of track), the Inspector must show evidence of one or more of the geometry conditions cited in §213.109(b)(1). Several factors may be documented if the defect is being cited. These factors include, but are not limited to:

- Geometry conditions;
- Class of track;
- Curvature;
- Traffic density (annual tonnage);
- Rail weight and condition; and
- Condition of other components of the track.

When determining compliance with this section, the Inspector must determine that crossties meet the requirements of effectiveness as defined above and make geometry measurements to verify that each 39-foot segment of track has:

- A sufficient number of effective ties to maintain geometry;
- The required number of non-defective ties for the track class as described in paragraph (d); and
- The proper placement of non-defective ties as described in paragraph (d) and positioned as required in paragraph (f) to support joints.

The majority of crossties throughout the nation are made from wood. However, there are varieties of alternate designed crossties made from materials such as composites, steel, and concrete. These types of crossties are becoming more common throughout the industry. Because of the increased use of these alternate design crossties and their associated resilient type rails fasteners, Inspectors should more rigorously consider the rail/crosstie interface. Also, see §213.127, Rail fastenings.

109(c) Each 39-foot segment of: Class 1 track shall have five crossties; Classes 2 and 3 track shall have eight crossties; and Classes 4 and 5 track shall have 12 crossties, which are not:

(1) Broken through;

(2) Split or otherwise impaired to the extent the crossties will allow the ballast to work through, or will not hold spikes or rail fasteners;

(3) So deteriorated that the tie plate or base of rail can move laterally more than ½ inch relative to the crossties; or

(4) Cut by the tie plate through more than 40 percent of a ties' thickness.

Guidance. Paragraph (c) above has been superseded by (d) which became effective on September 21, 2000.

109(d) Each 39-foot segment of track shall have the minimum number and type of crossties as indicated in the following table:

Class of track	*Tangent track and curves ≤ 2 degrees*	*Turnouts and curved track over 2 degrees*
1	*5*	*6*
2	*8*	*9*
3	*8*	*10*
4 and 5	*12*	*14*

Table 7

Guidance. Paragraph (d) addresses curved track greater than 2 degrees and will be determined by actual field measurements. Turnouts, regardless of their location (tangent or curve), shall have the same number of effective crossties as required for curves greater than 2 degrees.

When determining compliance with the minimum number of non-defective crossties per 39-foot segments, the Inspector is reminded that the 39-foot segment may be taken anywhere along the track and need not coincide with joint locations. This portion of the rule does not require associated evidence of an actual deviation, or geometry condition or other defects.

109(e) Crossties counted to satisfy the requirements set forth in the table in paragraph (d) of this section shall not be –

(1) Broken through;

(2) Split or otherwise impaired to the extent the crossties will allow the ballast to work through, or will not hold spikes or rail fasteners;

(3) So deteriorated that the tie plate or base of rail can move laterally ½ inch relative to the crossties; or

(4) Cut by the tie plate through more than 40 percent of a crosstie's thickness.

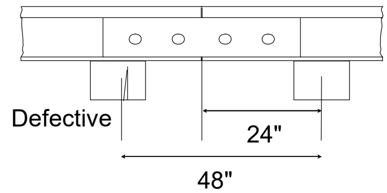
Guidance. When a crosstie exhibits any one or more of the conditions described in the four criteria for evaluation [§213.109(d)1-4] it may be considered non-effective itself, although that determination may not always result in a defective condition that can be recorded under defect codes 213.109.01, 213.109.02, 213.109.03, or 213.109.04.

If track geometry measurements fail to meet the requirements of Subpart C, and there are an insufficient number of effective crossties, both geometry and crossties could be cited as defects. If geometry measurements exceed the allowable tolerance, but a determination cannot be made that crossties are the cause, it is appropriate to cite only the defective geometry.

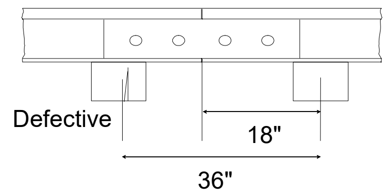
FRA Inspectors may use a Portable Track Loading Fixture (PTLF) described in §213.110 for the purposes of measuring loaded gage to determine effective distribution of crossties. Refer to Appendix E - PTLF instructions for non-GRMS territory under §213.53.

109(f) Class 1 and Class 2 track shall have one crosstie whose centerline is within 24 inches of each rail joint location, and Classes 3 through 5 track shall have one crosstie whose centerline is within 18 inches of each rail joint location or, two crossties whose centerlines are within 24 inches either side of each rail joint location. The relative position of these ties is described in the following figure:

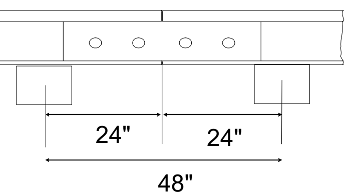
Each rail joint in Classes 1 and 2 track shall be supported by at least one crosstie specified in paragraph (c) and (d) of this section whose centerline is within 48."



Each rail joint in Classes 3 through 5 track shall be supported by at least one crosstie specified in paragraph (c) and (d) of this section whose centerline is within 36", or:



Two crossties, one on each side of the rail joint, whose centerlines are within 24" of the rail joint location shown above.



Guidance. A non-defective joint tie must be found within the prescribed distance of the centerline of the joint measured at the rail end. In Classes 3 through 5, joint tie placement can be satisfied by either a one tie configuration, or by a two tie configuration.

For clarity of measurement and description:

1. Where a short piece of rail only inches in length is inserted between the rail ends and incorporated into the joint bar assembly, measure from the bar centerline. Also see §213.121 (d), Rail Joints.
2. Where non-symmetrical bars exist, (e.g., five hole heel block bars, five hole compromise bars) measure from the design point where rail ends normally abut.

109(g) For track constructed without crossties, such as slab track, track connected directly to bridge structural components and track over servicing pits, the track structure shall meet the requirements of paragraphs (b)(1)(i), (ii), and (iii) of this section

Guidance. This paragraph addresses track constructed without crossties or bridge timbers, such as concrete-slab track, in which running rails are secured through fixation to another structural member.

Guidance, General. With respect to crossties in general, criticism has arisen over Inspector evaluation of crosstie condition, stating that decisions were subjective based on an Inspector's maintenance experience and varied widely among the Inspectors. We may never escape this type of criticism entirely, although it can be substantially reduced if Inspectors evaluate tie condition solely on the basis of the definitions provided in this section. Each crosstie must be evaluated individually by these criteria. As with all provisions of the TSS, the Inspector must use judgment and discretion in the application of the crosstie standards. They should be used to describe conditions that constitute a risk to the safe operation of trains, and should not be applied in doubtful cases.

Gage rods are not an effective substitute for a proper crosstie and rail fastening system. Gage rods can be subject to sudden failure, they provide no vertical rail support, and they provide no resistance to rail roll-over forces. However, gage rods may be installed when they are used as a secondary means of support for maintaining gage. Where gage rods are used and it is obvious that the condition of the crosstie and fastening system in the immediate vicinity is incapable of maintaining adequate gage, then the Inspector should consider citing a crosstie or fastener defect.

Certain crossties may not be able to hold spikes or rail fasteners in their present condition. In these cases, it may be possible to bring the crossties into compliance by either plugging and re-spiking, or adding additional rail-holding or plate-holding spikes, or both.

Where conditions are closer to a rail fastener issue (e.g., sound ties in track are not fastened to the rail), Inspectors should refer to the guidance under §213.127.

§213.110 Gage Restraint Measurement Systems

110(a) A track owner may elect to implement a Gage Restraint Measurement System (GRMS), supplemented by the use of a Portable Track Loading Fixture (PTLF), to determine compliance with the crosstie and fastener requirements specified in §§213.109 and 213.127 provided that--

(1) The track owner notifies the appropriate FRA Regional office at least 30 days prior to the designation of any line segment on which GRMS technology will be implemented; and

(2) The track owner notifies the appropriate FRA Regional office at least 10 days prior to the removal of any line segment from GRMS designation.

Guidance. This paragraph provides for the implementation of a GRMS, supplemented by the use of a PTLF, to determine compliance with the crosstie and rail fastener requirements specified in §§213.109 and 213.127. Track owners electing to implement this technology must provide the appropriate FRA Regional Office with notification that specifically identifies the line segment(s) where GRMS will be used. The appropriate FRA office is the headquarters location for the FRA region in which the GRMS designated line segment is located.

The notification must be provided to FRA at least 30 days prior to the designation of any line segment which will be subject to the requirements of this section. Even though the notification requirement is satisfied, and the GRMS vehicle is determined to meet the minimum design requirements, the actual “triggering event,” which places the line segment under the GRMS requirements, is the initial track survey with the GRMS vehicle.

Track owners must also provide FRA with at least 10 days notice prior to the removal of a line segment from GRMS designation. This requirement provides FRA with advance notice of the criteria change for the inspection of crossties and fasteners, and places some control over the random removal of line segments from GRMS designation.

110(b) Initial notification under paragraph (a)(1)of this section shall include--

(1) Identification of the line segment(s) by timetable designation, milepost limits, class of track, or other identifying criteria; and

(2) The most recent record of million gross tons of traffic per year over the identified segment(s).

Guidance. This paragraph specifies what information track owners should include in their notifications to FRA about line segments designated for GRMS inspection. The information must include, at a minimum, the segment's timetable designation, milepost limits, track class, million gross tons of traffic per year, and any other identifying characteristics of the segment.

For reasons of safety, GRMS vehicles have their split-axle in the retracted position when testing through special trackwork such as turnouts, at grade rail-to-rail crossing (diamond), expansion joints, lift rail assemblies, etc. Where certain trackage within is not part of the designation, notifications should identify what and where these locations are and what distance approaching and leaving these locations are also excluded from GRMS designation. Locations excluded from GRMS designation will be subject to the requirements of §§213.109 and 213.127.

110(c) The track owner shall also provide to FRA sufficient technical data to establish compliance with the minimum design requirements of a GRMS vehicle which specify that–

(1) Gage restraint shall be measured between the heads of rail --

(A) At an interval not exceeding 16 inches;

(B) Under an applied vertical load of no less than 10,000 pounds per rail; and

(C) Under an applied lateral load which provides for a lateral/vertical load ratio between 0.5 and 1.25, and a load severity greater than 3,000 pounds but less than 8,000 pounds.

Guidance. This paragraph describes minimum design requirements for GRMS vehicles. Track owners must submit to FRA sufficient technical data so that the Agency can establish whether or not the track owner is in compliance with these design requirements. This paragraph requires that gage must be measured between the heads of the rail at an interval not exceeding 16 inches. The paragraph provides for design flexibility by establishing acceptable ranges for the lateral/vertical load ratio and the resulting lateral load severity, both of which can be satisfied by various load configurations, provided that the applied vertical load is not less than 10,000 pounds per rail.

The rule provides for design flexibility by establishing acceptable ranges for various loading requirements. These ranges are considered absolute, and loading configurations that fall outside of the prescribed ranges will not be considered acceptable. Some loading configurations may develop high lateral/vertical load ratios and therefore lubrication of the gage face of the rail ahead of the split axle may be required to reduce the coefficient of friction to prevent wheel climb.

110(d) Load severity is defined by the formula–S=L-cV

Where-

S = Load severity, defined as the lateral load applied to the fastener system (pounds).
L = Actual lateral load applied (pounds).
c = Coefficient of friction between the rail/tie which is assigned a nominal value of (0.4).
V = Actual vertical load applied (pounds).

(e) The measured gage values shall be converted to a Projected Loaded Gage 24 (PLG 24) as follows–

PLG 24 = UTG + A X (LTG – UTG)

Where –

UTG=Unloaded track gage measured by the GRMS vehicle at a point no less than 10-feet from any lateral or vertical load application.
LTG=Loaded track gage measured by the GRMS vehicle at a point no more than 12 inches from the lateral load application point.
A=The extrapolation factor used to convert the measured loaded gage to expected loaded gage under a 24,000 pound lateral load and a 33,000 pound vertical load.

For all track - "A" - in the above formula is:

$$A = \frac{13.153}{(.001 \times L - .000258 \times V) - .009 \times (.001 \times L - .000258 \times V)^2}$$

Note: The A factor shall not exceed (3.184) under any circumstances.

Where -
L = Actual lateral load applied (pounds).
V = Actual vertical load applied (pounds).

(f) The measured gage value shall be converted to a Gage Widening Ratio (GWR) as follows –

$$GWR = \frac{(LTG - UTG)}{L} \times 16{,}000$$

Guidance. Paragraphs (d), (e), and (f) prescribe formulas to be used in the calculation of the Gage Widening Ratio (GWR) and the Projected Loaded Gage 24 (PLG 24). The accurate measurements of unloaded gage, GRMS loaded gage, and the lateral load applied are of critical importance because these measurements are used in the calculation of PLG 24 values and the values for GWR, values which constitute a direct measure of track strength. Therefore, to avoid any influence from adjacent loads, design requirements specify that the unloaded track gage must be measured by the GRMS vehicle at a point no less than 10-feet from any lateral or vertical load application. Loaded track gage measured by the GRMS vehicle shall be measured at a point no more than 12 inches from the lateral load application point.

110(g) The GRMS vehicle shall be capable of producing output reports that provide a trace, on a constant-distance scale, of all parameters specified in paragraph (l) of this section.

110(h) The GRMS vehicle shall be capable of providing an exception report containing a systematic listing of all exceptions, by magnitude and location, to all the parameters specified in paragraph (l) of this section.

110(i) The exception reports required by this section shall be provided to the appropriate person designated as fully qualified under §213.7 prior to the next inspection required under §213.233.

Guidance. Paragraphs (g), (h), and (i) require that GRMS vehicles be capable of producing strip-chart of all the parameters specified in paragraph (l) of this section, as well as a printed exception report listing by magnitude and location all exceptions from these parameters. The exception report listing must be provided to the appropriate person(s) designated as fully qualified under §213.7 prior to the next inspection required under §213.233 of the TSS.

Since the premise behind GRMS technology is to identify areas of weak gage restraint that either need immediate attention, or must be continually monitored until the next GRMS inspection, the exception report listing must be retained and be available for review by the

§213.7 inspection personnel. FRA Inspectors will obtain, or have access to, this exception report when conducting regular compliance inspections over GRMS designated line segments.

110(j) The track owner shall institute the necessary procedures for maintaining the integrity of the data collected by the GRMS and PTLF systems. At a minimum, the track owner shall–

(1) Maintain and make available to the Federal Railroad Administration documented calibration procedures on each GRMS vehicle which, at a minimum, shall specify a daily instrument verification procedure that will ensure correlation between measurements made on the ground and those recorded by the instrumentation with respect to loaded and unloaded gage parameters; and

(2) Maintain each PTLF used for determining compliance with the requirements of this section such that the 4,000-pound reading is accurate to within five percent of that reading.

Guidance. This paragraph requires the track owner to institute procedures that will ensure the integrity of data collected by the GRMS and PTLF systems. Track owners must maintain documented calibration procedures on each GRMS vehicle and make them available upon request from an FRA representative. A daily instrument verification procedure is required to ensure that measurements of loaded and unloaded gage recorded by the instrumentation correlate to actual field measurements. Track owners must also develop and implement the necessary PTLF inspection and maintenance procedures so that the 4,000-pound reading is accurate within plus or minus 5 percent.

110(k) The track owner shall provide training in GRMS technology to all persons designated as fully qualified under §213.7 and whose territories are subject to the requirements of this section. The training program shall be made available to the Federal Railroad Administration upon request. At a minimum, the training program shall address--

(1) Basic GRMS procedures;

(2) Interpretation and handling of exception reports generated by the GRMS vehicle;

(3) Locating and verifying defects in the field;

(4) Remedial action requirements;

(5) Use and calibration of the PTLF; and

(6) Recordkeeping requirements.

Guidance. This paragraph recognizes the need for persons designated as fully qualified under §213.7, and whose territories are subject to the requirements of this section, to receive training on the implementation of GRMS technology. The track owner therefore is required to develop a formal GRMS training program which must be made available to FRA upon request. The training of affected employees is another “triggering event” that must be satisfied prior to a line segment being designated as GRMS territory under this section.

The training program must provide detailed instruction on the specific areas identified in this paragraph. In particular, the training must address basic GRMS operational procedures, interpretation and handling of exception reports, how to locate and verify GRMS defects in the field, remedial action requirements to be initiated when defects are verified, how to use and calibrate the PTLF, and the recordkeeping requirements associated with the implementation of GRMS technology.

The requirement for GRMS training applies to fully qualified §213.7 personnel under paragraphs (a) and (b) who are going to be subject to the requirements of this section. This is not to say that all fully qualified §213.7 personnel need this training (e.g., welder foreman, production gang foreman, etc.). It is also not necessary for all fully qualified §213.7 personnel who receive the GRMS training to be issued PTLF's. However, if circumstances arise where they need a PTLF, they should have access to one and be trained in how to use it and interpret the results.

The track owner must also take into consideration any relief personnel, newly qualified personnel, or personnel transferred from non-GRMS territory into a GRMS territory, who will be subject to the GRMS requirements. These personnel must be provided with sufficient instructions and training that enable them to demonstrate to the track owner that they know and understand the requirements of this section.

110(l) The GRMS record of lateral restraint shall identify two exception levels. At a minimum, the track owner shall initiate the required remedial action at each exception level as defined in the following table–

<table>
<tr><th>GRMS Parameter [1]</th><th>If Measurement Value Exceeds</th><th>Remedial Action Required</th></tr>
<tr><td colspan="3">First Level Exceptions</td></tr>
<tr><td>UTG</td><td>58"</td><td rowspan="4">(1) Immediately protect the exception location with a 10 m.p.h. speed restriction; then verify location; and
(2) Restore lateral restraint and maintain in compliance with PTLF criteria as described in paragraph (m) of this section; and
(3) Maintain compliance with §213.53(b) of this part as measured with the PTLF.</td></tr>
<tr><td>LTG</td><td>58"</td></tr>
<tr><td>PLG24</td><td>59"</td></tr>
<tr><td>GWR</td><td>1.0"</td></tr>
<tr><td colspan="3">Second Level Exceptions</td></tr>
<tr><td>LTG</td><td>57¾" on Class 4 and 5 track [2]</td><td rowspan="3">[2] Limit operating speed to no more than the maximum allowable under §213.9 for Class 3 track; then verify location; and
(1) Maintain in compliance with PTLF criteria as described in paragraph (m) of this section; and
(2) Maintain compliance with §213.53(b) of this part as measured with the PTLF.</td></tr>
<tr><td>PLG24</td><td>58"</td></tr>
<tr><td>GWR</td><td>0.75"</td></tr>
<tr><td colspan="3">[1] Definitions for the GRMS parameters referenced in this table are found in paragraph (p) of this section.
[2] This note recognizes that typical good track will increase in total gage by as much as ¼ inch due to outward rail rotation under GRMS loading conditions. For Class 2 & 3 track, the GRMS LTG values are also increased by ¼ inch to a maximum of 58 inches. However, for any Class of track, GRMS LTG values in excess of 58 inches are considered First Level exceptions and the track owner must take the appropriate remedial actions. This ¼ inch increase in allowable gage applies only to GRMS LTG. For gage measured by traditional methods, or with the use of the PTLF, the table in §213.53(b) will apply.</td></tr>
</table>

Table 8

Guidance. This paragraph specifies the parameters and threshold levels required to be reported as a record of lateral restraint following an inspection by a GRMS vehicle. The regulation requires that two levels of exceptions be reported during the GRMS inspection. Specific remedial actions are required for each level, as identified in the Remedial Action Table in this section. First Level Exceptions are required to be immediately protected by a 10 m.p.h. speed restriction until verification and corrective action can be instituted. Second Level Exceptions are to be monitored and maintained within the PTLF criteria outlined in paragraph (m) of this section.

The prior knowledge criteria is satisfied for those locations that are identified as First or Second Level exceptions on the record of lateral restraint which is generated following each GRMS inspection. Where field inspections conducted between GRMS inspections reveal an exception location that does not comply with either the track strength requirement or the gage requirement that are identified in paragraph (m) of this section, the Inspector should consider recommending civil penalties. For locations that do not comply with the requirements of paragraph (m), and have not been identified on the record of lateral restraint as either a First or Second Level exception, the Inspector shall exercise discretion to determine whether or not civil penalties should be recommended.

Footnote 2 in the Remedial Action Table of this section recognizes that typical good track will increase in total gage by as much as ¼ inch due to outward rail rotation under GRMS loading conditions. Accordingly, for Class 2 and Class 3 track, the GRMS loaded track gage values are also increased by ¼ inch to a maximum of 58 inches. GRMS loaded track gage values in excess of 58 inches must always be considered First Level exceptions. This ¼ inch increase in gage applies only to GRMS loaded gage, and does not apply to PTLF gage measurements or to measurements made by more traditional methods.

110(m) Between GRMS inspections, the PTLF may be used as an additional analytical tool to assist fully qualified §213.7 individuals in determining compliance with the crosstie and fastener requirements of §§213.109 and 213.127. When the PTLF is used, whether as an additional analytical tool or to fulfill the requirements of paragraph (l), it shall be used subject to the following criteria–

(1) At any location along the track that the PTLF is applied, that location will be deemed in compliance with the crosstie and fastener requirements specified in §§213.109 and 213.127 provided that–

(i) The total gage widening at that location does not exceed ⅝ inch when increasing the applied force from 0 to 4,000 pounds; and

(ii) The gage of the track under 4,000 pounds of applied force does not exceed the allowable gage prescribed in §213.53(b) for the class of track.

(2) Gage widening in excess of ⅝ inch shall constitute a deviation from Class 1 standards.

(3) A person designated as fully qualified under §213.7 retains the discretionary authority to prescribe additional remedial actions for those locations, which comply with the requirements of paragraph (m)(1)(i) and (ii) of this section.

(4) When a functional PTLF is not available to a fully qualified person designated under §213.7, the criteria for determining crosstie and fastener compliance shall be based solely on the requirements specified in §§213.109 and 213.127.

(5) If the PTLF becomes non-functional or is missing, the track owner will replace or repair it before the next inspection required under §213.233.

(6) Where vertical loading of the track is necessary for contact with the lateral rail restraint components, a PTLF test will not be considered valid until contact with these components is restored under static loading conditions.

Guidance. While the remedial action table in paragraph (l) requires the use of the PTLF to measure compliance with the lateral restraint and gage requirements at identified exception locations in GRMS territory, paragraph (m) also provides for the use of a PTLF as an additional analytical tool by fully qualified §213.7 individuals at other locations in GRMS territory. Paragraph (m) also describes the manner in which a PTLF must be used in GRMS territory, whether it is being used as an additional analytical tool or being used to meet the remedial action requirements set forth in paragraph (l). Compliance with §§213.109 and 213.127 will be demonstrated when a PTLF is applied and (1) the total gage widening at that location does not exceed ⅝ inch when increasing the applied force from 0 to 4,000 pounds, and (2) the gage of the track measured under 4,000 pounds of applied force does not exceed the allowable gage prescribed in §213.53(b) of this section for the class of track involved. Gage widening in excess of ⅝ inch shall constitute a deviation from Class 1 standards.

At locations where compliance with the crosstie and rail fastener requirements have been demonstrated through the use of a PTLF, a fully qualified §213.7 individual retains the discretionary authority to prescribe additional remedial actions, such as the placement of speed restrictions, if the individual deems it necessary. FRA Inspectors will determine compliance with the crosstie and fastener requirements for gage restraint solely on the basis of the PTLF measurements.

Where crossties are found to be so severely split or plate-cut to the extent that they are incapable of providing adequate vertical support, and conditions have degraded to the point where track surface conditions are approaching the allowable limit for the class of track, Inspectors shall continue to consider writing a defect. In such a case use defect code 213.109.03, "crossties not effectively distributed to support a 39-foot segment of track." Inspectors should record the track surface geometry condition as well as the contributing condition of the crossties in the description column.

When a functional PTLF is not available to a fully qualified §213.7 individual during a scheduled inspection under §213.233 of this part, the track owner must repair or replace the PTLF prior to the next inspection required under §213.233, or crosstie and rail fastener compliance will be based solely on the requirements specified in §§213.109 and 213.127.

At locations where crosstie or rail fastening compliance is questioned and vertical loading of the track structure is necessary to restore contact with the lateral rail restraint components, the crossties must be raised until lateral restraint contact is restored and a PTLF measurement must then be made.

If the track owner fails to immediately restore contact between the rail and the fastening system so that a valid PTLF test can be performed, this non-action will in effect remove this location from the GRMS standard and the Inspector will determine compliance based on §§213.109 and 213.127.

Likewise, where gage rods have been installed which preclude a valid PTLF test to determine gage restraint of crossties and fasteners, this action will in effect remove the location from the GRMS standard and the Inspector will determine compliance based on §§213.109 and 213.127.

110(n) The track owner shall maintain a record of the two most recent GRMS inspections at locations which meet the requirements specified in §213.241(b). At a minimum, records shall indicate the following--

(1) Location and nature of each First Level exception; and

(2) Nature and date of remedial action, if any, for each exception identified in paragraph (n)(1) of this section.

Guidance. This paragraph requires the track owner to maintain a record of the two most recent GRMS inspections at locations meeting the requirements specified in §213.241(b). The records must indicate the location and nature of each First Level Exception and, the nature and date of initiated remedial action, if any, for each First Level Exception. First Level Exceptions are described in the Remedial Action Table in Paragraph (l).

The record required under paragraph (n) is also the official record of lateral restraint and needs to identify both exception levels; however the remedial action taken is required to be shown only for First Level Exceptions. Records will be maintained at locations that meet the requirements specified in §213.241(b).

110(o) The inspection interval for designated GRMS line segments shall be such that--

(1) On line segments where the annual tonnage exceeds two million gross tons, or where the maximum operating speeds for passenger trains exceeds 30 m.p.h., GRMS inspections must be performed annually at an interval not to exceed 14 months; or

(2) On line segments where the annual tonnage is two million gross tons or less and the maximum operating speed for passenger trains does not exceed 30 m.p.h., the interval between GRMS inspections must not exceed 24 months.

Guidance. Paragraph (o) details the GRMS inspection requirements which is illustrated in the following table:

TRAFFIC	GRMS INSPECTION INTERVAL
If annual tonnage exceeds 2MGT, or passenger train speeds (if applicable) exceed 30 m.p.h., then	GRMS inspections must be performed annually at an interval not to exceed 14 months [1]
If annual tonnage is 2MGT or less, and where passenger train speeds (if operated) do not exceed 30 m.p.h., then	The interval between GRMS inspections must not exceed 24 months [2]

Table 9

[1] The maximum interval of 14 months is intended to provide some flexibility for scheduling when it may not be possible to schedule annual inspections within the same calendar month each year.

[2] This extended frequency is an attempt to make the technology more accessible to short line operators who may not have the financial or equipment resources available to larger railroads. For example, a GRMS inspection may be scheduled at up to 24 month intervals if the railroad had 2 million annual tons or less and passenger trains were not authorized to operate at more than 30 m.p.h.

110(p) As used in this section--

(1) Gage Restraint Measurement System (GRMS) means a track loading vehicle meeting the minimum design requirements specified in this section.

(2) Gage Widening Ratio (GWR) means the measured difference between loaded and unloaded gage measurements, linearly normalized to 16,000 pounds of applied lateral load.

(3) L/V ratio means the numerical ratio of lateral load applied at a point on the rail to the vertical load applied at that same point. GRMS design requirements specify an L/V ratio of between 0.5 and 1.25. GRMS vehicles using load combinations developing L/V ratios which exceed 0.8 must be operated with caution to protect against the risk of wheel climb by the test wheelset.

(4) Load severity means the amount of lateral load applied to the fastener system after friction between rail and tie is overcome by any applied gage-widening lateral load.

(5) Loaded Track Gage (LTG) means the gage measured by the GRMS vehicle at a point no more than 12 inches from the lateral load application point.

(6) Portable Track Loading Fixture (PTLF) means a portable track loading device capable of applying an increasing lateral force from 0 to 4,000 pounds on the web/base fillet of each rail simultaneously.

(7) Projected Loaded Gage (PLG) means an extrapolated value for loaded gage calculated from actual measured loads and deflections. PLG 24 means the extrapolated value for loaded gage under a 24,000 pound lateral load and a 33,000 pound vertical load.

(8) Unloaded Track Gage (UTG) means the gage measured by the GRMS vehicle at a point no less than 10-feet from any lateral or vertical load.

Guidance. This paragraph prescribes a list of definitions of terms essential to the implementation of GRMS technology.

A well documented pattern of repeated or widespread deviations from the requirements of this section by the track owner will effectively terminate the options afforded by this section. The affected track would then become subject to the requirements of §§213.109 and 213.127.

§213.113 Defective rails

(a) When an owner of track to which this part applies learns, through inspection or otherwise, that a rail in that track contains any of the defects listed in the following table, a person designated under §213.7 shall determine whether or not the track may continue in use. If he determines that the track may continue in use, operation over the defective rail is not permitted until -- (1) The rail is replaced; or (2) The remedial action prescribed in the table is initiated.

RAIL DEFECT REMEDIAL ACTION TABLE					
Defect	Length of defect (inch)		Percent of rail head cross-sectional area weakened by defect		If defective rail is not replaced, take
	More than	But not more than	Less than	But not less than	the remedial action prescribed in note
Transverse fissure Compound fissure			70	5	B
			100	70	A2
				100	A
Detail fracture Engine burn fracture Defective weld			25	5	C
			80	25	D
			100	80	A2 or [E and H]
				100	A or [E and H]
Horizontal or Vertical split head Split web, Piped rail Head web separation	1	2			H and F
	2	4			I and G
	4				B
	Breakout in railhead				A
Bolt hole crack	½	1			H and F
	1	1½			H and G
	1½				B
	Breakout in railhead				A
Broken base	1	6			D
	6				A or [E and I]
Ordinary break					A or E
Damaged rail					D
Flattened rail	Depth ≥ ⅜ and Length ≥ 8				H

Table 10

Notes:

A. Assign person designated under §213.7 to visually supervise each operation over defective rail.

A2. Assign person designated under §213.7 to make visual inspection. After a visual inspection, that person may authorize operation to continue without continuous visual supervision at a maximum of 10 m.p.h. for up to 24 hours prior to another such visual inspection or replacement or repair of the rail.

B. Limit operating speed over defective rail to that as authorized by a person designated under §213.7(a), who has at least one year of supervisory experience in railroad track maintenance. The operating speed cannot be over 30 m.p.h. or the maximum allowable speed under §213.9 for the class of track concerned, whichever is lower.

C. Apply joint bars bolted only through the outermost holes to defect within 20 days after it is determined to continue the track in use. In the case of Classes 3 through 5 track, limit operating speed over defective rail to 30 m.p.h. until joint bars are applied; thereafter, limit speed to 50 m.p.h. or the maximum allowable speed under §213.9 for the class of track concerned, whichever is lower. When a search for internal rail defects is conducted under §213.237, and defects are discovered in Classes 3 through 5 which require remedial action C, the operating speed shall be limited to 50 m.p.h., or the maximum allowable speed under §213.9 for the class of track concerned, whichever is lower, for a period not to exceed 4 days. If the defective rail has not been removed from the track or a permanent repair made within 4 days of the discovery, limit operating speed over the defective rail to 30 m.p.h. until joint bars are applied; thereafter, limit speed to 50 m.p.h. or the maximum allowable speed under §213.9 for the class of track concerned, whichever is lower.

D. Apply joint bars bolted only through the outermost holes to defect within 10 days after it is determined to continue the track in use. In the case of Classes 3 through 5 track, limit operating speed over the defective rail to 30 m.p.h. or less as authorized by a person designated under §213.7(a), who has at least one year of supervisory experience in railroad track maintenance, until joint bars are applied; thereafter, limit speed to 50 m.p.h. or the maximum allowable speed under §213.9 for the class of track concerned, whichever is lower.

E. Apply joint bars to defect and bolt in accordance with §213.121(d) and (e).

F. Inspect rail 90 days after it is determined to continue the track in use.

G. Inspect rail 30 days after it is determined to continue the track in use.

H. Limit operating speed over defective rail to 50 m.p.h. or the maximum allowable speed under §213.9 for the class of track concerned, whichever is lower.

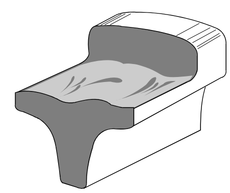
I. Limit operating speed over defective rail to 30 m.p.h. or the maximum allowable speed under §213.9 for the class of track concerned, whichever is lower.

(b) As used in this section --

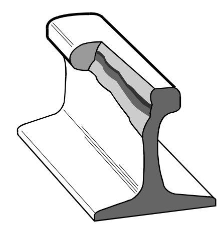
(1) Transverse fissure means a progressive crosswise fracture starting from a crystalline center or nucleus inside the head from which it spreads outward as a smooth, bright, or dark, round or oval surface substantially at a right angle to the length of the rail. The distinguishing features of a transverse fissure from other types of fractures or defects are the crystalline center or nucleus and the nearly smooth surface of the development which surrounds it.

(2) Compound fissure means a progressive fracture originating in a horizontal split head which turns up or down in the head of the rail as a smooth, bright, or dark surface progressing until substantially at a right angle to the length of the rail. Compound fissures require examination of both faces of the fracture to locate the horizontal split head from which they originate.

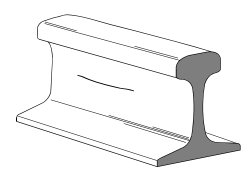
(3) Horizontal split head means a horizontal progressive defect originating inside of the rail head, usually ¼ inch or more below the running surface and progressing horizontally in all directions, and generally accompanied by a flat spot on the running surface. The defect appears as a crack lengthwise of the rail when it reaches the side of the rail head.



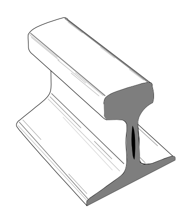
(4) Vertical split head means a vertical split through or near the middle of the head, and extending into or through it. A crack or rust streak may show under the head close to the web or pieces may be split off the side of the head.



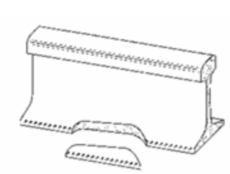
(5) Split web means a lengthwise crack along the side of the web and extending into or through it.



(6) Piped rail means a vertical split in a rail, usually in the web, due to failure of the shrinkage cavity in the ingot to unite in rolling.

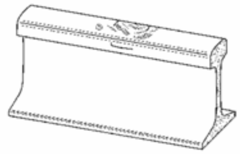


(7) Broken base means any break in the base of the rail.



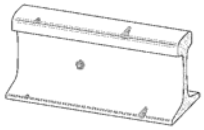
(8) Detail fracture means a progressive fracture originating at or near the surface of the rail head. These fractures should not be confused with transverse fissures, compound fissures, or other defects which have internal origins. Detail fractures may arise from shelly spots, head checks, or flaking.

(9) Engine burn fracture means a progressive fracture originating in spots where driving wheels have slipped on top of the rail head. In developing downward they frequently resemble the compound or even transverse fissures with which they should not be confused or classified.



(10) Ordinary break means a partial or complete break in which there is no sign of a fissure, and in which none of the other defects described in this paragraph (b) are found.

(11) Damaged rail means any rail broken or injured by wrecks, broken, flat, or unbalanced wheels, slipping, or similar causes.

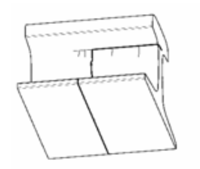


(12) Flattened rail means a short length of rail, not at a joint, which has flattened out across the width of the rail head to a depth of ⅜ inch or more below the rest of the rail. Flattened rail occurrences have no repetitive regularity and thus do not include corrugations, and have no apparent localized cause such as a weld or engine burn. Their individual length is relatively short, as compared to a condition such as head flow on the low rail of curves.

(13) Bolt hole crack means a crack across the web, originating from a bolt hole, and progressing on a path either inclined upward toward the rail head or inclined downward toward the base. Fully developed bolt hole cracks may continue horizontally along the head/web or base/web fillet, or they may progress into and through the head or base to separate a piece of the rail end from the rail. Multiple cracks occurring in one rail end are considered to be a single defect. However, bolt hole cracks occurring in adjacent rail ends within the same joint must be reported as separate defects.

(14) Defective weld means a field or plant weld containing any discontinuities or pockets, exceeding 5 percent of the rail head area individually or 10 percent in the aggregate, oriented in or near the transverse plane, due to incomplete penetration of the weld metal between the rail ends, lack of fusion between weld and rail end metal, entrainment of slag or sand, under-bead or other shrinkage cracking, or fatigue cracking. Weld defects may originate in the rail head, web, or base, and in some cases, cracks may progress from the defect into either or both adjoining rail ends.

(15) Head and web separation means a progressive fracture, longitudinally separating the head from the web of the rail at the head fillet area.



Guidance. The remedial actions required for defective rails specify definite time limits and speeds. The remedial actions also allow certain discretion to the track owner for the continued operation over certain defects. Inspectors should consider all rail defects dangerous and care should be taken to determine that proper remedial actions have been accomplished by the railroad. When more than one defect is present in a rail, the defect requiring the most restrictive remedial action shall govern.

The remedial action table and specifications in the rule address the risks associated with rail failure. These risks are primarily dependent upon defect type and size and should not be dependent upon the manner or mechanism that reveals the existence of the defect. Failure of the track owner to comply with the operational (speed) restrictions, maintenance procedures and the prescribed inspection intervals specified in this section and §213.237 (Defective rails and Inspection of rail, respectively), may constitute a violation of the TSS.

Note "A2" addresses mid-range transverse defect sizes. This remedial action allows for train operations to continue at a maximum of 10 m.p.h. up to 24 hours, following a visual inspection by a person designated under §213.7. If the rail is not replaced, another 24 hour cycle begins.

Note "B" limits speed to that as authorized by a person designated under §213.7(a) who has at least one year of supervisory experience in track maintenance. The qualified person has the responsibility to evaluate the rail defect and authorize the maximum operating speed over the defective rail based on the size of the defect and the operating conditions; however, the maximum speed over the rail may not exceed 30 m.p.h. or the maximum speed under §213.9 for the class of track concerned, whichever is lower.

Notes "C," "D," and "H" limit the operating speed, following the application of joint bars, to 50 m.p.h. or the maximum allowable speed, under §213.9 for the class of track concerned, whichever is lower. When the maximum speed specified in notes "B", "C", "D", and "H" exceeds the current track speed, the railroad is required to record the defect. For example, when a railroad determines that remedial action "B" is required and the track speed already is 30 m.p.h. or less, the railroad must record the defect. This indicates that the railroad is aware of the characteristics of the defective rail and has designated a permissible speed in compliance with the regulation.

When an FRA Inspector discovers a defective rail that requires the railroad representative to determine whether to continue the track in use and to designate the maximum speed over the rail, the Inspector should inquire as to the representative's knowledge of the defect and remedial action. If the railroad was not aware of the defect prior to the FRA inspection, the FRA Inspector should observe the actions taken by the railroad representative to determine compliance. If the railroad had previously found the defective rail, the FRA Inspector should confirm the proper remedial action was taken. During records inspections, the FRA Inspector should confirm that the defects were recorded and proper remedial actions were taken.

The remedial action table for defects failing in the transverse plane (transverse and compound fissures, detail and engine burn fractures, and defective welds) specifies a lower limit range base of 5 percent of the railhead cross-sectional area. If a transverse defect is reported to be less than 5 percent, the track owner is not legally bound to provide corrective action under the TSS. Defects reported less than 5 percent are not consistently found during rail breaking routines and therefore, defect determination within this range is not always reliable.

Transverse and compound fissure defects, weakened between 5 and 70 percent of cross-sectional head area require remedial action (note B). Defects in the range between 70 and less than 100 percent of cross-sectional head area, require remedial action (note A2), as prescribed. Defects that affect 100 percent of the cross-sectional head area require remedial action (note A) as prescribed, the most restrictive. Inspectors should be aware that transverse and compound fissures are defects that fail in the transverse plane and are characteristic of rail that has not been control-cooled (normally rolled prior to 1936).

Defects identified and grouped as detail fracture, engine burn fracture, and defective welds, will weaken and also fail in the transverse plane. Detail fractures are characteristic of control-cooled rail [usually indicated by the letters CC or CH on the rail brand (i.e., 1360 RE CC CF&I 1982 1111). Their prescribed remedial action relates to a low range between 5 and 25 percent and a mid-range between 25 and 80 percent, for note (C) and note (D), respectively. Those defects require joint bar applications and operational speed restrictions within certain time frames. Defects extending less than 100 and more than 80 percent require a visual inspection. If the rail is not replaced, effectively repaired, or removed from service, an elective would be to restrict operation to a maximum of 10 m.p.h. for up to 24 hours, then perform another visual inspection.

The second sentence in remedial action note (C) addresses defects which are discovered in Classes 3 through 5 track during an internal rail inspection required under §213.237, and which are determined not to be in excess of 25 percent of the rail head cross-sectional area. For these specific defects, a track owner may operate for a period not to exceed four days, at a speed limited to 50 m.p.h. or the maximum allowable speed under §213.9 for the class of track concerned, whichever is lower. If the defective rail is not removed or a permanent repair is not made within four days of discovery, the speed is limited to 30 m.p.h., until joint bars are applied or the rail is replaced.

The requirements specified in this second paragraph are intended to promote better utilization of rail inspection equipment and therefore maximize the opportunity to discover rail defects, which are approaching service failure size. The results of the FRA's research indicate that defects of this type and size range have a predictable slow growth life. Research further indicates that even on the most heavily utilized trackage in use today, defects of this type and size are unlikely to grow to service failure size in four days.

In the remedial action table, all longitudinal defects are combined within one group subject to identical remedial actions based on their reported size. These types of longitudinal defects all share similar growth rates and the same remedial actions are appropriate to each type.

Defective rails categorized as horizontal split head, vertical split head, split web, piped rail, and head-web separation, are longitudinal in nature. When any of this group of defects is more than 1 inch, but not more than 2 inches, the remedial action initiated, under note (H), is to limit train speed to 50 m.p.h., and note (F) requires reinspecting the rail in 90 days, if deciding operations will continue. Defects in the range of more than 2 inches, but not more than 4 inches, require complying with notes (I) and (G), speed is limited to 30 m.p.h. and the rail reinspected in 30 days, if they decide operations will continue. When any of the five defect types exceed a length of 4 inches, a person designated under §213.7(a) must limit the operating speed to 30 m.p.h., under note (B).

Another form of head-web separation, often referred to as a “fillet cracked rail,” is the longitudinal growth of a crack in the fillet area, usually on the gage side of the outer rail of a curve. The crack may not extend the full width between the head and the web, but it is potentially dangerous. Evidence of fillet cracking is a hairline crack running beneath the head of rail with “bleeding” or rust discoloration. Fillet cracks often result from improper superelevation or from stress reversal as a result of transposing rail. The use of a mirror is an effective aid in examining rail and the determination of head-web cracks or separation in the body of the rail.

A “bolt hole crack” is a progressive fracture originating at a bolt hole and extending away from the hole, usually at an angle. They develop from high stress risers, usually initiating as a result of both dynamic and thermal responses of the joint bolt and points along the edge of the hole, under load. A major cause of this high stress is improper field drilling of the hole. Excessive longitudinal rail movement can also cause high stress along the edge of the hole. When evaluating a rail end, which has multiple bolt hole cracks, Inspectors will determine the required remedial action based on the length of the longest individual bolt hole crack.

Under note (H) and (F), the remedial action for a bolt hole crack, more than ½ inch, but not more than 1 inch, if the rail is not replaced, is to limit speed to 50 m.p.h., or the maximum allowable under §213.9 for the class of track concerned, whichever is lower, then reinspect the rail in 90 days, if operations will continue.

For bolt hole cracks greater than 1 inch, but not exceeding 1½ inches, notes (H) and (G) apply. These rails are required to be limited to 50 m.p.h. and reinspected within 30 days. For a bolt hole crack exceeding 1½ inches, a person qualified under §213.7(a) may elect to designate a speed restriction, which cannot exceed 30 m.p.h., or the maximum allowable under §213.9 for the class of track concerned, whichever is lower.

Under notes (F) and (G), where corrective action requires rail to be reinspected within a specific number of days after discovery, several options for compliance may be exercised depending on the nature of the defect. For those defects, which are strictly internal and are not yet visible to the naked eye, the only option would be to perform another inspection with rail flaw detection equipment, either rail-mounted or hand-held. For defects that are visible to the naked eye and therefore measurable, a visual inspection or an inspection with rail flaw detection equipment are acceptable options. For certain defects enclosed within the joint bar area, such as bolt hole cracks and head-web separations, the joint bars must be removed if a visual reinspection is to be made.

The reinspection prescribed in notes (F) and (G) must be performed prior to the expiration of the 30 or 90 day interval. If the rail remains in track and is not replaced, the reinspection cycle starts over with each successive reinspection unless the reinspection reveals the rail defect to have increased in size and has therefore become subject to a more restrictive remedial action. This process continues indefinitely until the rail is removed from track.

Where corrective action requires rail to be reinspected within a specific number of days after discovery, the track owner may exercise several options for compliance. One option would be to perform another inspection with rail flaw detection equipment, either rail-mounted or hand-held. Another option would be to perform a visual inspection where the defect is visible and measurable. In the latter case, for certain defects enclosed within the joint bar area such as bolt hole breaks, removal of the joint bars will be necessary to comply with the reinspection requirement. If defects remain in track beyond the reinspection interval, the railroad must continue to monitor the defects and take the appropriate actions as required in the remedial action table.

A broken base can result from improper bearing of the base on a track spike or tie plate shoulder, and from over crimped anchors, or it may originate in a manufacturing flaw. With today's higher axle loads, Inspectors can anticipate broken base defects in 75 pound and smaller rail sections with an irregular track surface, especially on the field side. For any broken base discovered that is more than 1 inch but less than 6 inches in length, the remedial action (note D) is to apply joint bars bolted through the outermost holes to defect within 10 days, if operations will continue. In Classes 3 through 5 track, the operating speed must be reduced to 30 m.p.h. or less, as authorized by a person under §213.7(a), until joint bars are applied. After that, operating speed is limited to 50 m.p.h. or the maximum allowable under §213.9 for the class of track concerned, whichever is lower.

Under note D, there are several acceptable "outermost hole" bolting arrangements for joint bars centered on a rail defect. See Figure 17 for an illustration of acceptable bolting arrangements. In all cases, railroads may not drill a bolt hole next to a defect that is being remediated with the application of joints bars (pursuant to note D). The reason for not drilling next to the defect is to prevent the propagation of the crack into the hole closest to the defect.

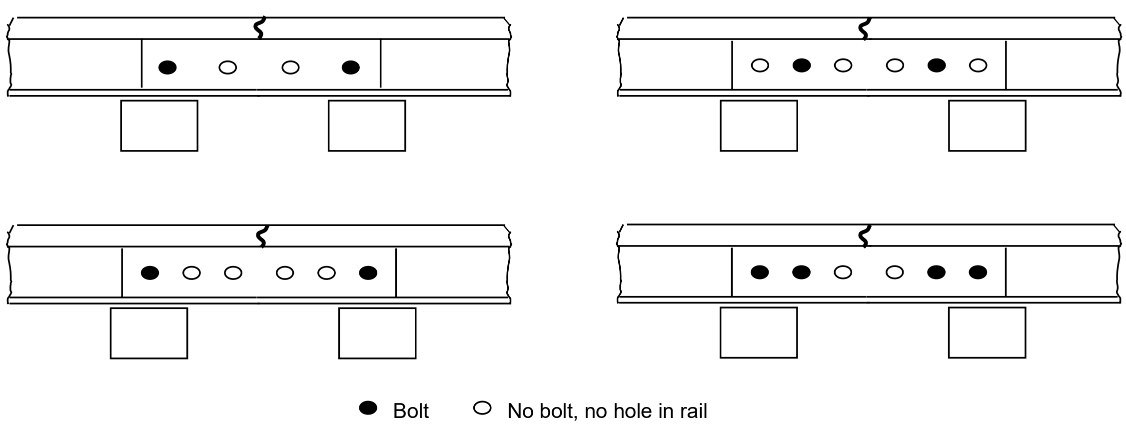


Figure 17

A broken base in excess of 6 inches requires the assignment of a person designated under §213.7 to visually supervise each train operation over the defective rail. The railroad may apply joint bars to the defect and bolt them in accordance with §213.121(d) and (e) and thereafter must limit train operations to 30 m.p.h. or the maximum allowable under §213.9 for the class of track concerned, whichever is lower. As reference, the dimensions between the outermost holes of a 24 inch joint bar vary between approximately 15 and 18 inches and a 36 inch joint bar approaches 30 inches.

Inspectors should point out to the track owner that broken bases nearing these dimensions may negate the purpose for which the joint bars are applied. A broken base rail may be caused by damage from external sources, such as rail anchors being driven through the base by a derailed wheel. It is improper to consider them "damaged rail," as this defect is addressed by more stringent provisions applicable to broken base rails, under note (A) or (E) and (I).

Damaged rail can result from flat or broken wheels, incidental hammer blows, or derailed or dragging equipment. Reducing the operational speed in Classes 3 through 5 track to 30 m.p.h. until joint bars are applied, lessens the impact force imparted to the weaken area. Applying joint bars under note (D) insures a proper horizontal and vertical rail end alinement in the event the rail fails.

Flattened rails (localized collapsed head rail) are also caused by mechanical interaction from repetitive wheel loadings. FRA and industry research indicate that these occurrences are more accurately categorized as rail surface conditions, not rail defects, as they do not, in themselves, cause service failure of the rail. Although it is not a condition shown to affect the structural integrity of the rail section, it can result in less than desirable dynamic vehicle responses in the higher speed ranges. The flattened rail condition is identified in the table, as well as in the definition portion of §213.113(b), as being ⅜ inch or more in depth below the rest of the railhead and 8 inches or more in length. As the defect becomes more severe by a reduced rail head depth, wheel forces increase.

The rule addresses flattened rail in terms of a specified remedial action for those of a certain depth and length. Those locations meeting the depth and length criteria shall be limited to an operating speed of 50 m.p.h. or the maximum allowable under §213.9 for the class of track concerned, whichever is lower.

"Break out in rail head" is defined as a piece that has physically separated from the parent rail. Rail defects meeting this definition are required to have each operation over the defective rail visually supervised by a person designated under §213.7. Inspectors need to be aware that this definition has applicability across a wide range of rail defects, as indicated in the remedial action table. Where rail defects have not progressed to the point where they meet the definition of a break out, but due to the type, length and location of the defect, they present a hazard to continued train operation, Inspectors should determine what remedial actions, if any, track owner should institute.

The following are two rail head break out examples where the "A" corrective action would be necessary:

Example One: There is a bolt hole break where the head of the rail is totally separated from the parent rail (either tight or loose), but that piece of rail will not physically lift out of the joint bars by hand. The Inspector might determine that the separation was total by the fact that the separated piece rattled when tapped. It is important that railroads take the appropriate remedial action in this situation, because it is potentially very unsafe. It is impossible to know what will happen when the next train operates over this defect. That train could cause the piece to become so loose that it comes out of place, cocks at an angle and causes a wheel to ramp up.

Example Two: A vertical split head defective rail where rail head separation is apparent because the Inspector can determine that a physical separation has occurred through the rail head, but the rail head has not entirely separated over the entire length of the defect.

The issue of "excessive rail wear" continues to be evaluated by the Rail Integrity Task Force. The FRA believes that insufficient data exists at this time to indicate that parameters for this condition should be proposed as a minimum standard.

The Sperry Rail Service prints an excellent reference manual on rail defects. Inspectors are expected to be conversant with rail defect types, appearance, growth, hazards, and methods of detection.

Some railroads apply safety "weld straps" to thermite type field welds. These straps do not provide the same support of a joint bar. They would provide only limited support if a weld were to break under a train movement and as such, they do not comply with the provisions of corrective actions C, D, or E (installation of joint bars). Only a joint bar with full contact with the bottom of the rail head and rail base [see §213.121 (a)] and with a manufactured relief for the weld material would comply with corrective actions C, D, or E.

When an FRA Inspector finds a rail defect that appears to originate from fatigue at a bond wire attachment weld, the Inspector should cite the railroad for defect code 213.113.16. Inspectors must also identify in their narrative the type of the rail defect (e.g., defective weld, detail fracture, etc.). FRA has added this defect code based on a National Transportation Safety Board (NTSB) recommendation arising out of the NTSB investigation of a February 9, 2003, Canadian National (CN) derailment in Tamaroa, Illinois. The NTSB determined that the probable cause of this accident was CN's placement of bond wire welds on the head of the rail just outside the joint bars, where untempered martensite associated with the welds led to fatigue cracking that, because of increased stresses associated with known soft ballast conditions, rapidly progressed to rail failure.

§213.115 Rail end mismatch

Any mismatch of rails at joints may not be more than that prescribed by the following table –

Class of track	*Any mismatch of rails at joints may not be more than the following*	
	On the tread of the rail ends	*On the gage side of the rail ends*
1	*¼"*	*¼"*
2	*¼"*	*3/16"*
3	*3/16"*	*3/16"*
4 and 5	*⅛"*	*⅛"*

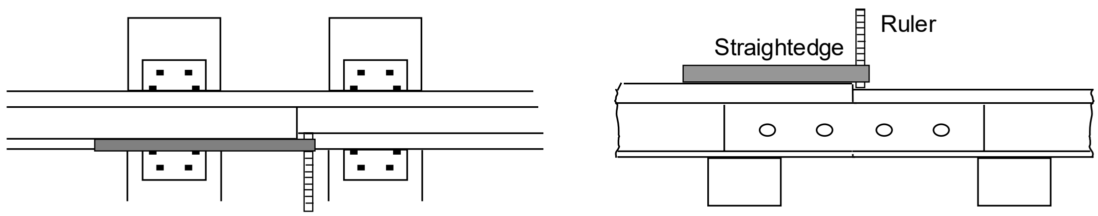
Table 11

Guidance. Use a straightedge to determine the mismatch by holding the straightedge longitudinally along the higher rail (tread) or along the gage side (⅝ inch down from the running surface) of the rail. Measure the distance directly between the straightedge and the rail. Disregard plastic overflow (gage side rail edge lipping), if any.

One example of mismatch occurs when a section of a rail is placed in the track where the existing rail head is gage and/or tread worn. Mismatch can also occur when the joint bars are loose. However, if the loose bars do not result in mismatch exceeding the thresholds under this section, report the defect as loose joint bars (see §213.121).

The standards prescribe both tread and gage mismatch thresholds. A mismatch may result in high impact forces especially at higher speeds. If a mismatch in excess of the allowable results in significant rail end damage, a violation should be considered.

Particular attention should be given to the mismatch on the gage side of a rail. A thin flange, skewed truck, or combination of both may cause a wheel to climb, particularly on the outer rail of a curve. Figure 18 shows the proper method to measure gage and tread mismatch.



Gage mismatch

Tread mismatch

Figure 18

§213.119 Continuous welded rail (CWR); general

Guidance, General. Each railroad's written procedure should be reasonable and consistent with current research results. The FRA will review each plan for compliance with paragraphs (a) through (g). The FRA Headquarters Track Specialists and Regional Track Specialists shall have primary responsibility for reviewing each set of railroad CWR procedures. Inspectors may be requested to provide recommendations concerning the comprehensiveness of those procedures.

In addition to safety critical procedures listed in this section, the railroad may decide to include procedures based on administrative or economic considerations. For example, a railroad may choose to include instructions that limit the use of worn secondhand replacement rail because of an economic concern about the length of time that it might take to perform a satisfactory weld. The railroad may also include specific actions in their procedures that are to be taken when installation or maintenance work does not comply with its overall procedures.

Recording an activity that does not conform to the railroad's CWR procedures does not provide the railroad with indefinite relief from responsibility for compliance when its procedures are not followed. Continued non-compliance may lead to an unsafe condition. The recordkeeping procedure is intended to provide a safety net by flagging those activities of non-compliance which, if not brought into compliance in a timely manner, could lead to an unsafe condition. For example, CWR installed in the winter months without adequate rail anchors as prescribed by the written procedures and discovered in late summer would clearly be a deficient condition, whether it was recorded or not. When in doubt as to what activities are considered safety related, the Inspector should consult with the Regional Track Specialist.

Whenever conducting inspections on a railroad and that activity includes observation of CWR, FRA Inspectors are to include only one "CWRP" unit on the header of their RISPC inspection report. Record one CWRP unit, regardless of the amount of CWR mileage inspected. Record the actual track mileage units using the activity codes MTH, MTW, etc. When a defect is taken for any of the §213.119 paragraphs (119 defect codes), FRA Inspectors are to also designate CWRP for the line item "activity" cell. In addition, Inspectors are to use CWRP in each line item activity cell when performing records inspections and recording deficiencies concerning CWR joint records.

When conducting track inspections, FRA Inspectors should have with them the most recent copy of a railroad's CWR plan. This is important, because it will enable Inspectors to perform a proper inspection and determine compliance with the plan. Inspectors can obtain copies of railroad's CWR plans by logging into the FRA Secure website and downloading a copy of the plan on file with FRA. Where Inspectors discover that there are substantial discrepancies between the official plan on file at FRA headquarters and the plan in the field (or that there are substantial discrepancies between the official plan on file with FRA and a railroad field manual), they should notify their Regional Track Specialist.

A track owner may update or modify CWR procedures as necessary, and is required to notify FRA of those changes.

The definition "buckling incident" explains the industry definition for such an event. However, the rule recognizes the importance of conditions that are precursors to buckles.

The two failure modes associated with track constructed with CWR are track buckles and pull-aparts. A track buckle is considered the more serious of the two and is characterized by the formation of a large lateral misalinement caused by:

- High compressive forces in the rail (thermal and mechanical loads);
- Weakened track conditions (weak track resistance, alinement deviations); and
- Vehicle loads (a dynamic "wave" uplift and lateral vs. vertical ratios).

Each track owner with track constructed of CWR shall have in effect and comply with a plan that contains written procedures which address: the installation, adjustment, maintenance, and inspection of CWR; inspection of CWR joints; and a training program for the application of those procedures. The plan shall be submitted to the Federal Railroad Administration. FRA reviews each plan for compliance with the following—:

119(a) Procedures for the installation and adjustment of CWR which include

(1) Designation of a desired rail installation temperature range for the geographic area in which the CWR is located; and

(2) De-stressing procedures/methods which address proper attainment of the desired rail installation temperature range when adjusting CWR.

Guidance. Track owners with track constructed of CWR are required to have in effect and comply with a CWR plan. This includes track owners who operate entirely on CWR track that has been designated as excepted track pursuant to §213.4. The requirements under §213.119 do not apply to excepted track. (See §213.5(b)). However, where a railroad designates a segment of track as excepted, it still must meet the requirements of at least Class 1 track for any portion of that track that is: 1) located within 30 feet of an adjacent track which is subjected to simultaneous use at speeds in excess of 10 m.p.h.; or 2) located on a bridge or on a public street or highway and there are trains with placarded cars. (See §213.4(d)).

Railroads typically establish a desired rail installation temperature range for the geographical area that is higher than the annual mean temperature. This higher installation temperature will account for the expected reduction of the force-free temperature caused by track maintenance, train traffic and other factors. A railroad's failure to establish a designated installation temperature range for a specific territory is addressed under §213.119(a).

119(b) Rail anchoring or fastening requirements that will provide sufficient restraint to limit longitudinal rail and crosstie movement to the extent practical, and specifically addressing CWR rail anchoring or fastening patterns on bridges, bridge approaches, and at other locations where possible longitudinal rail and crosstie movement associated with normally expected train-induced forces, is restricted.

119(c) Procedures which specifically address maintaining a desired rail installation temperature range when cutting CWR including rail repairs, in-track welding, and in conjunction with adjustments made in the area of tight track, a track buckle, or a pull-apart. Rail repair practices shall take into consideration existing rail temperature so that;

(1) When rail is removed, the length installed shall be determined by taking into consideration the existing rail temperature and the desired rail installation temperature range; and

(2) Under no circumstances should rail be added when the rail temperature is below that designated by paragraph (a)(1) of this section, without provisions for later adjustment.

119(d) Procedures which address the monitoring of CWR in curved track for inward shifts of alinement toward the center of the curve as a result of disturbed track.

Thermal and mechanical loads are opposed by three parameters: lateral, longitudinal, and torsional resistance of the track. Track buckles almost always occur in the lateral direction. Lateral resistance is the most important and is dependent upon weight and size of crosstie material, ballast material type, shoulder width, crib content and its level of consolidation, and vertical loads.

A crosstie's base, side (crib) friction and ballast shoulder resistance contribute to the overall lateral resistance sustained. In general, each contributes (base 50%, side 20-30%, and shoulder 20-30%) to this resistance but the ratios can vary dependent upon ballast condition. Lateral resistance varies in location depending on the ballast shoulder geometry, crosstie size and type, and state of ballast consolidation.

Thermal loads by themselves can cause a buckle and are often called "static buckling." However, most buckling occurs under a combination of thermal and vehicle loads, termed "dynamic buckling." Inspectors should place emphasis on vehicle (dynamic) effects on track lateral stability, where high rail temperatures and vehicle loading could progressively weaken the track due to dynamic uplift (flexural waves) and a buckle mechanism response induced by misalignment "growth."

Because the majority of buckles occur under dynamic train movements, loading is an important element in the buckling mechanism. Elements of track lateral instability include:

- Formation of initial track misalinement caused by reduced local resistance;
- High impact loads, initial rail surface (weld) imperfections, "soft" spots in ballast, and curve (radial breathing) shifting; and
- Misalinement growth caused by high lateral loads, increased longitudinal forces, track uplifts due to vertical loads, and train-induced vibration.

Inspectors may consider the above elements combined with related evidence of actual defects, geometry conditions, or other defective structural conditions when evaluating the adequacy of a railroad's CWR stability procedures under §213.119(b), (c), and (d). Locations where track buckling are more likely to occur include: horizontal and vertical curves, bottom of grades, bridge approaches, highway-rail grade crossings, recently disturbed track, and areas of heavy train starting or braking.

The signs or precursors of buckles include:

- Newly formed alinement deviations; wavy, kinky, snaky, etc.,
- Rails rotating or lifting out of the tie plates and intermittent loose tie plates;
- Excessive "running" rail causing ties to plow or churn the ballast;
- Insufficient and anchors not tight against the tie;
- Insufficient ballast section in the crib and shoulder areas; and
- Gaps at crosstie ends, especially on the low (inner) rail.

Curves are more prone to buckling because of the curvature effect, alinement imperfection sensitivity, and train loads. It is important for Inspectors to consider when and where a buckle may occur (e.g., on track segments where the CWR was laid below the desired rail installation temperature range and there was inadequate control of the laying temperature or inadequate adjustment of the rail afterwards). Also, Inspectors should observe areas of recent maintenance involving either ballast or rail, where there was inadequate reconsolidating time for disturbed ballast or inadequate temperature adjustment when replacing a defective rail. As curvature increases, the buckling resistance decreases. Under some conditions, high degree curvature can undergo gradual lateral shift (progressive buckling). Lateral alinement deviations reduce the track buckling strength and can initiate growth to critical levels. Vertical alinement deviations can also influence buckling.

Lateral misalinement is an important consideration because it reduces the ability of the track to resist buckling. An alinement offset or mid-ordinate within allowable limits may "grow" under the imposed loads. This is called "track shift." A longitudinal force in curved track will cause CWR rail to move radially. Compressive loads in the rail during the summer tend to move the track outwards and tensile loads in the winter will pull the track inward, a term known as "radial breathing." Inspectors should review the allowable limits, under §213.55, and evaluate the relevant alinement and track strength (§213.13, movement under load) due to repeated thermal and vehicle loadings.

Generally speaking, a decrease in the force-free temperature of 30 to 40 degrees from the installation temperature can be critical and lead directly to buckling. Inspectors should monitor the following factors that may influence shifts in the force-free temperature: improper rail installation, inadequate rail anchors or fastenings, lateral movements in curves through lining operations, "skeletonized" track segments (ballast removed for maintenance purposes), and inadequate ballast section. Lateral and longitudinal restraint is influenced by the factors mentioned above and, if improperly maintained or allowed to exist in a defective state, it increases the opportunity for a track buckle.

Track buckles occur less frequently in tangent than in curves. However, buckling in tangent track will generally occur suddenly and with more severe consequences.

The second of the two failure modes can be associated with track constructed with CWR is a pull-apart. A rail's decrease in temperature in the winter will create tensile forces. The maximum tensile load in the rail is determined by the difference in the installation or force-free temperature and the lowest rail temperatures. Enough tensile force can cause direct fracture at rail cross-sections with prior cracks, weak welds or shear joint bolts at CWR string end locations.

119(e) Procedures which control train speed on CWR track when –

(1) Maintenance work, track rehabilitation, track construction, or any other event occurs which disturbs the roadbed or ballast section and reduces the lateral or longitudinal resistance of the track; and

(2) In formulating the procedures under this paragraph (e), the track owner shall–

(i) Determine the speed required, and the duration and subsequent removal of any speed restriction based on the restoration of the ballast, along with sufficient ballast re-consolidation to stabilize the track to a level that can accommodate expected train-induced forces. Ballast re-consolidation can be achieved through either the passage of train tonnage or mechanical stabilization procedures, or both; and

(ii) Take into consideration the type of crossties used.

119(f) Procedures which prescribe when physical track inspections are to be performed to detect buckling prone conditions in CWR track. At a minimum, these procedures shall address inspecting track to identify –

(1) Locations where tight or kinky rail conditions are likely to occur;

(2) Locations where track work of the nature described in paragraph (e)(1) of this section have recently been performed; and

(3) In formulating the procedures under this paragraph (f), the track owner shall –

(i) Specify the timing of the inspection; and

(ii) Specify the appropriate remedial actions to be taken when buckling prone conditions are found.

119(g) Procedures which prescribe the scheduling and conduct of physical track inspections to detect cracks and other indications of potential failures in CWR joints. On and after January 1, 2007 in formulating the procedures under this paragraph, the track owner shall—

Guidance. This paragraph requires each track owner to include in its CWR plan provisions for the scheduling and conducting of joint inspections. A person who is qualified under §213.7(b) will perform the inspections required by this paragraph on foot at the joint.

(1) Address the inspection of joints and the track structure at joints, including, at a minimum, periodic on-foot inspections.

Guidance. This paragraph governs on-foot periodic inspections of CWR joints. Track owners are required to establish procedures for conducting these inspections. Upon identifying actual conditions of joint failures (i.e., broken or cracked joints bars) or potential conditions of joint failure, track owners must initiate the appropriate corrective action and keep the appropriate records. See §§213.119(g)(5) and 213.119(g)(7). In addition, when a track owner discovers CWR joints that are not in compliance with the requirements of Part 213, the track owner must take the appropriate remedial action required by Part 213. Inspectors should note that nothing in this paragraph interferes with the track owners' continuing obligation to conduct track inspections under §213.233. In addition, on-foot periodic inspections can be performed concurrently with §213.233.

Periodic inspections, as referenced herein, are on-foot inspections of CWR joints that track owners must conduct on a regular basis. Track owners are required to conduct on-foot periodic inspections at the minimum intervals specified in paragraph (g)(6). Track owners, of course, are free to conduct these inspections more frequently than required.

(2) Identify joint bars with visible or otherwise detectable cracks and conduct remedial action pursuant to §213.121.

Guidance. This paragraph requires track owners to identify joint bars with visible or otherwise detectable cracks and conduct remedial action pursuant to §213.121. Railroad Inspectors must know to distinguish between joint bars that are already cracked and joint bars that have the potential of cracking in the future. When a track owner discovers a cracked joint bar, he must take any remedial action specified in §213.121; however, if he discovers a joint bar with actual or potential joint failure, he must take the corrective action specified by his CWR plan. Corrective action will be further addressed in paragraph (g)(5).

(3) Specify the condition of actual or potential joint failure for which personnel must inspect, including, at a minimum, the following items:

Guidance. This paragraph identifies those items relating to joint inspections that track owners must address in their CWR plans. Inspectors should note that these items are the minimum that track owners should address. Of course, track owners are free to include additional items in their respective CWR plans. Railroad track inspectors are to identify and record action items listed during their inspection of joints because these items are related to the integrity of the joint, and thus, to the safety of trains that operate over these joints.

Inspectors should note that this list is not all-inclusive. There are other conditions that could indicate failure, and Inspectors should urge track owners to consider all conditions, not just these listed examples.

(i) Loose, bent, or missing joint bolts;

(ii) Rail end batter or mismatch that contributes to instability of the joint; and

(iii) Evidence of excessive longitudinal rail movement in or near the joint, including, but not limited to; wide rail gap, defective joint bolts, disturbed ballast, surface deviations, gap between tie plates and rail, or displaced rail anchors;

(4) Specify the procedures for the inspection of CWR joints that are imbedded in highway-rail crossings or in other structures that prevent a complete inspection of the joint, including procedures for the removal from the joint of loose material or other temporary material;

Guidance. This paragraph requires track owners to include procedures in their CWR plans for the inspection of CWR joints that are imbedded in highway-rail grade crossings or in other structures that prevent a complete inspection of the joint (e.g., pans in fueling facilities, scales, passenger walkways at stations that cover the track, etc.). The plans must also include procedures for the removal of loose material or other temporary material from the joint.

With respect to the procedures for “imbedded” joints, inspectors should not expect railroads to disassemble or remove the track structure (e.g., remove pavement or crossing pads) to conduct an inspection of CWR joints. However, we do expect that railroads will make every effort, to the extent practicable, to inspect the joints in these structures.

Inspectors need to be aware that CWR joints may sometimes be temporarily buried during maintenance (e.g. where ballast is distributed in the middle of the track and along the track) and therefore unavailable for inspection. FRA expects that railroads will take necessary measures to conduct inspections of these CWR joints and expects that railroads will schedule their maintenance so as to allow for a complete inspection of these joints. Where CWR joints are buried (e.g., by ballast), inspectors should understand that railroad maintenance personnel will wait for the completion of the track surfacing and dressing of the ballast before conducting their joint bar inspections. However, railroad employees may use hand tools or mechanical means to remove ballast from the sides of track joints, so that they can conduct an inspection of those track joints.

Finally, FRA notes that components of the track (such as crossties, fasteners, tie plates, etc.) are also not fully visible in highway-rail crossings and similar structures. Inspectors should note that FRA has never specifically exempted these items from the inspections required under Part 213. Inspectors should continue to expect that the railroads will inspect these areas to the maximum extent possible.

(5) Specify the appropriate corrective actions to be taken when personnel find conditions of actual or potential joint failure, including on-foot follow-up inspections to monitor conditions of potential joint failure in any period prior to completion of repairs.

Guidance. This paragraph requires track owners to specify in their plans the appropriate corrective actions that must be taken when track inspectors find conditions of actual or potential joint failure. Inspectors should note the difference between the terms "remedial actions" and "corrective action" and apply accordingly. Remedial actions are those actions which track owners are required to take as a result of requirements of Part 213 to address a non-compliant condition. For example, if a track owner discovers a cracked joint bar, he must replace it. See §213.121 or CWR Plan. Corrective actions, on the other hand, are those actions which track owners specify in their CWR plans to address conditions of potential joint failure, including, as applicable, repair, restrictions on operations, and/or additional on-foot inspection. To ensure clarity, FRA has defined these terms in §213.119(j).

On-foot follow-up inspections, as referenced herein, are joint-specific and conducted in response to conditions that a track owner discovers during periodic inspections. Track owners will identify in their CWR plans the conditions that trigger follow-up inspections. For example, where a track owner identifies "replace bolt or inspect weekly" as a corrective action for a bent bolt, if a track inspector discovers a bent bolt during a periodic inspection and does not immediately replace it, then the track inspector will have to conduct follow-up inspections at that joint.

(6) Specify the timing of periodic inspections, which shall be based on the configuration and condition of the joint:

Guidance. This paragraph requires railroad owners to specify the timing of on-foot periodic inspections. The minimum number of required joint inspections are addressed in the table in paragraph (g)(6)(i). The timing periods in this paragraph represent the minimum of what is expected. Railroad owners are encouraged to implement additional inspection periods as they determine necessary.

In paragraphs (g)(6)(ii) - (iv), Inspectors should be aware that FRA is allowing exceptions to the minimum inspection frequencies for unscheduled detours, certain passenger trains, and items that are already inspected on a monthly basis pursuant to §213.235. Each of these exceptions will be discussed in more detail below.

(i) Except as provided in paragraphs (g)(6)(ii) through (iv), track owners must specify that all CWR joints are inspected, at a minimum, in accordance with the intervals identified in the following table—

Minimum Number of Inspections per Calendar Year [1]					
Track Class	*Freight trains operating over track with an annual tonnage of:*			*Passenger trains operating over track with an annual tonnage of:*	
	Less than 40 mgt	*40 to 60 mgt*	*Greater than 60 mgt*	*Less than 20 mgt*	*Greater than or equal to 20 mgt*
5 and above	*2*	*3 [2]*	*4 [2]*	*3 [2]*	*3 [2]*
4	*2*	*3 [2]*	*4 [2]*	*2*	*3 [2]*
3	*1*	*2*	*2*	*2*	*2*
2	*0*	*0*	*0*	*1*	*1*
1	*0*	*0*	*0*	*0*	*0*
Excepted track	*0*	*0*	*0*	*n/a*	*n/a*

4 = Four times per year, with one inspection in each of the following periods: January to March, April to June, July to September, and October to December; and with consecutive inspections separated by at least 60 calendar days.

3 = Three times per calendar year, with one inspection in each of the following periods: January to April, May to August, and September to December; and with consecutive inspections separated by at least 80 calendar days.

2 = Twice per calendar year, with one inspection in each of the following periods: January to June and July to December; and with consecutive inspections separated by at least 120 calendar days.

1 = Once per calendar year, with consecutive inspections separated by at least 180 calendar days.

[1] Where a track owner operates both freight and passenger trains over a given segment of track, and there are two different possible inspection interval requirements, the more frequent inspection interval apples.

[2] When extreme weather conditions prevent a track owner from conducting an inspection of a particular territory within the required interval, the track owner may extend the interval by up to 30 calendar days from the last day that the extreme weather condition prevented the required inspection.

Table 12

Guidance. The first footnote provides that where a track owner operates both freight and passenger trains over a given segment of track, and there are two different possible inspection interval requirements, the more frequent inspection interval applies. This footnote was developed to address concerns over track shared by freight and passenger trains. It was anticipated that there could be a potential conflict with the inspection frequency required for the track if the track owner were to follow the chart for both types of trains. By requiring the more frequent inspections in situations of conflict, this footnote ensures greater safety and protection to track used for mixed purposes.

The second footnote was added in response to concerns over sensitivity of extreme regional weather conditions. Concern was raised with regard to the difficulty of inspecting CWR joints in northern regions when there is a large amount of snow. FRA notes that there could be times when it would be extremely difficult for a track owner to clear snow and ice from the joint in order for it to be seen for inspection. This footnote allows some flexibility for track owners in such a situation.

(ii) Consistent with any limitations applied by the track owner, a passenger train conducting an unscheduled detour operation may proceed over track not normally used for passenger operations at a speed not to exceed the maximum authorized speed otherwise allowed, even though CWR joints have not been inspected in accordance with the frequency identified in paragraph (g)(6)(i), provided that:

(A) All CWR joints have been inspected consistent with requirements for freight service; and

(B) The unscheduled detour operation lasts no more than 14 consecutive calendar days. In order to continue operations beyond the 14-day period, the track owner must inspect the CWR joints in accordance with the requirements of paragraph (g)(6)(i).

Guidance. This paragraph allows track owners to operate passenger trains without lowering the track speed for a limited period of time without adhering to the required inspection frequencies for passenger trains pursuant to the table in §213.119(g)(6)(i). This provision accommodates for unplanned outages, derailments, accidents, and other emergency situations. Track owners are still required to adhere to the applicable freight inspection frequencies. This provision is intended to provide relief to railroads that operate passenger trains and that have a last minute emergency situation. However, if a track owner operates passenger trains at the normal track speed for more than fourteen days, the track must be inspected at the appropriate passenger train levels as detailed in the chart at §213.119(g)(6)(i).

(iii) Tourist, scenic, historic, or excursion operations, if limited to the maximum authorized speed for passenger trains over the next lower class of track, need not be considered in determining the frequency of inspections under paragraph (g)(6)(i).

Guidance. As defined in §213.119(j), tourist, scenic, historic, or excursion operations mean railroad operations that carry passengers with the conveyance of the passengers to a particular destination not being the principal purpose. These operations run less frequently than intercity or commuter passenger trains and occur most often on short-line railroads. If a track owner has an operation of this type on the track and does not want to take that operation into account in determining inspection frequency, the owner must drop the track speed one class with regard to that operation. This way, the track owner will be still be in compliance with the inspection frequency mandated by the table in paragraph (g)(6)(i) regardless of the class of freight the owner runs on the track. As the first footnote to the table in paragraph (g)(6)(i) states, where two different possible inspection interval requirements, the more frequent inspection interval applies.

(iv) All CWR joints that are located in switches, turnouts, track crossings, lift rail assemblies or other transition devices on moveable bridges must be inspected on foot at least monthly, consistent with the requirements in §213.235; and all records of those inspections must be kept in accordance with the requirements in §213.241. A track owner may include in its §213.235 inspections, in lieu of the joint inspections required by paragraph (g)(6)(i), CWR joints that are located in track structure that is adjacent to switches and turnouts, provided that the track owner precisely defines the parameters of that arrangement in the CWR plans.

Guidance. This paragraph exempts the following items from the periodic inspection frequency intervals: switches, turnouts, track crossings, lift rail assemblies or other transition devices on moveable bridges. Track owners already inspect these items on a monthly basis pursuant to §213.235. Rather than apply the additional periodic inspection requirements (i.e., apply the intervals in the table in §213.119(g)(6)(i) to switches and turnouts, etc), FRA believes it is more appropriate to have track owners conduct their inspections of joints at these locations during their monthly §213.235 inspections.

FRA has historically understood and operated under the assumption that a turnout extends from the point of the switch to the heel of the frog. Inspectors should continue to operate under that assumption, and accordingly, all joints in turnouts, switches, etc. must be inspected monthly pursuant to §213.235 and records of these inspections must be kept in accordance with §213.241. The regulation does not require that the data elements listed in §213.119(g)(7)(i) appear on the §213.235 inspection record.

All joints that extend beyond the point of a switch or beyond the heel of the frog must be inspected at the frequency intervals identified in §213.119(g)(6)(i). However, track owners are free to include, in their monthly §213.235 inspection, these joints that are located in track structure that is adjacent to turnouts and switches. If track owners choose to do this, they must clearly define the parameters of that arrangement in their CWR plan. In other words, the track owner should clearly identify the physical limits of the adjacent track structure (e.g., insulated joints up until the signal), and they must clearly identify the inspection interval for joints in that adjacent track (e.g., "inspect all insulated joints to the signal during the monthly §213.235 inspection.").

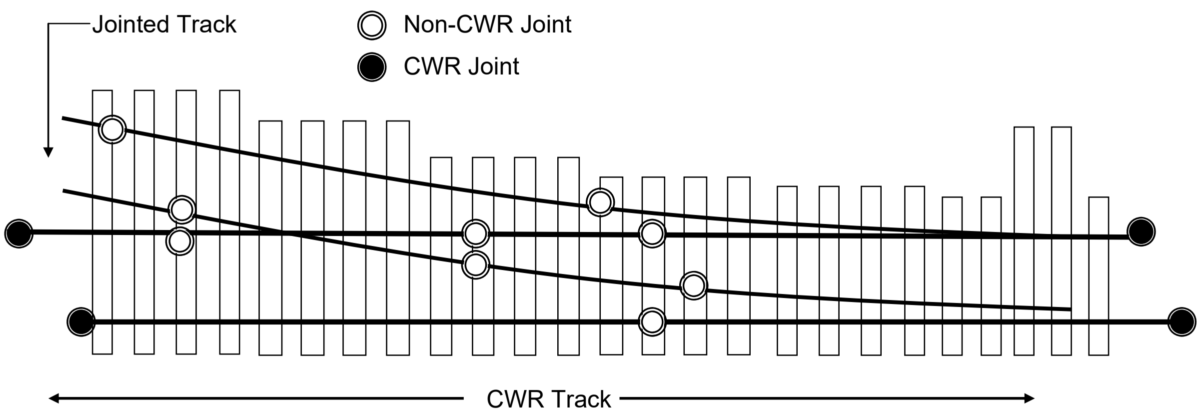


Figure 19

In addition, as long as track owners clearly define the parameters in the CWR plans, the track owner need not keep two sets of records (i.e., a record from the §213.235 inspection and a record from the §213.119(g)(6)(i) inspection) for inspections of these "adjacent" joints. For example, if the track owner's CWR plan indicates that joints in crossovers between turnouts must be inspected during the monthly §213.235 inspection, and a railroad track inspector inspects the joints in the crossover during the monthly §213.235 inspection, then it is sufficient for the track owner to create and maintain only the §213.235 record.

FRA believes this option is useful, because it avoids the confusion and duplication that might otherwise result. In addition, FRA notes that it would be burdensome for track inspectors to inspect those "adjacent" joints monthly and make a note of the inspection in the monthly

§213.235 record and also be required to make an additional §213.119(g)(6)(i) record every couple of months.

(7) Specify the recordkeeping requirements related to joint bars in CWR, including the following:

Guidance. This paragraph requires track owners to keep records specific to CWR joint bars. FRA has distinguished between two major categories of records; (i) records pertaining to periodic and follow-up inspections, and (ii) fracture reports.

(i) The track owner shall keep a record of each periodic and follow-up inspection required to be performed by the track owner's CWR plan, except for those inspections conducted pursuant to §213.235 for which track owners must maintain records pursuant to §213.241. The record shall be prepared on the day the inspection is made and signed by the person making the inspection. The record shall include, at a minimum, the following items: the boundaries of the territory inspected; the nature and location of any deviations at the joint from the requirements of this Part or of the track owner's CWR plan, with the location identified with sufficient precision that personnel could return to the joint and identify it without ambiguity; the date of the inspection; the remedial action, corrective action, or both, that has been taken or will be taken; and the name or identification number of the person who made the inspection.

Guidance. This paragraph addresses the inspection reports that have to be created after periodic inspections required by paragraph (g)(6)(i) and follow-up inspections as required by the track owner's CWR plan. The inspection reports of the periodic inspections shall be prepared on the day the inspection is made and are to contain the required information. The periodic inspection record can be combined with other records required pursuant to §213.241.

(ii) The track owner shall generate a Fracture Report for every cracked or broken CWR joint bar that the track owner discovers during the course of an inspection conducted pursuant to §§213.119(g), 213.233, or 213.235 on track that is required under §213.119(g)(6)(i) to be inspected.

Guidance. This paragraph requires railroads to submit Fracture Reports to the HQ staff. Railroads should complete Fracture Reports when they find cracks during routine inspections pursuant to §§213.119(g), 213.233, or 213.235 on track that is required under §213.119(g)(6)(i) to be inspected. **FRA intends to use the Fracture Reports to collect CWR rail joint data; FRA does not intend to use the Fracture Reports for enforcement purposes. Inadvertent errors on Fracture Reports submitted by railroads employees should not be subject to civil penalties**. Inspectors should encourage track owners to complete Fracture Reports whenever cracks are discovered, in addition to the required inspections. Track owners are not required to complete a Fracture Report for cracks found in excepted track, Class 1 track, and Class 2 track without passenger service.

However, if an FRA inspector encounters repeated failure to prepare and complete reports or come upon a persistent and recurring pattern of non-reporting. Inspectors are to inform their Regional Specialist of the non-reporting. Regional Specialist will confer with Division Staff to determine appropriate **enforcement** action. Track owners are not required to keep the Fracture Reports pursuant to the requirements of §213.241. However, Fracture Reports are to be kept until the track owner has received confirmation from HQ that the data has been received.

FRA currently has provided four (4) options as a means for the track owner to submit Fracture Reports. The first option is through an electronic data submission using eXtensible Markup Language (XML) format. This option allows the railroad to decide how best to capture the information, yet still submit to the FRA in a standard and valid way. The railroads can submit to FRA by sending the XML files directly to the FRA via email The second option, the fillable PDF Format, uses a fillable Adobe PDF file to capture and submit the data. The railroad can complete each report and submit the Adobe generated XML file to the FRA via a submit button located on the form. Third, FRA has made available a formatted Excel spreadsheet, into which railroads can input their Fracture Reports. This spreadsheet can be submitted via e-mail, electronic media, or uploaded to the FRA Office of Safety Analysis' website. As a final option, FRA has made available a printable version of the OMB approved Fracture Report form for download. More specific instructions regarding submission of the report are available on the Office of Safety Analysis' website at the following address: http://safetydata.fra.dot.gov/officeofsafety/CWR/Default.asp

(ii)(a) The Fracture Report shall be prepared on the day the cracked or broken joint bar is discovered. The record shall include, at a minimum: the railroad name; the location of the joint bar as identified by milepost and subdivision; the class of track; annual million gross tons for the previous calendar year; the date of discovery of the crack or break; the rail section; the type of bar (standard, insulated, or compromise); the number of holes in the joint bar; a general description of the location of the crack or break in bar; the visible length of the crack in inches; the gap measurement between rail ends; the amount and length of rail end batter or ramp on each rail end; the amount of tread mismatch; the vertical movement of joint; and in curves or spirals, the amount of gage mismatch and the lateral movement of the joint.

Guidance. This paragraph requires that the Fracture Report be prepared on the day the cracked or broken CWR joint bar is found. The Fracture Report is to be completed whenever a cracked or broken joint bar is discovered during the period inspections required by §213.119(g)(6)(i), as well as those currently required by §§213.233 and 213.235.

The annual gross million ton information requested in the Fracture Report can be entered on the report by an appropriate employee of the railroad, since the railroad track inspector may not have ready access to this information (even though the inspector should impliedly be aware of the range within which the value falls as a result of instructions provided concerning the frequency of inspection required).

(ii)(b) The track owner shall submit the information contained in the Fracture Reports to the FRA Associate Administrator for Safety twice annually, by July 31 for the preceding six-month period from January 1 through June 30 and by January 31 for the preceding six-month period from July 1 through December 31.

Guidance. This paragraph requires the track owner to submit the information contained in the Fracture Reports twice annually to the FRA. FRA is collecting the Fracture Report data and will review and analyze it to better determine the root causes of joint failures.

In addition, FRA Inspectors will be expected to submit Fracture Reports when cracked or broken CWR Joint bars are found during an inspection that are a defect or an exception to the railroad's CWR Plan in addition to noting the defect on their report. However, only one Fracture Report is to be submitted for a defective joint. An FRA inspection is not one of the required times that a railroad must submit a Fracture Report. But the railroad may voluntarily complete the form; therefore the FRA inspector would not complete and submit the form. Inspectors are to complete their reports on the fillable PDF form which can be found on the FRA's Office of Safety Analysis webpage under the toolbar tab identified as CWR. The submit button will email the Adobe generated XML file to a predetermined address.

(ii)(c) After February 1, 2010, any track owner may petition FRA to conduct a technical conference to review the Fracture Report data submitted through December of 2009 and assess

whether there is a continued need for the collection of Fracture Report data. The track owner shall submit a written request to the Associate Administrator for Safety, requesting the technical conference and explaining the reasons for proposing to discontinue the collection of the data.

Guidance. This paragraph allows any track owner to petition FRA after February 1, 2010, to conduct a technical conference to assess whether there is a continued need for the collection of Fracture Report data. During the technical conference, FRA would review the data collected, the analysis done to date, and determine if sufficient data has been collected to enable FRA to make a technically competent determination of CWR joint bar failure causes and contributing conditions.

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CWR JOINT BAR FRACTURE REPORT	***TYPE OF INSPECTION*** ☐ PERIODIC JOINT INSPECTION (213.119[g][5][i]) ☐ TRACK INSPECTION (213.233) ☐ TURNOUT INSPECTION (213.235) ☐ OTHER (discovered during other than required inspection)

RAILROAD:	SUBDIVISION:		MILEPOST:
DATE FOUND: _____ /_____ 20_____	ANNUAL MGT:	TRACK #:	TRACK CLASS:

☐ TANGENT	☐ CURVE _____ degrees ☐ IN SPIRAL	☐ LOW/INNER RAIL ☐ HIGH/OUTER RAIL	RAIL SECTION(S):_______ / _______
ANNUAL JOINT INSPECTION FREQUENCY FOR THIS SEGMENT ☐ 1x ☐ 2x ☐ 3x ☐ 4x ☐ OTHER: ______________			DATE OF LAST JOINT INSPECTION: _____ /_____ /20_____

BAR TYPE	☐ STANDARD	☐ INSULATED	☐ COMPROMISE
(check all that apply)	NUMBER OF HOLES:	☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8	

FIELD SIDE BAR	***GAGE SIDE BAR***
BROKEN THROUGH Check location of break: ☐ CENTER ☐ INNER BOLT HOLE ☐ OTHER	**BROKEN THROUGH** Check location of break: ☐ CENTER ☐ INNER BOLT HOLE ☐ OTHER
CRACKED Check location(s) and record length(s):	**CRACKED** Check location(s) and record length(s):
☐ TOP CENTER __________ inches	☐ TOP CENTER __________ inches
☐ BOTTOM CENTER __________ inches	☐ BOTTOM CENTER __________ inches
☐ INNER BOLT HOLE __________ inches	☐ INNER BOLT HOLE __________ inches
☐ OTHER BOLT HOLE __________ inches	☐ OTHER BOLT HOLE __________ inches
☐ OTHER (describe) __________ inches	☐ OTHER (describe) __________ inches

GAP BETWEEN RAIL ENDS _________ INCHES

RAIL END BATTER OR RAMP (Figures 1 and 2)

☐ NORTH or ☐ EAST RAIL END _________ INCHES HIGH _________ INCHES LONG

☐ SOUTH or ☐ WEST RAIL END _________ INCHES HIGH _________ INCHES LONG

TREAD MISMATCH _________ INCHES (Figure 3)

JOINT VERTICAL MOVEMENT _________ INCHES

<u>IF JOINT IN CURVE or SPIRAL:</u>

GAGE RAMP (Figure 4) _________ INCHES OUT _________ INCHES LONG

GAGE MISMATCH (Figure 5) _________ INCHES

JOINT LATERAL MOVEMENT _________ INCHES

OTHER COMMENTS:

FRACTURE REPORT INSTRUCTIONS

TYPE OF INSPECTION – Indicate the type of inspection being performed when fracture was found. At least one (1) box in group must be checked.

RAILROAD – FRA railroad reporting code, (e.g. CSX or NS). Four (4) character alpha.

SUBDIVISION – Railroad's subdivision or district. If none enter “system”. Fourteen (14) character alphanumeric.[1]

MILEPOST – Railroad's designated milepost at the location of the fracture. 7.2 character alphanumeric, e.g., ABC1234.56.[1]

DATE FOUND – Date the fracture was found. Eight (8) character numeric, MMDDYYYY.

ANNUAL MGT – Million Gross Tons (from previous year) for the specific track with the fracture. 4.1 numeric, e.g., 123.4 (allowable range 0 to 999.9 inclusive).

TRACK CLASS – FRA Class for track with the fracture. One (1) character numeric, e.g., 3 (allowable range 2 - 6 inclusive).

TANGENT/CURVE/SPIRAL/INNER/OUTER – Indicate whether fracture found on tangent, curve (include degree of curvature) or spiral and if inner or outer rail, if applicable. If tangent, check TANGENT. Otherwise check CURVE or SPIRAL and INNER or OUTER. If curve checked, curvature entered as 2.1 numeric, e.g. 2.5.

RAIL SECTION – Indicate each rail section comprising the joint, (e.g. for a standard bar, enter 136 or for a compromise bar, enter 132/115).

ANNUAL JOINT INSPECTION FREQUENCY – Number of times per year that walking joint bar inspection is performed. Two (2) character numeric, e.g. 3 (allowable range 1 – 12 inclusive).

DATE OF LAST JOINT BAR INSPECTION – Date the last walking joint bar inspection was performed. Eight (8) character numeric, MMDDYYYY.

BAR TYPE/HOLES – Indicate bar type: standard, insulated, or compromise bar and number of holes. Two (2) boxes (one in each group) must be checked.

BROKEN THROUGH – For each bar, field and gage, check appropriate box if broken completely through and indicate the location of the break (through center, through inner bolt hole or other location). For each bar, field and gage, there is no requirement to check any box(es) – neither bar is broken through.

CRACKED – For each bar, field and gage, indicate the crack location(s) and corresponding length(s). For each bar, field and gage, any number of boxes may be checked. If box is checked, crack length is 3.1 numeric, e.g., 2.5. If OTHER is checked, text description can be 64 (128) character alpha-numeric.

GAP BETWEEN RAIL ENDS – Measure and record the distance between the rail ends. If joint is pulled apart or separated, estimate the gap prior to separation. 5.2 numeric, e.g. 10.25.

RAIL END BATTER OR RAMP - Measure and record the ***height and length of the batter or ramp for each rail end*** and record even if found to be zero. See Figures 1 and 2 for method of measurement. Check appropriate boxes (one each of NORTH or EAST and one each of SOUTH or WEST) and enter batter ramp as four (4) 4.2 numeric, e.g., 1.25.

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1 This format has been pre-established in FRA’s RISPC system for its safety inspectors.

TREAD MISMATCH – Measure and record the tread mismatch. See Figure 3 for method of measurement. 4.2 numeric, e.g., 1.25.

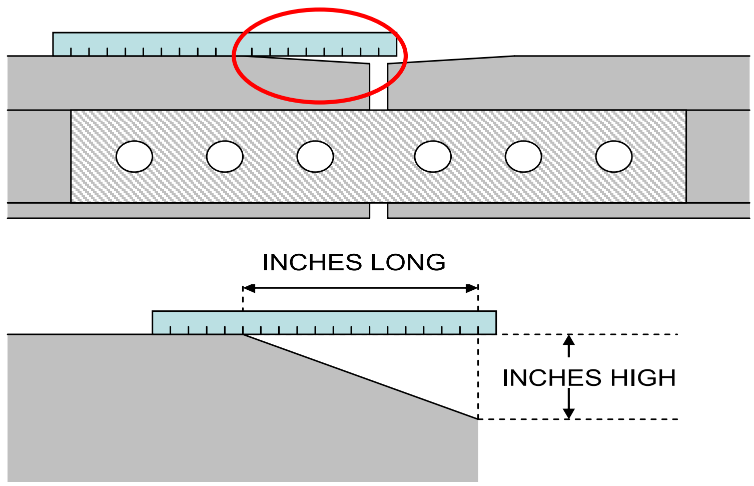
JOINT VERTICAL MOVEMENT – Record the vertical movement of the rail joint (not track surface) according to 213.13. 4.2 numeric, e.g., 1.25.

GAGE RAMP – In curves only, measure and record the gage ramp distance out and length. See Figure 4 for method of measurement. Two (2) 4.2 numeric, e.g., 1.25.

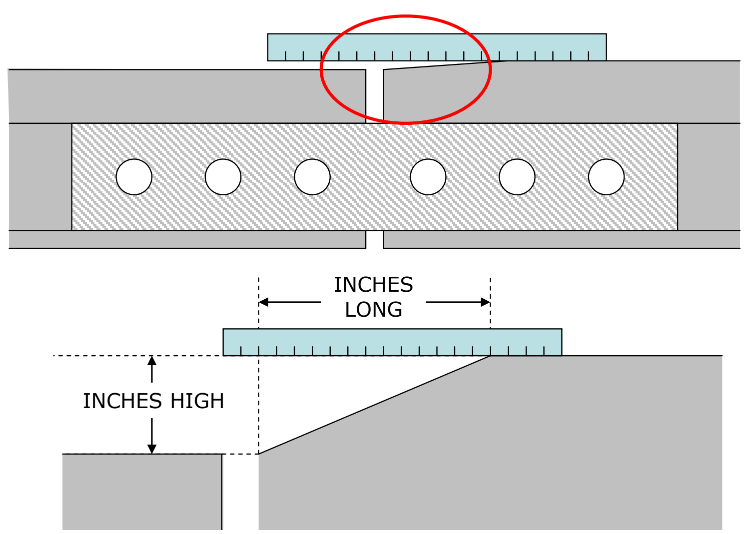
GAGE MISMATCH – In curves only, measure and record the gage mismatch. See Figure 5 for method of measurement. 4.2 numeric, e.g., 1.25.

JOINT LATERAL MOVEMENT – In curves only, record the lateral movement of the rail joint (not gage) according to 213.13. 4.2 numeric, e.g., 1.25.

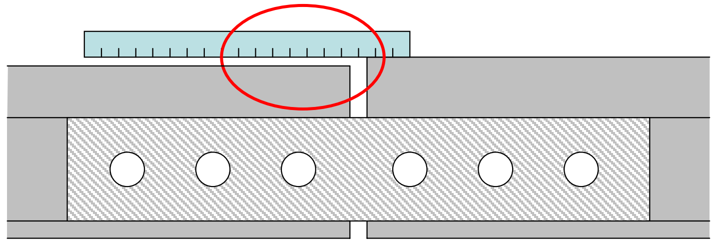
OTHER COMMENTS: - Other comments, including any other factors or conditions that may have contributed to the fracture of the bar(s). 256 character alphanumeric.

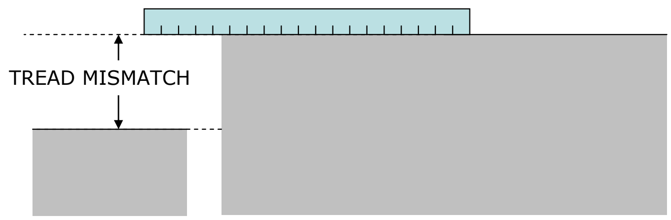


CWR Joint Bar Fracture Report - Figure 1
Method for measuring RAIL END BATTER.
Measurement to be made on each rail end.
(NOT TO SCALE)

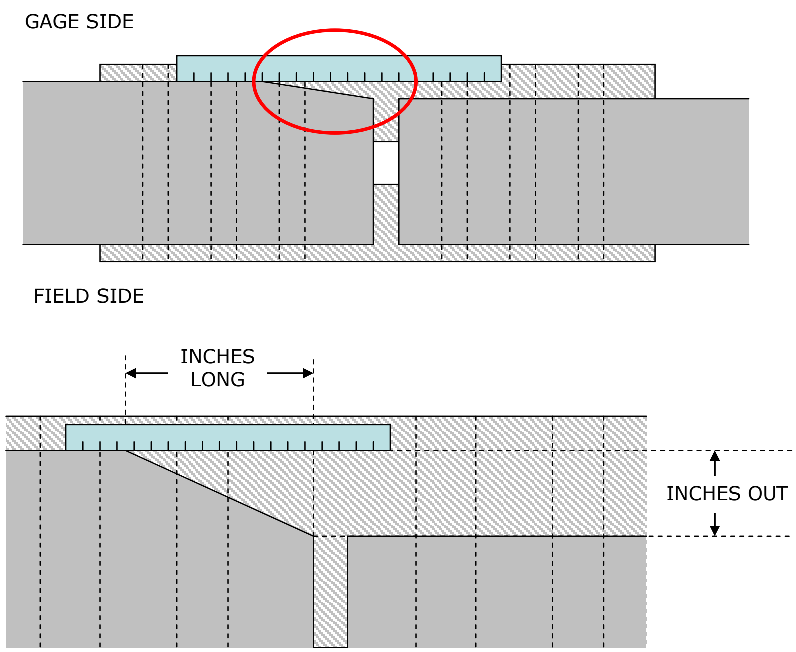


CWR Joint Bar Fracture Report - Figure 2.
Method for measuring RAIL END RAMP.
(NOT TO SCALE)

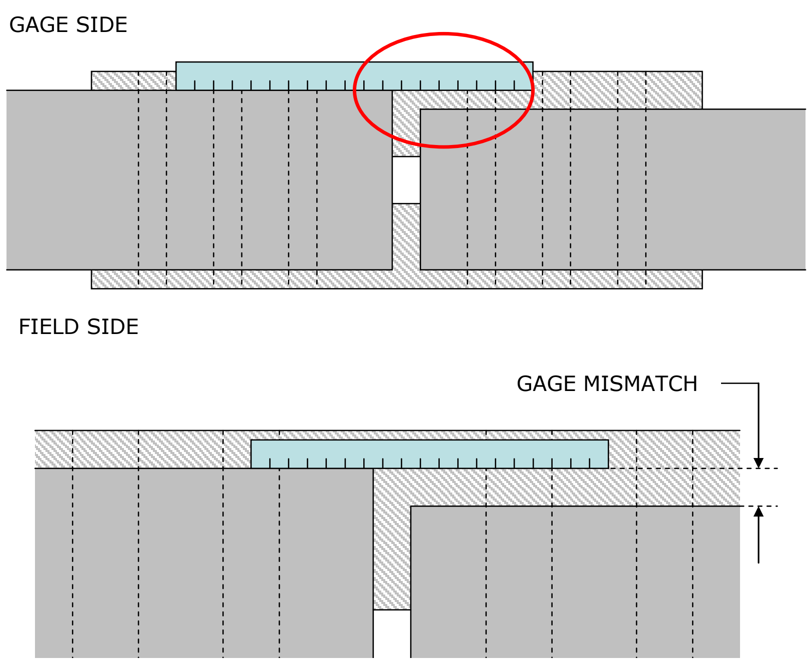




CWR Joint Bar Fracture Report - Figure 3
Method for measuring TREAD MISMATCH.
(NOT TO SCALE)



CWR Joint Bar Fracture Report - Figure 4
Method for measuring GAGE RAMP.
(NOT TO SCALE)



CWR Joint Bar Fracture Report - Figure 5.
Method for measuring GAGE MISMATCH.
(NOT TO SCALE)

Figure 20

(8) In lieu of the requirements for the inspection of rail joints contained in paragraphs (g)(1) through (7) of this section, a track owner may seek approval from FRA to use alternate procedures.

Guidance. This paragraph permits a track owner to devise an alternate program for the inspection of joints in CWR. A track owner seeking to deviate from the minimum inspection frequencies specified in § 213.119(g)(6) should submit the alternate procedures and a supporting statement of justification to the FRA's Associate Administrator for Safety (Associate Administrator). In the supporting statement, the track owner must include data and analysis that establishes to the satisfaction of the Associate Administrator that the alternate procedures provide at least an equivalent level of safety across the railroad.

If the Associate Administrator approves the alternate procedures, the Associate Administrator will notify the track owner of such approval in writing. In that written notification, the Associate Administrator will specify the date on which the alternate procedures will become effective. After that date, the track owner shall comply with the approved procedures. If the Associate Administrator determines that the alternate procedures do not provide an equivalent level of safety, the Associate Administrator will disapprove the alternate procedures in writing. While a determination is pending with the Associate Administrator, the track owner shall continue to comply with the requirements contained in §213.119(g)(6).

Technology (including frequent automated track geometry surveys) and sound CWR management, including prompt removal of so-called "temporary" joints, may provide the additional information required to verify the ongoing integrity of joints in CWR. The alternative procedures provision of this final rule will allow track owners to take advantage of these new approaches as they become available.

(i) The track owner shall submit the proposed alternate procedures and a supporting statement of justification to the Associate Administrator for Safety (Associate Administrator).

(ii) If the Associate Administrator finds that the proposed alternate procedures provide an equivalent or higher level of safety than the requirements in paragraphs (g)(1) through (g)(7) of this section, the Associate Administrator will approve the alternate procedures by notifying the track owner in writing. The Associate Administrator will specify in the written notification the date on which the procedures will become effective, and after that date, the track owner shall comply with the procedures. If the Associate Administrator determines that the alternate procedures do not provide an equivalent level of safety, the Associate Administrator will disapprove the alternate procedures in writing, and the track owner shall continue to comply with the requirements in paragraphs (g)(1) through (7) of this section.

(iii) While a determination is pending with the Associate Administrator on a request submitted pursuant to paragraph (g)(8) of this section, the track owner shall continue to comply with the requirements contained in paragraphs (g)(1) through (7) of this section.

119(h) The track owner shall have in effect a comprehensive training program for the application of these written CWR procedures, with provisions for periodic re-training, for those individuals designated under §213.7 as qualified to supervise the installation, adjustment, and maintenance of CWR track and to perform inspections of CWR track.

Guidance. All railroad employees designated under §213.7 as qualified to supervise the installation, adjustment, and maintenance of CWR track and to perform inspections of CWR track must be trained on the track owner's CWR plan. The track owner shall maintain a written record of this training per §213.7(d). The RSAC Track Safety Standards Working Group is currently collaborating with FRA to provide clearer guidance with regard to the provision for periodic re-training.

119(i) The track owner shall prescribe and comply with recordkeeping requirements necessary to provide an adequate history of track constructed with CWR. At a minimum, these records must include:

(1) Rail temperature, location and date of CWR installations. This record shall be retained for at least one year;

(2) A record of any CWR installation or maintenance work that does not conform with the written procedures. Such record shall include the location of the rail and be maintained until the CWR is brought into conformance with such procedures;

(3) Information on inspection of rail joints as specified in paragraph (g)(7) of this part.

Guidance. Paragraph (i) contains the recordkeeping requirements for railroads that have track constructed of CWR. At a minimum, a track owner must keep records of the items listed in paragraph (i)(1) through (i)(3). Paragraph (i)(1) requires a track owner to keep a record of the rail temperature, location and date of CWR installations. Paragraph (i)(2) requires a track owner to keep a record of any CWR installation or maintenance work that does not conform with the written procedures. Paragraph (i)(3) requires a track owner to keep records of information on inspection of rail joints as specified in paragraph (g)(7).

119(j) As used in this section—

Action Items mean the rail joint conditions that track owners identify in their CWR plans pursuant to paragraph (g)(3) which require the application of a corrective action.

Guidance. Action items mean the rail joint conditions that track owners identify in their CWR plans pursuant to paragraph (g)(3) which require a corrective action. Section 213.119(g)(3) identifies the broad categories that track owners need to address (e.g., rail end batter or mismatch). Track owners will need to identify specific criteria/thresholds in their respective CWR plans (e.g., how many inches of rail end batter is permissible, at what amount of mismatch must railroads take corrective actions, and what corrective actions must they take). Note: These broad categories are only the required minimums. Track owners are free to identify additional categories and set thresholds for these categories.

Adjusting/De-stressing means the procedure by which a rail's temperature is re-adjusted to the desired value. It typically consists of cutting the rail and removing rail anchoring devices, which provides for the necessary expansion and contraction, and then re-assembling the track.

Buckling Incident means the formation of a lateral mis-alinement sufficient in magnitude to constitute a deviation from the Class 1 requirements specified in §213.55 of this part. These normally occur when rail temperatures are relatively high and are caused by high longitudinal compressive forces.

Corrective Actions mean those actions which track owners specify in their CWR plans to address conditions of actual or potential joint failure, including, as applicable, repair, restrictions on operations, and additional on-foot inspections.

Guidance. Note, this term is used in §213.119(g)(5).

Continuous Welded Rail (CWR) means rail that has been welded together into lengths exceeding 400-feet.

CWR joint means (a) any joint directly connected to CWR, and (b) any joint(s) in a segment of rail between CWR strings that are less than 195 feet apart, except joints located on jointed sections on bridges.

Guidance. This definition is intended to include joints affected by CWR, and joints that are intended to be in CWR but by the addition of temporary joints may not be directly attached to a CWR string, such as an insulated joint plug rail. As many bridges have jointed rail by design, this definition would not include jointed rail joints on bridges.

Desired Rail Installation Temperature Range means the rail temperature range, within a specific geographical area, at which forces in CWR should not cause a buckling incident in extreme heat, or a pull-apart during extreme cold weather.

Disturbed Track means the disturbance of the roadbed or ballast section, as a result of track maintenance or any other event, which reduces the lateral or longitudinal resistance of the track, or both.

Mechanical Stabilization means a type of procedure used to restore track resistance to disturbed track following certain maintenance operations. This procedure may incorporate dynamic track stabilizers or ballast consolidators, which are units of work equipment that are used as a substitute for the stabilization action provided by the passage of tonnage trains.

Rail Anchors means those devices which are attached to the rail and bear against the side of the crosstie to control longitudinal rail movement. Certain types of rail fasteners also act as rail anchors and control longitudinal rail movement by exerting a downward clamping force on the upper surface of the rail base.

Rail Temperature means the temperature of the rail, measured with a rail thermometer.

Remedial Actions mean those actions which track owners are required to take as a result of requirements of this part to address a non-compliant condition.

Tight/Kinky Rail means CWR which exhibits minute alinement irregularities which indicate that the rail is in a considerable amount of compression.

Tourist, Scenic, Historic, or Excursion Operations mean railroad operations that carry passengers with the conveyance of the passengers to a particular destination not being the principal purpose.

Train-Induced Forces means the vertical, longitudinal, and lateral dynamic forces which are generated during train movement and which can contribute to the buckling potential.

Track Lateral Resistance means the resistance provided by the rail/crosstie structure against lateral displacement.

Track Longitudinal Resistance means the resistance provided by the rail anchors/rail fasteners and the ballast section to the rail/crosstie structure against longitudinal displacement.

Unscheduled Detour Operation means a short-term, unscheduled operation where a track owner has no more than14 calendar days' notice that the operation is going to occur.

§213.121 Rail joints

121(a) Each rail joint, insulated joint, and compromise joint shall be of a structurally sound design and dimensions for the rail on which it is applied.

Guidance. For proper rail load transfer to occur, rail joints must contact the head and base of the rails when the bolts are tight. Many rail joint designs have been used with varying degrees of success, and the TSS does not attempt to single out any particular design as the only acceptable joint. This could inhibit innovation in modern track design.

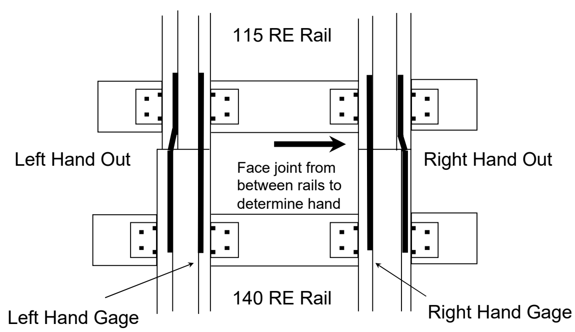


Figure 21

The TSS requires structural soundness and bolt condition based on maximum authorized train speed. Inspectors must be attentive to locations where standard joint bars are used to join dissimilar rail sections where it would be proper to have compromise bars.

The TSS recognize these important aspects of rail joints and begin this section with a requirement that rail joints have a structurally sound design and dimension for the rail on which they are applied.

Rail joints are considered to be a necessary discontinuity and require special attention by railroad maintenance personnel, railroad inspectors, and FRA Inspectors. As far as possible, a rail joint should provide the same relative strength, stiffness, flexibility, and uniformity as the rail itself. Figure 21 illustrates the proper application of compromise joint bars.

As shown in Figure 22, one of the design elements of joint bars to consider is if it's a head-contact or head-free design:

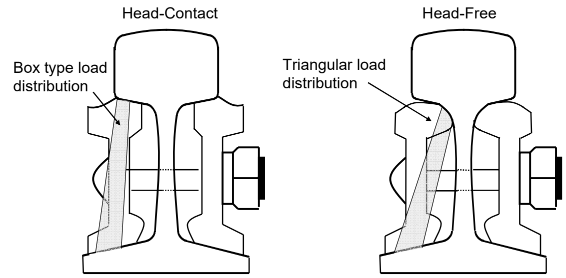


Figure 22

- The head-contact bar supports the rail ends with a box-type construction, carrying the load between the underside of the head and the base of the rail.
- The head-free joint bar does not contact the underside of the rail heads, but instead contacts the rail in the fillet area. The load distribution is referred to as a triangular load distribution.

The use of a standard (non-compromise) joint bar of head-contact design on a rail section other than for designed may constitute a deviation. The differences between the head-contact joint bar and the head-free joint bar are significant.

It is evident the joint bar and the rails do not bend or flex exactly with each other along their length. Tests and measurements show that for positive bending, there exists a downward bearing pressure of the under side of the head of the rail on the top surface of the joint bars for some distance along the bar away from the rail ends, (approximately 2 inches). There is also an upward bearing pressure of the upper surface of the base of the rails at parts of the length of the bar further away from the rail end, (bearing distance approximately 3 inches). The converse is true for negative bending.

The head-free joint bar accepts bearing and shear forces from vertical loads in the rail's upper fillet. A head-contact bar is not designed to fit into the filet. Specifically, the head-contact joint bar accepts bearing from vertical loads on the flat underside of the rail's head: generally on a 1 to 4 slope. It is not designed to seat into the rail's upper filet. Although the vertical fishing dimension for the 112 and 115 RE rail sections is identical ($3^{3}/_{16}$ inches), the head filet radius is different:

- For the 115-pound section, radius equals ¾ inch
- For the 112-pound section, radius equals ⅜ inch

As shown in Figure 23, the 115 head-free bar fits the 112 rail filet practically at a point, most probably inducing joint bar stresses in excess of design which is a deviation from §213.121(a). The 112 head-contact bar does properly not fit into the 115 rail fillet as it bears in a very small areas beneath the head of the rail, possibly inducing joint bar stresses in excess of design and exerting a wedge action between the rail head and rail web, promoting head and web separation. In addition, the joint bar may experience a twist, or torsional force from the tightening of the track bolts when used as a compromise between 115 and 112 rail. The torsional stress from twist will be the greatest at the head and toe of the bar at the rail ends.

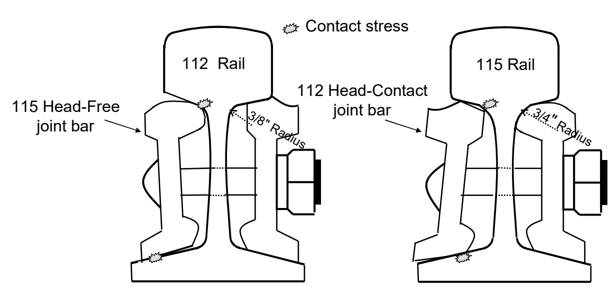


Figure 23

There are exceptions to the use of a joint bar of head-contact design on a rail section other than for designed. For example, a 131 pound or 132 pound head-contact joint bar may be used in lieu of a 131/132 or 131/136 compromise joint bar if rail drilling and joint bar punching is the same. The width of the rail head in these configurations is sufficient to allow full contact in the upper fishing wear surface. In summary:

- 112 pound RE joint bars should not be used as compromise joint bars between 112 RE and 115 RE rail.
- 115 pound RE joint bars should not be used as compromise joint bars between 112 RE and 115 RE rail.
- 131 RE head-contact bars or 132 RE head-contact bars may be used as compromise joint bars between 131 RE and 132 RE rail or 136 RE rail where rail drilling and joint bar punching are the same. (Note: FRA Standards do not prohibit the track owner from field drilling bolt holes to fit).

While the above addresses compromise joint bars, it is stressed that 112 RE bars are not to be used on 115 RE and 119 RE rail and vice versa. Joint bars with 131 RE head-free and 132 RE head-free design, or 131 RE head-free and 136 RE head-free joint bars, are not interchangeable and are not to be intermixed.

For a compendium of rail section dimensions in order to compare other rail sections for compatibility between joint bars on various rail sections refer to Appendix C of this manual.

121(b) If a joint bar on Classes 3 through 5 track is cracked, broken, or because of wear allows excessive vertical movement of either rail when all bolts are tight, it shall be replaced.

Guidance. Joint bars are designed to fit into the space between the bottom of the rail head and rail base (fishing). With the bolts tight, the joint bars are wedged into the fishing space to provide lateral and vertical beam strength thereby supporting the abutting rail ends. When held up against the rail with bolts, joint bars contact the rail at two points; bottom of the rail head (or fillet) and top of the rail base. These contact points, known as the “fishing surfaces,” can experience metal loss due to abrasion and mechanical wear that occurs during the cyclical train dynamic loading. After long-term service, the fishing surfaces of the rails and bars can wear to the point that joint bars are no longer wedged into the rail, even with tight bolts. In such cases, the joint assembly will no longer optimally support the abutting rail ends.

Joints with minimally worn fishing surfaces can provide for the safe passage of wheels in Classes 1 through 5. As a guide, excessive vertical movement would exist when there is significant fishing surface wear and wheel loads cause the abutting rail ends to exhibit tread mismatch approaching the thresholds under §213.115. If excessive vertical movement occurs, or there are any cracks, corrective action would be to replace the bars or take other proper corrective action.

Proper corrective action for a joint bar cracked or broken, other than center break, in Classes 3 through 5 track, would be replacement or a reduction to Class 2. If both joint bars are cracked or broken between the 1st and 2nd bolt hole (including through the 2nd bolt hole), it should be considered Class 1. This is because there is only one bolt in a rail end that is within the remaining section of the joint bar that is providing support.

121(c) If a joint bar is cracked or broken between the middle two bolt holes it shall be replaced.

Guidance. For a center cracked or broken bar, the appropriate corrective action would be replacement or reduction to Class 1 speeds under the provisions of §213.9(b).

121(d) In the case of conventional jointed track, each rail shall be bolted with at least two bolts at each joint in Classes 2 through 5 track, and with at least one bolt in Class 1 track.

Guidance. Track owners must have the number of required bolts in each rail in a joint. This paragraph does not prescribe a tightness (torque) standard for each bolt. A bolt that no longer can support the joint bar against the rail will continue to provide resistance to pull aparts when the rail is in tension. The ability of the bolts to hold bars against the rail to support the abutting rail ends is covered under §213.121(f).

A bolt does not fulfill the requirements of this paragraph if it is in imminent danger of complete failure (it no longer is holding the bar to the rail and no longer resists pull apart forces). For example, the nut is missing (it will likely fall out under subsequent train movements) or the bolt shaft is fractured.

121(e) In the case of continuous welded rail track, each rail shall be bolted with at least two bolts at each joint.

Guidance. Rail in lengths more than 400-feet is considered CWR for purposes of applying the requirements of this paragraph. If there is only one bolt in a rail end at a joint, in a CWR string (400-feet or longer), that one bolt will be subject to all the tensile axial forces and will easily shear (break) resulting in a pull-apart.

121(f) Each joint bar shall be held in position by track bolts tightened to allow the joint bar to firmly support the abutting rail ends and to allow longitudinal movement of the rail in the joint to accommodate expansion and contraction due to temperature variations. When no-slip, joint-to-rail contact exists by design, the requirements of this paragraph do not apply. Those locations when over 400-feet in length, are considered to be continuous welded rail track and shall meet all the requirements for continuous welded rail track prescribed in this part.

Guidance. If the joint bars are loose, the joint is not in compliance with §213.121(f). In addition, a joint assembly is not in compliance when inadequately tightened bolts prevent it from supporting the abutting rail ends under the expected traffic loads.

Joint bolts can deteriorate sufficiently as to create a condition where the bars may become completely detached from the rail or cause a total lack of support, which can contribute to a broken rail. Such a condition can create a mismatch which exceeds the limits specified in §213.115 (Rail end mismatch). In such a case, the defect would be rail end mismatch (class specific) and Inspectors should also include a notation about the loose joint bars.

This paragraph also recognizes the design characteristic that enables the rail ends in a joint to move longitudinally to handle temperature changes (expansion/contraction) or rail creep (traffic flow). This type of joint bar assembly is standard for jointed rail because that type of track construction has lower axial forces than CWR. In CWR, it is desirable to contain the rail expansion and contraction in the remaining joints (i.e., insulated joints) in order to eliminate the pull-apart action that occurs in regular joints. In CWR, the track structure, by design, dissipates the axial forces. Accordingly, this paragraph allows joint designs that stop the axial rail movement within the assembly.

Except for the axial movement component of this paragraph, joint bars such as glued insulated joints are subject to all of the remaining requirements of this paragraph and all other paragraphs of §213.121. These types of assemblies are considered to be joints, even in CWR (see §213.119). However, for the definition as to what constitutes CWR, a glued joint is not a longitudinal discontinuity in a rail string. Glued joints are also considered joints under §213.109 with respect to the required positioning of non-defective ties at joints.

121(g) No rail shall have a bolt hole which is torch cut or burned in Classes 2 through 5 track.

Guidance. This paragraph prohibits the use of a rail containing a bolt hole that has been torch cut or burned in Classes 2 through 5 track.

121(h) No joint bar shall be reconfigured by torch cutting in Classes 3 through 5 track.

Guidance. This paragraph prohibits the reconfiguration of joint bars by torch cutting in Classes 3 through 5 track. By omission of the reference to Classes 1 and 2 track, this practice of reconfiguration is allowed in those classes. However, the joint bars that are reconfigured by torch cutting must meet certain criteria for structural soundness of design and dimension, which is required under (a) of this section.

§213.122 Torch cut rail

122(a) Except as a temporary repair in emergency situations no rail having a torch cut end shall be used in Classes 3 through 5 track. When a rail end is torch cut in emergency situations, train speed over that rail end shall not exceed the maximum allowable for Class 2 track. For existing torch cut rail ends in Classes 3 through 5 track the following shall apply –

(1) Within one year of September 21, 1998, all torch cut rail ends in Class 5 track shall be removed;

(2) Within two years of September 21, 1998, all torch cut rail ends in Class 4 track shall be removed; and

(3) Within one year of September 21, 1998, all torch cut rail ends in Class 3 track over which regularly scheduled passenger trains operate, shall be inventoried by the track owner.

Guidance. The regulation prohibits the torch cutting of rail ends in Classes 3 through 5 track except as a temporary repair in emergency situations. In such emergency situations, train speed shall not exceed the maximum allowable for Class 2 track.

Existing torch cuts must be removed from track in the following time frames:

- Class 5 track - by September 21, 1999.
- Class 4 track - by September 21, 2000.
- Class 3 track with passenger trains - by September 21, 1999, all torch cuts shall be inventoried by the track owner.

122(b) Following the expiration of the time limits specified in (a)(1), (2), and (3) of this section, any torch cut rail end not removed from Classes 4 and 5 track, or any torch cut rail end not inventoried in Class 3 track over which regularly scheduled passenger trains operate, shall be removed within 30 days of discovery. Train speed over that rail end shall not exceed the maximum allowable for Class 2 track until removed.

Guidance. Those torch cuts inventoried will be “grandfathered in” and any torch cuts found after the expiration of one year that are not inventoried must be slow ordered to Class 2 speed and removed within 30 days of discovery. If a railroad chooses to upgrade a segment of track to Class 3, and passenger trains are operated, all torch cuts must be removed before speeds can exceed the maximum for Class 2 track. If a railroad chooses to upgrade a segment of track from any lower class to Class 4 or 5, it must remove all torch cuts.

§213.123 Tie plates

123(a) In Classes 3 through 5 track, where timber crossties are in use, there must be tie plates under the running rails on at least 8 of any 10 consecutive ties.

123(b) In Classes 3 through 5 track no metal object which causes a concentrated load by solely supporting a rail shall be allowed between the base of the rail and the bearing surface of the tie plate. This paragraph (b) is applicable September 21, 1999.

Guidance. Inspectors should consider this section jointly with the requirements for crossties and rail fastenings and report tie plate conditions as defects where safety is impaired by the absence of tie plates.

In Classes 3 through 5 track no metal object that causes a concentrated load by solely supporting a rail shall be allowed between the base of rail and the bearing surface of the tie plate. The specific reference to “metal object” is intended to include only those items of track material that pose the greatest potential for broken base rails such as track spikes, rail anchors, and shoulders of tie plates. The phrase “causes a concentrated load by solely supporting a rail” further clarifies the intent of the regulation to apply only in those instances where there is clear physical evidence that the metal object is placing substantial load on the rail base, as indicated by a lack of loading on adjacent ties.

§213.127 Rail fastening systems

Track shall be fastened by a system of components which effectively maintains gage within the limits prescribed in §213.53(b). Each component of each such system shall be evaluated to determine whether gage is effectively being maintained.

Guidance. “Rail fastening systems” include modern day elastic fastening systems, which can consist of abrasion pads, insulator clips, shoulder inserts cast into concrete ties, as well as the fastener itself, of which many different designs are in use today. The fastening system can also be of the traditional cut spike variety, with or without tie plates. The failure of certain critical components within a particular system could adversely affect the ability of the individual fastener to provide adequate gage restraint. The wording of this regulation provides for an evaluation of all components within the system, if necessary, when degradation of the fastening system has resulted in problems maintaining gage within the limits prescribed in §213.53(b).

When an Inspector identifies a gage geometry condition where the fastener system has degraded and the location in question meets the factors described below, the Inspector must examine each component of the fastener system (e.g., clip, insulating pad, bolts, spiking pattern, etc.). The Inspector should describe the nature of the failed component(s) on the F 6180.96 form. If a fastener condition causes the gage to exceed the limits of §213.53, the Inspector shall report the condition as a gage defect and describe the nature of the fastener condition on the same defect line of the report.

This section requires the Inspector to exercise judgment in evaluating the condition of fasteners. The following factors should be considered in the evaluation:

- Gage exceeding the limits of §213.53 (in such cases gage and track class will govern);
- Gage close to the limits of §213.53 with evidence of recent widening;

- Evidence of recent rapid deterioration of gage with probable continued deterioration;
- Evidence of recent significant damage to rail fasteners to the extent that gage widening is probable;
- Evidence of recent maintenance work improperly performed resulting in lack of sufficient fasteners to prevent gage widening under expected traffic;
- Traffic conditions, including speed, tonnage, and type of equipment; and
- Conditions of curvature and grades.

FRA Inspectors may use a Portable Track Loading Fixture (PTLF) described in §213.110 for the purposes of measuring the effectiveness of fasteners. Refer to [Appendix E - PTLF instructions] for non-GRMS territory under [§213.53].

A unique attribute of concrete crossties is the abrasion that can occur between the base of the rail and the rail-seat on the crosstie, a component of the rail fastening system. A variety of tie pad designs and materials are placed between the rail and the ties to mitigate abrasion. However, unequal or "wedged" abrasion of the rail seat can be problematic for a high-speed or high tonnage operating environment that may cause rail fasteners to become loose under load or in extreme cases cause rail-tilt or roll-out. See Figure 24. Accordingly, Inspectors should look for rail roll-out due to rail seat abrasion on concrete crossties, particularly in territory with heavy traffic levels and moderate curvature. The mechanics of this condition on concrete crossties include the following elements:

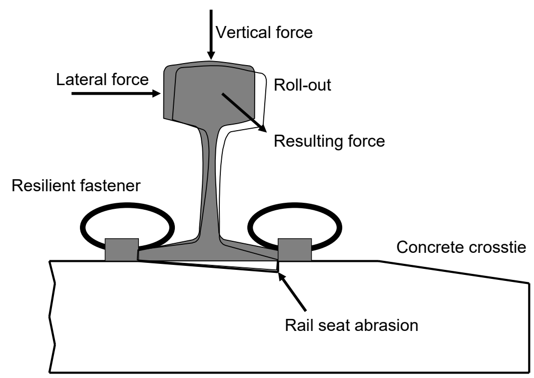


Figure 24

- Concrete wear or abrasion resulting in loose rail clips, insulators, and pads;
- Loose components allow more moisture and abrasives to enter rail seat; and
- Once the field side of the rail base wears through the tie pad and contacts the concrete tie rail seat, rapid cutting into the concrete (accelerated abrasion) can occur.

Signs and symptoms of concrete crosstie rail seat abrasion include;

- Tie pad crushed or squeezed-out (maintaining integrity of the tie pad is essential);
- Insulators crushed, moving or missing;
- Clips loose indicating loss of pressure on the rail base (loss of toe load);
- Longitudinal rail movement;
- Indications of cement colored paste in the ballast from the abraded rail seat; and
- Metal flaking or grease streaks in the center of the low rail in a curve caused by the outer rim of wheel (or false flange) placing excessive pressure on the head of the rail, a condition generally created by gage-widening.

Based on the above discussion, it is apparent that rail-seat abrasion on concrete ties causes rail roll-out. As rail roll-out occurs, it decreases the effectiveness of the rail fasteners and will often lead to gage geometry conditions. As a general rule, Inspectors should cite this condition as a rail fastener defect (defect code 213.127.02). However, where rail roll-out causes the gage to exceed the threshold for the designated class of track, Inspectors should cite this condition as a gage defect (see §213.53).

Rail anchors are not considered to be rail fastenings. Resilient rail fastenings that perform a dual function to restrain rail laterally and longitudinally, should only be evaluated on their ability to provide lateral restraint to prevent gage-widening in regard to this section.

An insufficient fastener defect should be written when an unsafe condition results from missing or defective fasteners (e.g., heads of cut spikes sheared off at throat) on otherwise supportive crossties.

§213.133 Turnouts and track crossing generally

133(a) In turnouts and track crossings, the fastenings must be intact and maintained so as to keep the components securely in place. Also, each switch, frog, and guard rail must be kept free of obstructions that may interfere with the passage of wheels.

Guidance. There are several types of fastenings, which include reinforcing straps, connecting rods, rail hold down clips, and braces. (For a more extensive compilation of fastenings, see the fasteners listed in defect codes 213.133.01 through 213.133.14). Where fastenings are loose or missing, Inspectors should cite the railroad using defect code 213.133.20 (Turnout or track crossing fastenings not intact or maintained.) In addition, where fasteners are loose or missing and there is an apparent contributing condition (e.g., a large section of the casting is broken out at an at-grade rail to rail crossing), Inspectors should include a description of that contributing condition in their inspection report.

133(b) Classes 3 through 5 track shall be equipped with rail anchoring through and on each side of track crossings and turnouts, to restrain rail movement affecting the position of switch points and frogs. For Class 3 track, this paragraph (b) is effective September 21, 1999.

133(c) Each flangeway at turnouts and track crossings must be at least 1½ inches wide.

Guidance. A turnout is a track arrangement consisting of a switch and frog extending from the point of the switch to the heel of the frog. This arrangement allows engines and cars to pass from one track to another. Because of the operating or movable parts and lateral thrust, it is essential that fastenings be in place, tight, and in sound condition.

A track crossing (diamond) is an assembly used where two tracks intersect at grade permitting traffic on either track to cross the rails of the other. It may consist of four frogs connected by short rails, or a plant manufactured "diamond." Because of the impact a crossing is subjected to, it is essential that fastenings be in place, tight, and in sound condition. Each switch, frog, and guard rail must be kept free of obstruction.

Anchors on each side of a turnout or crossing and through a turnout are required on Classes 4 through 5 track. For Class 3 track, this requirement is effective on September 21, 1999. In determining the adequacy of anchors at and on each side of a turnout or crossing and through turnouts, Inspectors should determine the capability of these devices to:

- Restrain rail;
- Assure proper fit of switch points; and

- Prevent line irregularities.

Ties and timbers at switches and crossings must be of sound condition, well-tamped, and the roadbed must be adequately drained.

Flangeways at turnouts and track crossings must be at least 1½ inches wide.

Turnouts and track crossings must be walked and measurements made before they can be included on the F 6180.96 form as a unit inspected.

§213.135 Switches

135(a) Each stock rail must be securely seated in switch plates, but care shall be used to avoid canting the rail by overtightening the rail braces.

Guidance. The TSS under §213.135 specifies the requirements for switch restraint, movement, and fit. Each stock rail must be securely seated in the switch plates. Various conditions, such as loose braces or hanging ties, can cause a stock rail to become unseated. In these situations, Inspectors should cite the railroad with defect code 213.135.01. Alternatively, a stock rail can become unseated if the braces are overtightened during maintenance. In these situations, Inspectors should cite the railroad with defect code 213.135.02.

135(b) Each switch point shall fit its stock rail properly, with the switch stand in either of its closed positions to allow wheels to pass the switch point. Lateral and vertical movement of a stock rail in the switch plates or of a switch plate in a tie shall not adversely affect the fit of the switch point to the stock rail. Broken or cracked switch point rails will be subject to the requirements of §213.113, except that where remedial actions C, D, or E require the use of joint bars, and joint bars cannot be placed due to the physical configuration of the switch, remedial action B will govern, taking into account any added safety provided by the presence of reinforcing bars on the switch points.

Guidance. This paragraph recognizes the existence of reinforcing bars or straps on switch points where joint bars cannot be applied to certain rail defects, as required under §213.113(a)(2), because of the physical configuration of the switch. In these instances, remedial action B will govern, and a person designated under §213.7(a), who has at least one year of supervisory experience in track maintenance, will limit train speed to that not exceeding 30 m.p.h. or the maximum allowable under §213.9(a) for the appropriate class of track, whichever is lower. Of course, the person may exercise the options under §213.5(a) when appropriate.

Sec. 213.135(b) addresses cracks in the switch rail (point) with reinforcing straps acting as surrogate joint bars. If the switch point rail is not cracked and only the straps are cracked, then it is not appropriate to cite §213.135(b), and Inspectors should cite the appropriate defects under §213.133(a) (Turnouts and track crossing generally). Normally minor cracks in a strap are not a major concern. However, if a strap is fully broken and causing other problems (e.g., loose switch clip, etc.), then §213.133 would be appropriate. If the straps and switch point rail are both broken, then there is an unprotected rail break and Inspectors should cite the appropriate defect under §213.113.

Most industry standards call for a 4¾ inches opening between the switch point and the stock rail, measured at the No. 1 switch rod. As components wear, “lost motion” will result. When the problem of elongated switch clip and/or rod holes is encountered, the switch rods may be adjusted at the clip (e.g., adjustable side jaw clips, rocker clips, etc.). Adjustment may also be accomplished at the switch stand depending on the design of the assembly. In some cases, lost motion may be compensated by the addition of properly designed shims between the switch clip assembly and the switch rail.

When the opening is substantially less than the standard dimension, wheels can still pass through the switch as intended. However, the backs of wheels may contact the inside rail head of the open switch rail. This interaction can cause undesirable lateral pressure against the switch rail. This pressure can contribute to broken heel block bolts, cause cracked or broken switch clips, and broken switch crank cross pins. In extreme circumstances, the closed point can open under movement because of the transfer of lateral loads through the switch rods. In these circumstances, Inspectors should make an extra effort to determine the condition of all affected components. The amount of throw is one of the many factors that must be taken into consideration when determining the railroad's compliance with §§213.133 and 213.135.

Based on the above, make sure that switch points fit snugly against the rail when the switch is thrown in either position. As appropriate, request that the railroad representative operate the switch to test for lost motion and/or loose connections.

The Appendix to the American Railway Engineering and Maintenance of Way Association Portfolio of Trackwork Plans contains the following split switch terms:

> "Split Switch with Uniform Risers - A split switch in which the switch rails have a uniform elevation on riser plates for the entire length of the switch, and therefore not having a heel slope, the point rail rise being run off back of the switch in the closure rails."
>
> "Split Switch with Graduated Risers - A split switch in which the switch rails are gradually elevated by means of graduated riser plates until they reach the required height above the stock rail, and therefore having a heel slope."

The heel of the switch point is higher than the stock rail at the heel joint with the uniform riser layout while, on the graduated layout, the switch point is at the same elevation as the stock rail. The mixing of uniform riser and graduated riser plates in the same switch, while not specifically addressed in the TSS, can cause undesired stress in the switch rails and closure rails. Inspectors should make a note of the intermixing of switch plates in turnouts that have a high amount of traffic.

135(c) Each switch shall be maintained so that the outer edge of the wheel tread cannot contact the gage side of the stock rail.

Guidance. Inspectors are to examine the seating of stock rails in the switch plates to ensure that the outer tread of a wheel cannot engage the gage side of these rails. Grease lines or slight groves running at a slight angle on the tread of a stock rail can provide Inspectors with clues about the wheel/rail interface. These marks can be found in the area where wheel treads transition from the switch rail to the stock rail. When found, Inspectors should closely examine the gage side of the stock rail to make sure the outer edge of wheel treads are not contacting the gage side of the stock rail. As shown in Figure 25, this type of defect can occur when a worn switch rail and switch plates remain in place after a stock rail has been renewed. This causes the switch rail to drop down from the same

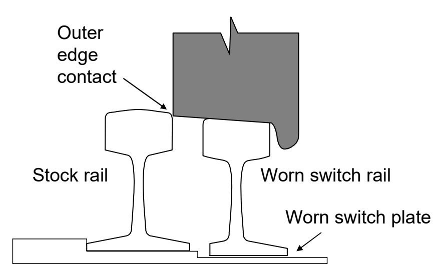


Figure 25

level as its corresponding stock rail. The danger associated with this condition is the possibility that the outer edge of a wheel can contact the gage side of the stock rail during a trailing movement through a switch, thereby turning over the stock rail.

Other items that can cause a stock rail to be higher than a switch point include improper surfacing, crosstie conditions/defects, and loose rail braces.

135(d) The heel of each switch rail shall be secure and the bolts in each heel shall be kept tight.

Guidance. At least two tight bolts in each rail are required to ensure that the heel of each switch rail is "secure" for purposes of determining compliance with §213.135(d). Examine the heel block, its fastenings, and bars; or, in the absence of a heel block, (which is known as a floating heel block) examine that assembly.

If heel joints were considered to be a normal joint, only one bolt per rail end would be required in the heel for Class 1 track. However, the heel joint functions in a different manner than a normal track joint. The heel joint serves as the pivotal point for the rotation of the switch point. It helps maintain the proper horizontal, vertical, and longitudinal fit of the switch point against its stock rail. One bolt per rail end in Class 1 track at the heel joint does not provide redundancy. The loss of the single bolt in the rail end at the heel joint could have serious safety consequences.

Some railroad heel joints have as many as six bolts for the higher track classes. Typically, when railroads plan to field weld, they do not drill the middle two bolt holes in the rail of a six hole joint bar. This practice, which provides for at least two bolts in each rail end of the heel, satisfactorily secures the assembly.

The switch heel assembly with joint bars also performs the function of a joint. As such, where there is an improper joint bar at a heel block, an Inspector should cite §213.121 (Rail joints). One example of an improper joint bar is the installation of a six hole joint bar where a five hole bar by design should be used. This would be a deviation of §213.121, because it is an improperly designed bar for that application, which may make it difficult to throw the switch or may cause gapping.

135(e) Each switch stand and connecting rod shall be securely fastened and operable without excessive lost motion.

Guidance. For hand-operated switch stands of virtually all types, rotary motion imparted to the vertical spindle within the stand by the person operating the hand lever is translated into (practically) linear movement of the connecting rod by the right angle combination of the end of the spindle beneath the stand and its attached crank. Unless cranks are integrated with the spindle by casting during manufacture, they are separate pieces that must be joined. Cranks are attached to spindles in one of two ways: (1) they may be turned into a threaded opening in the side of the spindle or (2) the crank may be fabricated to have a square or rectangular smooth opening at one end which can be moved from below up onto a spindle having a similar cross-section to a position where it can be secured in place by a horizontally inserted cross pin that simultaneously engages the crank with the spindle. For ease of reference in this discussion, the first case will be referred to as Type A and the second case as Type B. An undesired decoupling of the connecting rod and the switch stand can occur in Type A if the bolt attaching a connecting rod to a threaded crank comes out and, in Type B, separation of the crank and the spindle can occur in the absence of the cross pin. Either instance could result in the gapping of the closed switch point under train movement, unless some other device is in place to physically restrain the points.

Type B switch stands may at times have a plate like arrangement of sheet metal suspended from the headblock timbers beneath the assembly. This device, generally a shallow "U" shape, is commonly referred to as a "safety plate." The function of the plate is twofold: (1) to restrict the downward movement of the crank on the spindle, should the cross pin be absent, so the crank does not completely separate from the spindle, and (2) to keep a vertically unrestrained crank from sliding down the spindle far enough to permit the connecting rod enough space below the bottom of the switch stand to move up off the lug of the crank. There have been cases where cross pins have fractured. The plate itself is deformed so that the downward displacement of the crank was sufficient to enable the connecting rod to clear the crank lug without contacting the base of the stand. This leads to decoupling of the switch stand and the connecting rod.

Inspectors must constantly bear in mind those aspects of switch stand performance that are crucial to functional safety. This discussion concentrates on that region of the mechanical linkage between the switch points and the switch stand that may be difficult to observe in the course of a turnout inspection.

There are several different styles of Type B switch stands that are in use on main tracks and yards in the railroad industry. These models differ in minor ways. Nevertheless, they rely on the cross pin restraint of the spindle/crank subassembly and they all share vulnerability to the uncoupling of the switch stand and connecting rod. A turnout inspection must include examination of these hard to see parts even.

135(f) Each throw lever shall be maintained so that it cannot be operated with the lock or keeper in place.

Guidance. Inspectors must examine each switch lock and keeper. Certain types of switch stands "internally toggle" when the handle is thrown all the way in either position to hold the switch point against its stock rail. These types of switch stands are used in other than main track and often are a "semi-automatic" design whereby a train trailing the turnout, with the switch in the incorrect position, will initially force the points over. The final throw is completed by the internal toggling action of the switch stand. By design and application preference, these switch stands might not have a lock or keeper for other than main track applications (see Figure 26).

There is a concern associated with this type of switch stand retrofitted with an "S" shaped strap, bolted and welded to one of the two flanges of the throw lever stop. The bolt has been proven to be ineffective in preventing rotation of the strap, and the bead weld, placed by the manufacturer at the top of the strap, cracks from repeated depression of the keeper. The strap rotates downward, altering the location of the lock shackle or keeper, allowing the throw of the switch lever without removal of the lock or keeper.

Figure 26

If the above types of switch stands are used at switches and derails not requiring securing, the soundness of the strap is not in question. However, if the track owner requires that the stand be secured by lock or keeper, a weld displaying cracks will call into question the soundness of the latch mechanism and defect code 213.135.09, throw lever (potentially) operable with switch-lock or keeper in place, should be cited without recommending a violation. If the track owner fails to aggressively address and correct the potential defect on the subject types of switch stands, consider recommending a violation to Chief Counsel.

135(g) Each switch position indicator shall be clearly visible at all times.

Guidance. Examine condition of switch position indicator and note any unnecessary obstruction to its visibility. This requirement does not mandate that every switch have a position indicator but merely requires such devices to be clearly visible when installed on a switch stand.

135(h) Unusually chipped or worn switch points shall be repaired or replaced. Metal flow shall be removed to insure proper closure.

Guidance. The rule does not provide for specific dimensions for determining when switch points are "unusually chipped or worn." The Accident/Incident database indicates that worn or broken switch points are the largest single cause of derailments within the general category of "Frogs, Switches, and Appliances." However, most of these derailments are related also to other causal factors such as wheel flange condition, truck stiffness, and train handling characteristics. Therefore, qualified individuals must use their experience to determine when switch points are "unusually chipped or worn."

135(i) Tongue & Plain Mate switches, which by design exceed Class 1 and excepted track maximum gage limits, are permitted in Class 1 and excepted track.

Guidance. This paragraph provides an exemption for this item of specialized track work, primarily used in pavement or street railroads, which by design does not conform to the maximum gage limits prescribed for Class 1 and excepted track. This type of special work is fabricated from "girder rail" which includes a tram (flangeway) rolled into the rail section. A "mate" is similar to a frog but located on the side of the switch that is equivalent to a straight stock rail. The switch, when in the open or curved position, guides wheels past the mate on the turnout (curved) side in a manner similar to a frog guard rail.

Guidance, General. In addition to considering the above criteria, Inspectors must perform the following when inspecting switches:

- Check alinement, gage, and surface;
- Examine condition as to wear of switch points and stock rails.
- See that all bolts, nuts, cotter pins, and other fastenings are in place, in good condition, and are properly tightened;
- See that switch points fit snugly against the rail when the switch is thrown in either position. Request that the railroad representative operate switches to test for lost motion and/or loose connections;
- If applicable, examine the rod and fastenings that connect the switch point to the switch circuit controller to ensure they are in place and in good condition;
- Examine the condition and support of spring and power switch machines and hand-thrown switch stands, including automatic or safety switch stands. Switch stand and machine fastenings to the head block ties must be tight to avoid any movement or play;
- Examine switch-lock, and keeper;

- Examine condition of switch position indicator and note any unnecessary obstruction to its visibility;
- Examine the heel block, its fastenings, and bars; or, in the absence of a heel block, examine the floating heel of the switch point;
- Examine the seating of stock rails in the switch plates to ensure that the outer tread of a wheel cannot engage the gage side of these rails and that chairs or braces do not cant these rails in. This defect is particularly a problem for travel in the direction from the frog to the switch (trailing movement). Grease lines or slight groves running at a slight angle on the tread of a stock rail can provide Inspectors with clues about the wheel/rail interface. These marks can be found in the area where the wheel tread transitions from the switch rail to the stock rail. When found, Inspectors should closely examine the gage side of the stock rail to make sure the outer edge of wheel treads are not contacting the gage side of the stock rail; and
- Examine the gage plates and switch rods.

§213.137 Frogs

137(a) The flangeway depth measured from a plane across the wheel-bearing area of a frog on Class 1 track may not be less than 1⅜ inches, or less than 1½ inches on Classes 2 through 5 track.

Guidance. The Association of American Railroads (AAR) Field Manual of Interchange Rules states that a wheel is condemnable when the flange height is "1½ inches or more above the approximate center line of the tread." The American Railway Engineering and Maintenance-of-way Association (AREMA) Portfolio of Trackwork Plans, Point and Flangeway Dimensions, provides a designed flangeway depth of at least 1¾ inches. Therefore, the amount of clearance between a worn wheel with a high flange and the bottom of a new frog's flangeway may be as little as ⅜ inch. At higher speeds, if a worn frog has a flangeway less than 1½ inches, the wheel flange could "bottom out" in the flangeway and result in severe damage to the frog.

Section 213.137(a) permits a flangeway depth of 1⅜ inches in Class 1 track. In such a condition, a wheel that is approaching condemning limits might contact the bottom of the flangeway. As such, it is possible to have evidence of wheel flangeway contact on the bottom of the flangeway caused by non-compliant wheels.

137(b) If a frog point is chipped, broken, or worn more than ⅝ inch down and six inches back, operating speed over that frog may not be more than 10 m.p.h.

Guidance. If a frog point is chipped, broken, or worn more than ⅝ inch down and 6 inches back, a collapse of the point area is possible after repeated wheel impacts. This parameter requires a defect to be more than ⅝ inch down from the original profile to a location 6 inches back toward the heel to be considered. For example, a frog point that is ⅞ inch below its original profile at the actual frog point and ⅞ inch below at a position 6 inches back toward the heel of the frog would be a defect.

Figure 27

For a severe condition that would not meet this criteria such as a breakout at a frog point that is only 4 inches in length and greater than ⅝ inch down, Inspectors may consider using the defect code 213.137.99. While this condition may not be a defect, it is a method to notify a railroad of a condition that the Inspector feels the structural integrity of the frog is in question. Please note that 213.137.99 does not link to a paragraph in the TSS and may only be used as an advisory to the railroad.

Another possible result of a severely worn frog point, especially when coupled with a worn or loose guard rail, is that a railroad wheel may "hit" the point and climb to the wrong side of the frog. Also see Figure 28 for information about "depressed point" designs that may influence the measurement of a worn or broken frog point.

137(c) If the tread portion of a frog casting is worn down more than ⅜ inch below the original contour, operating speed over that frog may not be more than 10 m.p.h.

Guidance. This paragraph specifically refers to the amount of tread wear from the original contour of the casting. The original contour can be determined in a variety of ways depending upon the frog design.

The tread of the frog is considered to be any portion that is contacted by the tread of the wheel except for portion of the frog from the actual point to a position 6 inches back towards the heel [this area is addressed by §213.137(b)]. As shown in Figure 28, the measurements of the portion of the tread further back than the 6 inch position may be taken by placing a straightedge positioned longitudinal or transverse.

Figure 28 shows a rail bound manganese frog design with an actual frog point that is $^{3}/_{16}$ inch lower than the tread portion. A frog built without manganese (e.g., a frog composed of Tee rails called a bolted rigid frog) will have a point with a similar profile. Called a depressed point, the tread will taper up to the top of the rail profile in the direction toward the frog heel in a distance equal to one-half the frog number in inches, but not less than 5 inches.

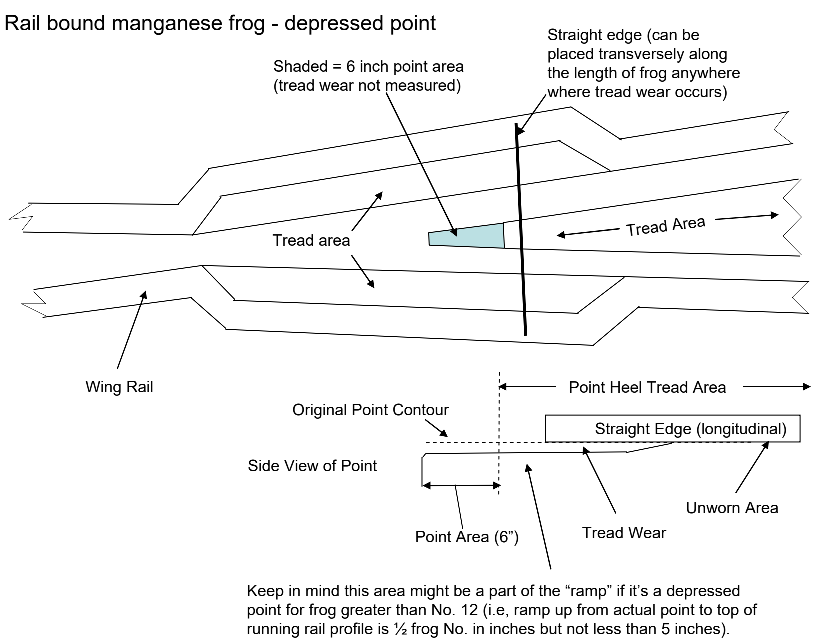


Figure 28

An alternate rail bound manganese or solid cast frog design includes a profile whereby the tread portion of the casting adjacent to a frog point is manufactured to a plane ⅛ inch above the top of the rail profile (wing wheel riser). See Figure 29. These design characteristics need to be considered when measuring tread wear as discussed below.

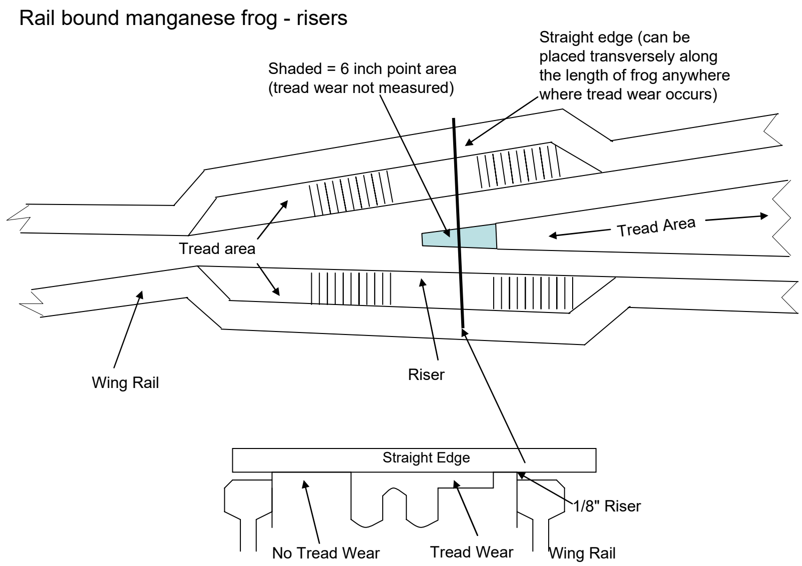


Figure 29

When measuring tread wear, the distance from the bottom of the straight edge to the worn tread at the riser is measured. Various types of gauges such as a folding leaf gauge with different degrees of taper or a wedge-type gauge may obtain this measurement. Tape measures are also frequently used to measure tread wear.

If the tread is worn more than ⅜ inch, the corresponding flangeway depth may also be reaching critical limits. Since the manganese insert is typically designed to be about 2 inches thick at the wall of the flangeway and about 1⅜ inches or less at the bottom of the flangeway, wear in this condemning range could result in structural failure of the frog.

Frogs frequently exhibit small spalling (pitting) in the tread. Usually, this type of spalling is not hazardous. Measurements of tread wear should be made over a length that is worn down due to abrasion or plastic flow of metal not at the bottom of small spalls. However, if the depression is of sufficient size to permit the tread of a wheel to follow that depression, tread wear should be measured at the depression.

To measure flangeway depth, place a straight edge across the frog at the area of concern. Measure the space between the underside of the straight edge to the bottom of the flangeway and the space between the underside of the straight edge and the tread. As shown in Figure 30, subtract the tread value from the flangeway value to obtain the actual flangeway depth.

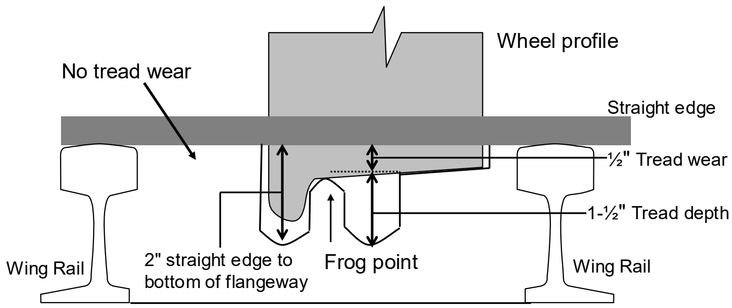


Figure 30

When a railroad wheel approaches the frog in the facing direction, the weight of the wheel is supported on the tread of the frog opposite the point until the wheel reaches the transition point, about 6 inches back from the actual point. At this location, the weight is transferred to the frog point.

137(d) Where frogs are designed as flange-bearing, flangeway depth may be less than that shown for Class 1 if operated at Class 1 speeds.

Guidance. This paragraph provides an exemption for an item of specialized track work that by design does not conform to the minimum flangeway depth requirements prescribed in paragraph (a) of this section. Called a flange-bearing frog, this technology is under consideration as a method of reducing impact loads at frogs. This design is a new concept for track above yard speeds but has been used extensively in light rail transit trackwork.

There are a number of frog designs in use throughout the industry and the most common types are rail bound manganese and bolted rigid (stiff). The special attributes of spring frogs are covered under §213.139. Conventional moveable point frogs are found at flat angle track crossings and slip switches (Figure 31). This type of movable point frog is similar to a switch because of its movable points that fit against a knuckle rail, which is like a stock rail.

In recent decades new technology movable frogs have been introduced in the Nation and there are two types - “swing nose” (Figure 32) and movable wing (Figure 33). Conventional movable point frogs and swing nose frogs are virtual switches; therefore there are no guard rails. As such, it is appropriate to use the applicable elements of §213.135 (Switches) in an inspection report when encountering defects in these movable point frogs. For example, a movable point that does not fit its knuckle rail properly would be covered under §213.135 (b) (each switch point shall fit its stock rail properly).

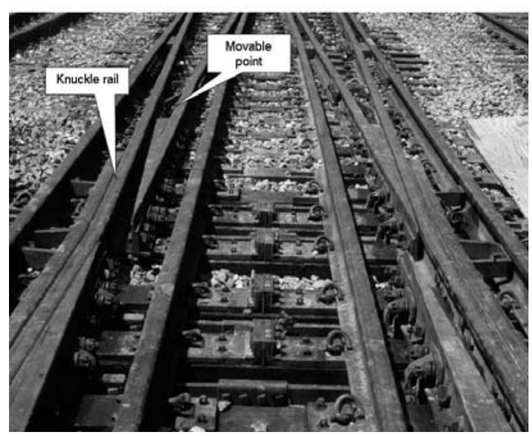


Figure 31

The movable wing rail type frog is similar to a spring frog but both wing rails are moved remotely in synchronization with the switch points. It is appropriate to use the applicable elements of §213.139 (Spring rail frogs) in an inspection report when encountering defects. Like above, when using any of the 139 series defect codes it is necessary to include defect code 213.133.20 - Turnout or track crossing fastenings not intact or maintained.

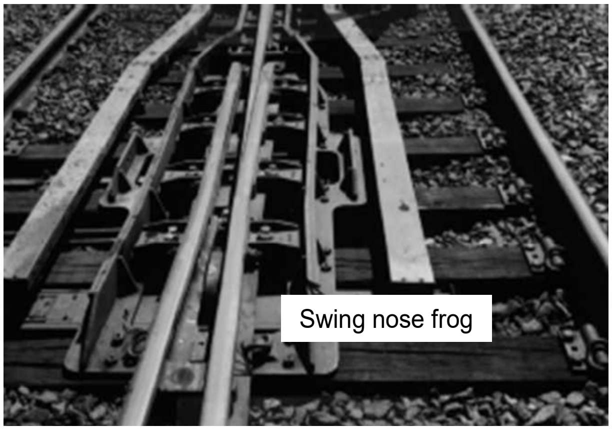


Figure 32

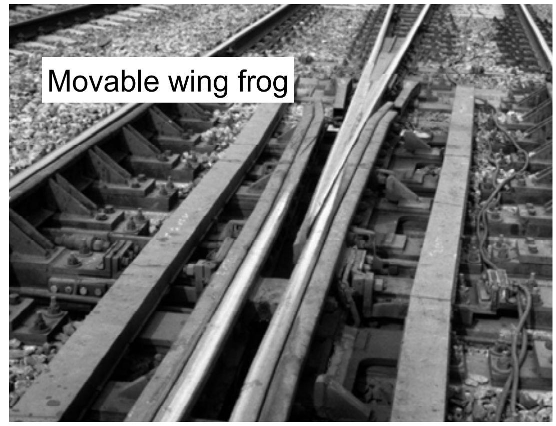


Figure 33

The following are the key elements to consider when inspecting new technology frogs:

- Bolting or fastener designs that fasten the movable point frog to concrete or timber switch ties are considered fasteners in the same manner as cut spikes. Fastenings are discussed under §213.127 of this manual. Bolts that connect movable frog components together are considered frog bolts and must be addressed by using defect code 213.133.12, Loose or missing frog bolts.
- Of paramount importance is a proper fit of the vee point rails against the wing rails on movable frogs. Inspectors must use their judgment to determine if the point fits the wing rail properly to allow wheels to pass the frog point. Movements of the wing rail must not adversely affect the fit of the frog point to the wing rail. When an Inspector encounters a condition on a movable frog which should be addressed on the inspection report and no existing code is available for that condition, defect code 213.137.99 will be acceptable with a full description of the condition in the inspection report.
- Unlike rail bound manganese frogs, the running surface of most, if not all, movable frogs are made of hardened rail. Inspectors must be aware that this rail may contain defects that require remedial action under §213.113. Asymmetrical rails found in some switch points and frogs must be closely examined during inspections, as this appears to be a potential weak spot where a crack or break could occur.
- When performing inspections, FRA Inspectors should discuss any concerns about an advanced turnout with appropriate railroad personnel. Inspectors should consult with the Regional Track Specialist to resolve any questions about the safety of these installations.

Guidance, General. The various types of frogs available for specific applications include bolted rigid, solid manganese, self-guarded, rail bound manganese, spring rail, movable point, cast, or swing nose. On rail bound manganese frogs, the normal wear pattern is in the manganese insert.

An Inspector, in addition to measurements described in the TSS, should see that a frog is supported throughout on well tamped and sound ties.

The requirements for flangeway depth in Paragraph (a) and the requirements for tread wear in Paragraph (c) also apply to crossing frogs. Since the designed flangeway depth is also 1⅞ inches, the safety concerns are therefore the same as excessive wear on the tread portion could result in a wheel flange striking the bottom of the flangeway and causing structural damage to the frog.

Inspectors must evaluate cracks or breaks in frog castings or rail defects in the non-running portion of wing rails in terms of their potential effect on the safe passage of rolling stock. In particular, when making the evaluation:

- The Inspector should determine if there is a loss or imminent loss of wheel guidance due to a loss of functional integrity.
- The Inspector should not consider cracks or breaks in a manganese frog casting that do not affect the safe passage of rolling stock to be a defective condition. If a severe crack, or a series of cracks, creates a condition where the breaking out of a piece of the casting is imminent, the use of defect code 213.137.99 should be considered. Cracks or wear that develop into a loss of functional integrity should be addressed by using defect code 213.137.02 or 213.137.03 which governs worn frog points and castings.
- Rail defects in the non-running portion of wing rails should be addressed by using defect code 213.137.99.

§213.139 Spring rail frogs

139(a) The outer edge of a wheel tread shall not contact the gage side of a spring wing rail.

Guidance. Inspectors must closely examine every spring rail frog encountered during an inspection. While spring rail frogs have been successfully used for many years, their unique design requires special maintenance attention to avoid derailment hazards to trailing point train movements on the main track. If a spring wing rail is higher than the top of a frog point, a hollow wheel (or false flange) of a wheel during a trailing move may push on the spring wing rail causing an extreme wide gage. While some spring frogs have a “relief” groove built into the frog for this purpose, Inspectors must be acutely aware of any signs of the gage side of a spring wing rail being struck by the outer edge of wheel treads.

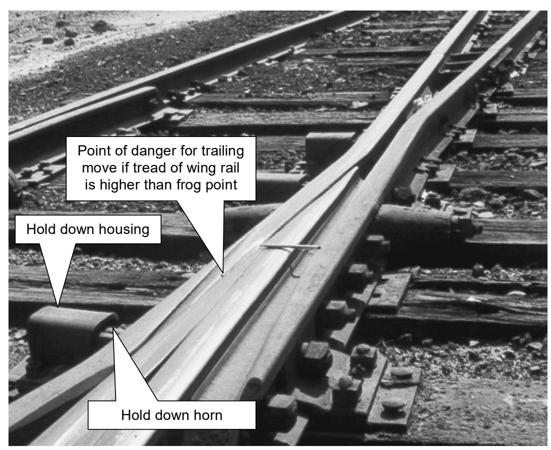


Figure 34

139(b) The toe of each wing rail shall be solidly tamped and fully and tightly bolted.

Guidance. The toe of each spring rail frog must be solidly supported, and proper hold-down housing clearance must be maintained to avoid excessive vertical movement of the wing rail. The first sign that this is occurring will be gouging on the gage corner of the wing rail behind the point of frog. Wheel gouging must not be confused with channeling in the spring wing rail that is incorporated at the time of manufacture to accommodate wheel tread transition.

If the toe is not solidly tamped and excessive horn and housing clearance exists, the wing rail may have vertical motion operating on the point rail in a trailing-point movement and the forces on the wing rail will cause the wing rail to move laterally, allowing the wheel to drop in at the throat of the frog.

139(c) Each frog with a bolt hole defect or head-web separation shall be replaced.

Guidance. Any bolt hole defect or head-web separation in a spring frog of any dimension constitutes a defect. This paragraph does not prescribe a corrective action other than "replacement."

139(d) Each spring shall have compression sufficient to hold the wing rail against the point rail.

Guidance. Typically, if a wing rail is up against the point it is an indication that the spring is holding it as intended. If there is a suspicion that there is insufficient compression in the spring, the railroad representative should determine its compliance.

139(e) The clearance between the hold-down housing and the horn shall not be more than ¼ inch.

Guidance. Since the spring wing rail is a movable part of a spring frog, it cannot be fastened down. The hold-down housing and a horn assembly prevents the wing rail from moving up higher than the top of the frog point. Figure 35 illustrates the proper method to determine if there is excessive space between the hold-down housing and the horn.

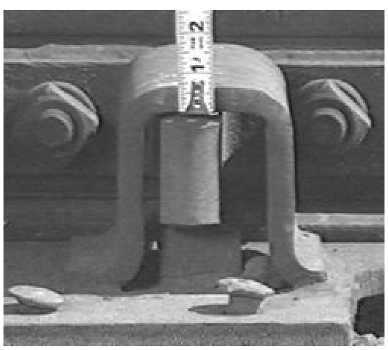


Figure 35

Guidance, General. Due to the unique design characteristics of spring frogs, turnouts with this type of appliance require special consideration in regard to guard rails. On the main track side of a turnout when trains are not "springing" the frog (by design) and operating on an unbroken path, an extra length guard rail assures a proper path for wheel sets.

A guard rail should be of sufficient length to cover the designed hinge length. This keeps wheels off the spring wing rail from the point where this rail is "hinged" through the frog throat and finally to the actual frog point.

While the TSS does not address this design concept, Inspectors should be aware of this attribute of spring frogs. If a guard rail is of insufficient length to cover the designed hinge length, any lateral wheel forces can cause significant problems. Specifically, the guard rail and other frog elements will quickly deteriorate, and in extreme circumstances, the wing rail can open while trains are moving through the main track side which can result in an unprotected wide gage. Inspectors should note on their inspection report any guard rail on a spring frog that is not of the proper length or installed in the improper position.

Another special consideration with regard to spring frogs is the longitudinal relationship between the spring wing rail and frog point. If a turnout has insufficient rail anchors to restrain longitudinal movement, the wing rail may not function properly. Evidence that longitudinal movement is occurring may be a gap between the wing rail and the frog point. Inspectors are reminded to refer to §213.133 (b) that requires Classes 3 through 5 track to be equipped with sufficient rail anchoring to restrict longitudinal rail movement. If longitudinal movement is observed because of insufficient anchors on Classes 1 and 2 track, Inspectors are encouraged to note this condition and inform the railroad.

Spring frogs are manufactured with a steel base plate. Attached to the base plate are clip plates, which are placed along the fixed side of the frog. The clip plates, which are shaped into a right angle, are attached to the base plate by bolts, welds, or both. Frog bolts are placed through the body of the frog and through the vertical portion of the clip plates and tightened. This holds the body of the frog to the clip plate assembly.

There are no gage holding fasteners along the movable side of the frog as they would interfere with the spring wing rail. Therefore, it can be seen that the frog bolts and clip plate assemblies acting together maintain alinement of the spring frog. Care should be taken to insure that frog bolts and clip plate bolts are in place and tight (defect code 213.133.12). Also check clip plates to see if welds are cracked or broken and check clip plates for cracks and breaks at the corner where the plate bends from horizontal to vertical. Where cracks or breaks in clip plates affect the fastening of the frog to the base plate use defect code 213.127.01 (insufficient fasteners).

In recent years, railroads have augmented the design of spring frog installations by the application of improved stops to limit the amount of movement of the spring rail. In addition, some frogs have been retrofitted with welded stops. Most stops are designed to allow the wing to open no more than 1⅞ to 2¼ inches. When stops are properly installed, the risk of trailing point derailments is reduced.

When spring frogs are equipped with the improved features such as relief grooves and stops, the Inspector should evaluate the condition of the components in order to ascertain that the improved features are functioning as intended.

When spring frog defects are found, the defective conditions must be repaired as soon as possible. Combinations of the defects are especially hazardous. The railroad must protect the movements over the frog with a speed restriction until the defects are repaired.

Spring frog defects are considered as non-class-specific defects (see §213.9) and, therefore, Inspectors must consider the circumstances involved in evaluating the remedial action taken by the railroad when spring frog defects are found. Inspectors should consider all spring frog defects as serious which must be repaired as soon as possible. In most circumstances, when it is evident that the outer edge of wheels are contacting the gage side of the wing rail or a combination of spring frog defects exist, Inspectors would expect that the railroad would implement a speed restriction.

Some spring frogs are equipped with retarders that reduce the impact of the wing on the point as the wing closes with each passing wheel in the diverging route. The retarders may hang, causing the wing to remain open. While the TSS does not address this design concept, Inspectors should still be aware of this attribute of spring frogs because it could lead to further degradation of frog components.

§213.141 Self-guarded frogs

141(a) The raised guard on a self-guarded frog may not be worn more than ⅜ of an inch.

Guidance. When examining self-guarded frogs, observe the condition of the frog point and where there is evidence of wear caused by wheel flanges contacting the frog point, take measurements to determine compliance with this section. To determine the amount of wear on a raised guard, measure the thickness at a portion where there is wear. Compare this measurement to a portion where there is no wear and the difference between the two is equivalent to the amount of wear.

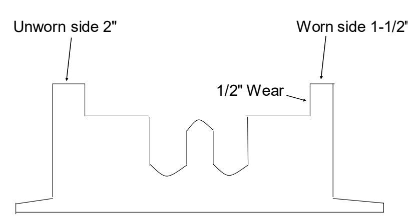


Figure 36

141(b) If repairs are made to a self-guarded frog without removing it from service, the guarding face must be restored before rebuilding the point.

Guidance. During repairs of a self-guarded frog, it is imperative that the raised guarding face is restored before the actual frog point. This precaution is necessary due to the potential for a wheel flange striking the frog point.

Self-guarded frogs are designed for use in low speed track and their use in tracks where speeds exceed 20 m.p.h. can result in excessive lateral forces such as wheels “kicking” or in extreme cases wheels climbing up the raised guard. The TSS does not prohibit the use of self-guarded frogs in any class of track; however, Inspectors are encouraged to inform a railroad of the potential for problems that may occur if a self-guarded frog is found in a track where speeds exceed 20 m.p.h.

§213.143 Frog guard rails and guard faces; gage

The guard check and guard face gages in frogs must be within the limits prescribed in the following table:

Class of track	*Guard check gage* *The distance between the gage line of a frog to the guard line [1] of its guard rail or guarding face, measured across the track at right angles to the gage line [2], may not be less than*	*Guard face gage* *The distance between guard lines [1], measured across the track at right angles to the gage line [2], may not be more than*
1	*4' 6⅛"*	*4' 5¼"*
2	*4' 6¼"*	*4' 5⅛"*
3 & 4	*4' 6⅜"*	*4' 5⅛"*
5	*4' 6½"*	*4' 5"*
[1] A line along that side of the flangeway which is nearer to the center of the track and at the same elevation as the gage line. *[2] A line ⅝ inch below the top of the centerline of the head of the running rail or corresponding location of the tread portion of the track structure.*		

Table 13

Guidance. A guard rail is installed parallel to the running rail opposite a frog to form a flangeway with the rail and to hold wheels of equipment to the proper alinement when passing through the frog.

A guard rail must be maintained in the proper relative position to the frog in order to accomplish its critical intended safety function. Inspectors should examine guard rails carefully to see that they are adequately fastened, and when measuring guard rail gage, fully consider any movement of guard rail or frog under traffic conditions.

This section clearly specifies allowable tolerances for guard check and guard face gage for various classes of track.

When measuring guard check gage, it is important to consider the path of wheels through the frog because the function of a guard rail is to keep wheel flanges from striking the actual frog point. As reference, standard check gage on a railroad wheel set is approximately 54½ inches (see Figure 37 for approximate design check gage values). While the TSS minimum guard check gage is less than wheel check gage in lower classes of track, the condition of the actual frog point in relation to the path of wheels through a frog is a good indicator of the effectiveness of a guard rail.

The critical area where guard check gage must be measured is at the actual point of frog. Inspectors must also consider any unusual wear that may exist at the actual frog point and position the track gauge or other measuring device accordingly.

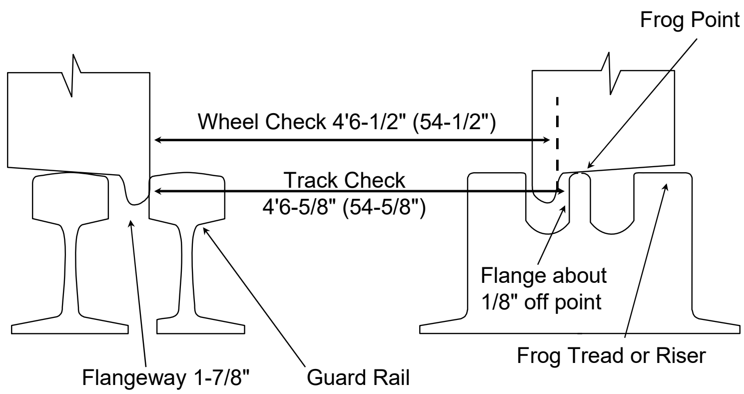


Figure 37

When measuring guard check gage, dynamic lateral movement of the guard rail and/or frog shall be considered. In the case of a frog that is moving laterally under train movement (floating), it is important to consider the most restrictive measurement. Specifically, if measuring guard check gage in a turnout where the frog can move toward the track being measured due to train movement on the other track, that dynamic frog position would be considered. See Figure 38.

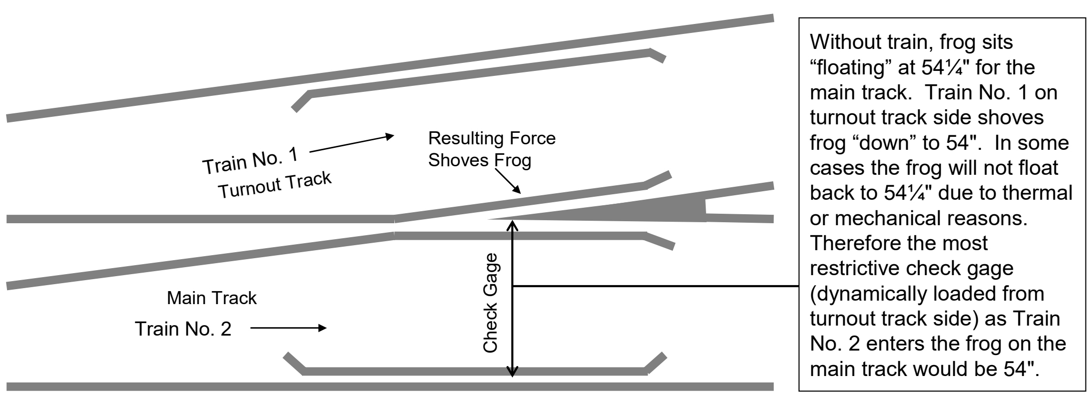


Figure 38

In severe cases where a frog is severely floating (moving laterality under load), and there is an accompanying condition (i.e., deteriorated crossties or ineffective fasteners), FRA Inspectors should cite the defect or recommend a civil penalty for the accompanying condition (i.e., §§213.109 (Crossties) or 213.127 (Rail fastenings)).

Face gage is a dimension that becomes critical when the distance between two opposing guard rails, or a guard rail and a frog wing rail, become larger than the distance between the back of wheel sets. This would occur by improper installation or a condition such as a severe alinement defect. Normally, face gage would be measured in the same vicinity as check gage. However, Inspectors should consider measuring face gage at other points in special trackwork where there may be an indication that wheels are being "pinched." For general reference, Figure 39 illustrates approximate design face gage values.

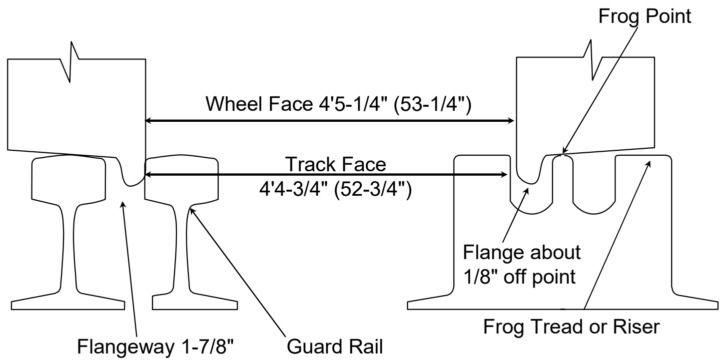


Figure 39

Broken guard rails occur infrequently, since they do not support the vertical wheel loads of passing trains. When evaluating a crack or break in a guard rail, the Inspector should be aware that cracks or breaks exist which do not affect the ability of the guard rail to function as intended. If the integrity of the guard rail is affected, the Inspector will cite the defect using defect code 213.143.03, Cracked or broken guard rail.

There are many different types and designs of frog guard rail designs. Some guard rail plates are recessed to seat the running rail, while others are flat. Some guard rail plates are punched with spike-hole slots; others are not. Other guard rails are bolted to the running rail. On some railroads, it is normal practice not to spike the gage side of the running rail through the guard rail area while some guard rail plates do not have holes punched for this purpose. FRA has no record of serious safety problems that have developed as a result of not spiking the running rail through the guard rail area.

If encountering a problem where the running rail has moved laterally to create an unsafe condition, the Inspector should use insufficient fasteners defect code 213.127.01. Inspectors should discuss unique situations with their Regional Track Specialist.

While not a requirement of the TSS, guard rails have a straight portion that guides wheels through the area from the "throat" to the actual frog point. If Inspectors find a guard rail where the straight portion does not encompass this area, Inspectors should bring this to the attention of the railroad. Figure 40 illustrates the proper measurement points to determine check/face gage compliance and shows the proper longitudinal relationship between a guard rail and frog point.

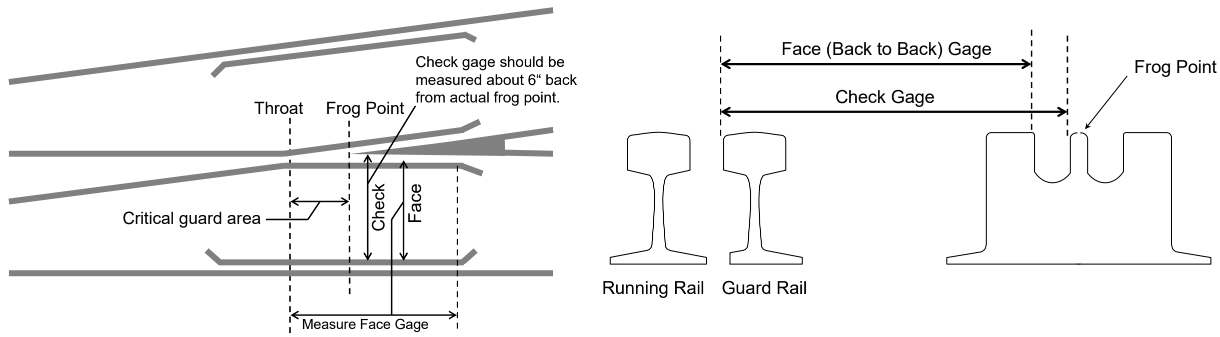

Check gage should be measured about 6" back from actual frog point.
Throat
Frog Point
Critical guard area
Check
Face
Measure Face Gage
Face (Back to Back) Gage
Check Gage
Frog Point
Running Rail
Guard Rail

Figure 40

Subpart E - Track Appliances and Track - Related Devices

§213.201 Scope

This subpart prescribes minimum requirements for track appliances and track-related devices.

§213.205 Derails

205(a) Each derail shall be clearly visible.

Guidance. The TSS requires derails to be clearly visible. While the TSS does not specify a color derails are to be painted, they must be visible to railroad employees, and a derail dark in color and obscured by vegetation would not be in compliance.

205(b) When in a locked position, a derail shall be free of lost motion which would prevent it from performing its intended function.

Guidance. Inspectors will need to determine the extent of movement due to worn parts or improper adjustment, if any, and determine if such movement renders the derail ineffective.

205(c) Each derail shall be maintained to function as intended.

Guidance. Derails are of various designs and may be of the following types: switch point, spring switch point, sliding, hinged, and portable.

Derails can be operated by various means: electrical, hand throw, lever, and mechanical rod from a point other than at the derail. They should be installed to derail rolling stock in a direction away from the track or facility to be protected.

In addition to the requirements of this section, a switch point type derail must also comply with the requirements of §213.133 [turnouts generally] and §213.135 [switches].

205(d) Each derail shall be properly installed for the rail to which it is applied. [This paragraph (d) is applicable September 21, 1999.]

Guidance. Derails must be the proper size for the rail to which it is applied. Derails are manufactured to “sizes” based on the rail section to which they are to be applied and should be installed according to the manufacturer’s instructions. Installation of a derail of incorrect size can make a derail ineffective. Inspectors may use derail manufacturer instructions and specification as a guide to determine if a derail is properly installed (correct size for the rail to which it is applied).

Derails are made by “hand” (right or left) to derail equipment to a specific side of the track. In addition, “universal” derails will derail equipment in either direction. A derail that is installed to derail equipment toward a main track that should otherwise be protected would constitute an improperly installed derail. A “hand” derail placed in the wrong direction would also constitute an improperly installed derail.

Subpart F - Inspection

§213.231 Scope

This subpart prescribes requirements for the frequency and manner of inspecting track to detect deviations from the standards prescribed in this part.

§213.233 Track inspections

233(a) All track shall be inspected in accordance with the schedule prescribed in paragraph (c) of this section by a person designated under §213.7.

> **Guidance**. Recognizing that proper inspection of track is essential to safe maintenance, Subpart F contains the minimum requirements for the frequency and manner of inspecting track. Inspectors should know that a track owner may exceed the TSS in the interest of good practice, but they cannot be less restrictive. FRA's track safety program success is dependent upon the adequacy of the railroad's inspection efforts and subsequent maintenance program. Monitoring and assessing a railroad's track condition, through regular inspections, is integral to our safety success.

233(b) Each inspection shall be made on foot or by riding over the track in a vehicle at a speed that allows the person making the inspection to visually inspect the track structure for compliance with this part. However, mechanical, electrical, and other track inspection devices may be used to supplement visual inspection. If a vehicle is used for visual inspection, the speed of the vehicle may not be more than 5 miles per hour when passing over track crossings and turnouts, otherwise, the inspection vehicle speed shall be at the sole discretion of the Inspector, based on track conditions and inspection requirements. When riding over the track in a vehicle, the inspection will be subject to the following conditions --

(1) One Inspector in a vehicle may inspect up to two tracks at one time provided that the Inspector's visibility remains unobstructed by any cause and that the second track is not centered more than 30 feet from the track upon which the Inspector is riding;

(2) Two Inspectors in one vehicle may inspect up to four tracks at a time provided that the Inspectors' visibility remains unobstructed by any cause and that each track being inspected is centered within 39 feet from the track upon which the Inspectors are riding;

(3) Each main track is actually traversed by the vehicle or inspected on foot at least once every two weeks, and each siding is actually traversed by the vehicle or inspected on foot at least once every month. On high density commuter railroad lines where track time does not permit an on track vehicle inspection, and where track centers are 15 foot or less, the requirements of this paragraph (b)(3) will not apply; and

(4) Track inspection records shall indicate which track(s) are traversed by the vehicle or inspected on foot as outlined in paragraph (b)(3) of this section.

> **Guidance**. This paragraph specifies the number of additional tracks that can be inspected. Depending upon whether one or two qualified railroad inspectors are in the vehicle, and depending upon the distance between adjacent tracks (30 or 39 feet, measured between track centerlines), a track owner's railroad inspectors may inspect multiple tracks (up to four) from hi-rail vehicles. Tracks obstructed from their view by tunnels, differences in ground level, railroad rolling stock, etc., cannot be included in the inspection record. Section 213.233(b)(3) requires each main track to be traversed at least once every two weeks and a siding traversed at least once every month. Track inspection records, under §213.241, must indicate which track(s) are traversed in accordance with paragraph (b)(3).

233(c) Each track inspection shall be made in accordance with the following schedule:

Class of Track	Type of Track	Required Frequency
Excepted track and *Class 1, 2, and 3 track*	*Main track and sidings*	Weekly *with at least 3 calendar days interval between inspections, or* before use*, if the track is used less than once a week, or* twice weekly *with at least 1 calendar day interval between inspections, if the track carries passenger trains or more than 10 million gross tons of traffic during the preceding calendar year.*
Excepted track and *Class 1, 2, and 3 track*	*Other than main track and sidings*	Monthly *with at least 20 calendar days interval between inspections.*
Class 4 and 5 track	………	Twice weekly *with at least 1 calendar day interval between inspections.*

Table 14

Guidance. A geometry car inspection will not be considered acceptable for meeting the required inspection frequency specified by §213.233(c), unless a waiver allowing this substitution is in effect.

Section 213.233(c), specifies the minimum frequency at which inspections must be conducted. For purposes under §213.233(c) and outlined in the frequency schedule, “main track” is defined as “a track, other than an auxiliary track, extending through yards and between stations.” A siding is defined as “an auxiliary track for meeting or passing trains.” Section 213.233(c) also links inspection frequencies to the amount of annual tonnage, presence of passenger trains, and speed according to track class. A railroad’s change in the designation of a track to “other than main track” in its timetable and/or special instructions may not necessarily permit a railroad to reduce track inspection frequency. If the traffic remains essentially the same, the station designations remain, or if the method of operations continue the same, the track will be considered a main track with respect to the TSS. In addition, if any main track type operating rules or procedures are applicable to a track in question, FRA will consider such a track as a main track under the TSS. This would be the case even if the railroad uses the term such as spur, lead, running, etc. to describe the track in question. (Source: Letter dated July 10, 1991, from FRA Associate Administrator for Safety to Union Pacific Railroad.)

Each railroad inspection performed in accordance with the schedule prescribed in paragraph (c) must be made on foot or by riding over the track in a vehicle at a speed that allows the person making the inspections to visually inspect the track structure for compliance. An inspection made from a vehicle driven alongside the track does not constitute an inspection performed at the required frequency. The railroad may make additional inspections using other inspection methods provided that these inspections are not used to comply with frequency requirements prescribed in Section 213.233.

Inspecting after dark is in compliance with the requirements of §213.233, Track inspections, as long as the railroad inspector is capable of detecting defects. As an example, inspections are routinely made in tunnels with limited or no lighting, and maintenance requirements may require inspections after daylight hours. Appropriate artificial lighting is required for an inspector to conduct a valid inspection.

When FRA Inspectors are conducting inspections from a hi-rail vehicle, only the track occupied will be recorded on the F 6180.96 form [hi-rail main track (MTH) or hi-rail yard track (YTH)]. When conducting a walking inspection, multiple tracks may be inspected and counted as units on the F 6180.96 form. It is recognized that walking inspections reveal more defective conditions than hi-rail inspections. Therefore, FRA Inspectors may include multiple tracks while conducting walking inspections. Inspectors will use good judgment in insuring a high quality inspection while conducting walking inspections.

For the purposes of the application of inspection intervals, a week is defined as a period of seven days, Sunday through Saturday. This is the accepted standard definition and emphasized here to avoid confusion when the railroad changes the starting and ending days of a week from inspector to inspector or from territory to territory. Classes 1 through 3 track require a weekly inspection with at least three calendar days interval between inspections, or before use, if the track is used less than once a week; or twice weekly with at least one calendar day interval between inspections, if the track carries passenger trains or more than 10 million gross tons of traffic during the preceding calendar year.

When a railroad operates seasonal or irregular passenger service, it is expected that the twice weekly inspection will be conducted during those periods. A railroad will be considered to be in compliance if the twice weekly inspection occurs the week before and the week or weeks that the passenger trains are operated. If a one time infrequent or seasonal passenger train movement occurs only on one day of a week, the twice weekly inspection the prior week and one [*] inspection the week of the movement is adequate.

[*] If the scheduled passenger train is to operate on one day only, at an interval during the week that does not allow for the two required inspections prior to that movement, then the one inspection for the week must occur before the movement.

233(d) If the person making the inspection finds a deviation from the requirements of this part, the Inspector shall immediately initiate remedial action.

Note: to §213.233. Except as provided in paragraph (b) of this section, no part of this section will in any way be construed to limit the Inspector's discretion as it involves inspection speed and sight distance.

Guidance. To assure that railroads are providing proper inspections at the required frequency, Inspectors must periodically examine the railroad's inspection records (noting record keeping type defects under §213.241 only). By reviewing the track owner's inspection procedures and records, or through personal observations, Inspectors will determine the number of tracks being inspected, the number of railroad inspectors performing inspections, the specific tracks inspected, and whether the railroad inspector actually traversed the track by vehicle or on foot. As specified in this section of the TSS, the track owner must assure all tracks are inspected in accordance with the prescribed schedule. Failure of the owner to comply with this schedule may constitute a violation.

If a track owner's qualified person, designated under §213.7, finds a deviation from the TSS and fails to immediately initiate proper remedial action, the failure may constitute a violation. FRA track inspections do not constitute a required track inspection under the TSS. FRA inspections assess a railroad's compliance with Part 213. Inspectors will review a track owner's inspection records to learn if these records reflect the actual conditions of the track structure under train operations.

Turnouts and track crossings visually inspected from a vehicle must be accomplished at a speed not exceeding 5 m.p.h. A vehicle's speed will be at the sole discretion of the operator and is based upon track conditions, inspection requirements, operating rules, and other circumstances that may vary from day to day and location to location. Nothing in the TSS precludes an inspection from a train or engine as long as the overall effectiveness of the inspection is not compromised and the person is able to visually inspect the track structure for compliance with this part. However, examining track while simultaneously operating a locomotive shall not be considered as an inspection under the TSS. The person must have the ability to stop movements to make a close examination of any possible track defect.

Deviations found under §213.233 are those observed in the field as opposed to the §213.241 record keeping requirements, which are normally reviewed at a track owner's corporate or division offices. Inspectors may also monitor other railroad records such as dispatcher or control operator's record of track authorities conveyed and speed restrictions placed to confirm that inspections were made and proper remedial actions were taken.

Classes 1 through 3 track require a weekly inspection with at least three calendar days interval between inspections, or before use, if the track is used less than once a week; or twice weekly with at least one calendar day interval between inspections if the track carries passenger trains or more than 10 million gross tons of traffic during the preceding calendar year.

§213.235 Inspection of switches, track crossings, and lift rail assemblies or other transition devices on moveable bridges

235(a) Except as provided in paragraph (c) of this section, each switch, turnout, track crossing, and moveable bridge lift rail assembly of other transition device shall be inspected on foot at least monthly.

Guidance. Paragraph (a) prescribes the frequency and method of inspection for switches, turnouts, track crossings, and moveable bridge lift rail assemblies or other transition devices by a track owner's qualified persons. By examining records and conducting field investigations, FRA Inspectors can confirm the track owner's on foot inspection of each switch, turnout, track crossing, and movable lift bridge rail assembly at least monthly.

235(b) Each switch in Classes 3 through 5 track that is held in position only by the operating mechanism and one connecting rod shall be operated to all of its positions during one inspection in every three month period.

Guidance. Each switch, in Classes 3 through 5 track, that is held in normal or reverse position by only one connecting rod is required to be operated (thrown) in all its positions during one track inspection by the track owner in every three month period. An example of a switch that has more than one connecting rod is a switch that also has a lock rod. A rod connecting a switch to a switch circuit controller (point detector) is not considered to be a rod that holds a switch in position. This requirement is designed to emphasize the importance of these non-redundant mechanisms. Thorough inspection is best accomplished by operating the switch mechanism to allow for a comprehensive inspection of these components. Inspectors should observe the various switch components, determine their functional design, and assess missing components that are integral to safe operation. If the proper operation of the points is in doubt, Inspectors should use the appropriate codes under §213.133. The phrase "all positions" is intended to cover slip and lap (three-way) switches.

235(c) In the case of track that is used less than once a month, each switch, turnout, track crossing, and moveable bridge lift rail assembly or other transition device shall be inspected on foot before it is used.

Guidance. "Lift Rails" have unique properties and functions. This discussion will focus on cast manganese alloy types of lift rail assemblies that provide a transition between a fixed span and a movable span on lift bridges, swing bridges, and bascules. Lift rails are made of three pieces for swing bridges: a section on the fixed span, a section on the movable span, and the rocker.

Figure 41

Analogous to a rail in some respects, a manganese lift rail provides a running surface and it is also similar to a rail joint in that it joins rails at the ends of bridge spans. It is made of manganese alloy, and it has the appearance of a frog.

Manganese lift rails have tapered sections to reduce shock. The design provides for the transfer of wheels to take place on one span, rather than between spans. Track and bridge maintenance personnel familiar with manganese steel lift rails point out that cracks generally progress slowly.

Railroad maintenance officials advocate proper maintenance to prevent or reduce cracking of manganese lift rails. Because there is deformation of manganese over time, they recommend that metal flow be ground at the wheel contact point to reduce or prevent cracks. Railroad maintenance personnel also emphasize that the bridge itself can aggravate wear and deterioration of manganese steel lift rails when the bridge needs to be adjusted or repaired. The condition of the bridge ties, for example, is an important factor in the maintenance of these of such assemblies.

Policies regarding speeds on manganese lift rails are set by each railroad. Some railroads require a 25 m.p.h. maximum speed on all lift rails regardless of condition. Further reductions of train speeds should be placed when the lift rails deteriorate to prohibitive levels. In deciding to place a speed restriction or remove a lift rail from service, railroads consider a wide range of factors including the amount of traffic, bridge condition, and the condition of the lift rail itself.

Conclusions:

- When evaluating the safety of a manganese lift rail assembly, Inspectors must consider that crakes in manganese casting are known to propagate slowly. Although cracks are known to propagate slowly, cracks can be more hazardous under certain bridge conditions, such as a deteriorated deck. Inspectors are cautioned against citing §213.113 (Defective rails), to describe cracks in the manganese casting running surface of the manganese lift rail appliance.
- Specific concerns about the safety of a manganese steel lift rails must be immediately brought to the attention of an appropriate railroad manager and discussed with the Regional Track Specialist.

Guidance, General. Inspections conducted from a vehicle are not considered sufficient to determine compliance. Therefore, each switch, turnout, track crossing, and lift rail assembly or other transition device on moveable bridges will be inspected by a walking inspection before FRA Inspectors can consider a unit (activity) inspected, as outlined in Chapter 2 of this manual.

§213.237 Inspection of rail

*237(a) In addition to the track inspections required by §213.233, a continuous search for internal defects shall be made of all rail in Classes 4 through 5 track, and Class 3 track over which passenger trains operate, at least once every 40 million gross tons (mgt) or once a year, whichever interval is shorter. On Class 3 track over which passenger trains do not operate such a search shall be made at least once every 30 mgt or once a year, whichever interval is longer. ** [This paragraph (a) is effective January 1, 1999.]*

Guidance. The inspection frequency requirements stated in this paragraph consider both the passage of time and the accumulated tonnage since the last inspection. Several methods are employed by railroads to estimate tonnage, but they are only estimates and cannot be considered as precisely accurate. In addition, scheduling of rail detection cars is influenced by many factors such as the availability of equipment if the service is contracted, equipment failures or various other scheduling problems, which may arise.

For Class 3 track over which only freight operations are conducted the date of the most recent inspection will define the beginning of a new inspection cycle and before the expiration of time or tonnage limits, whichever is longer, an inspection for internal rail defects must be conducted. For Classes 4 and 5 track, and Class 3 track over which passenger trains operate, the date of the most recent inspection will define the beginning of a new inspection cycle and before the expiration of time or tonnage limits, whichever is shorter, an inspection for internal rail defects must be conducted.

Language in §213.237(a) refers to §213.233 (Track inspection) indicating that many rail, defects as well as conditions caused by wear or damage, cannot be visually discovered. These require an internal search by a detector car or other specialized detection equipment.

Some railroads have elected to perform more internal rail inspections than required under the TSS, with intervals between tests typically ranging from 20 to 30 MGTs or between 20 and 30 days. These typical intervals define a good baseline for generally accepted maintenance practices, and the industry’s rail quality managers consider these limits as points of departure for adjustment of test schedules to account for the effects of specific track characteristics, maintenance, traffic, and weather.

The annual test requirement for Classes 4 and 5 track and Class 3 track over which passenger trains operate is based on risk factors associated with freight train speeds and passenger train operations.

Selecting an appropriate frequency of rail testing is a complex task involving many different factors which include but not limited to, temperature differential, curvature, residual stresses, rail sections, cumulative tonnage, and past rail test results. Taking into consideration all of the above factors, FRA’s research suggests that 40 MGTs is the maximum tonnage that should be hauled between rail tests and still allow a safe window of opportunity for detection of an internal rail flaw before it propagates in size to a service failure. Furthermore, FRA’s Accident/Incident data points to a need for inclusion of all Class 3 trackage in a railroad’s rail testing program. The requirement states that Class 3 track, over which passenger trains do not operate, should be tested once a year or once every 30 MGTs, whichever is longer.

237(b) Inspection equipment shall be capable of detecting defects between joint bars, in the area enclosed by joint bars.

Guidance. The equipment used must be capable of detecting defects in the joint area as well as in the body of the rail. Two separate systems may be used to meet this requirement provided that each is used before the expiration of the time or tonnage limits as required by this section.

237(c) Each defective rail shall be marked with a highly visible marking on both sides of the web and base.

Guidance. Each defective rail must be marked with a highly visible marking on both sides of the web and base to prevent reuse of the rail. A defect's identity and control numbers are not required on the web and base, but may be used by a railroad for inventory purposes. Inspectors should be aware that rail with certain defects, such as a bolt hole crack, may have the defective portion "cropped" and the remaining portion placed back in service. The track owner may remove defect markings from the non-defective portion of such rail.

*237(d) If the person assigned to operate the rail defect detection equipment being used determines that, due to rail surface conditions, a valid search for internal defects could not be made over a particular length of track, the test on that particular length of track cannot be considered as a search for internal defects under §213.237(a). ** (This paragraph (d) is not retroactive to tests performed prior to September 21, 1998).*

Guidance. This paragraph and paragraph (e) address a situation where a valid search for internal rail defects could not be made because of rail surface conditions. Several types of technologies are presently employed to continuously search for internal rail defects, some with varying means of displaying and monitoring search signals. A continuous search is intended to mean an uninterrupted search by whatever technology is being used, so that there are no segments of rail that are not tested. If the test is interrupted (e.g., as a result of rail surface conditions that inhibit the transmission or return of the signal) then the test over that segment of rail is not valid because it was not continuous. Therefore, a non-test is not defined in absolute technical terms. Rather, the provision leaves this determination to the rail test equipment operator who is uniquely qualified on that equipment. Paragraph (d) is not retroactive to tests performed prior to September 21, 1998.

237(e) If a valid search for internal defects cannot be conducted for reasons described in paragraph (d) of this section, the track owner shall, before the expiration of time or tonnage limits;

(1) Conduct a valid search for internal defects;

(2) Reduce operating speed to a maximum of 25 miles per hour until such time as a valid search for internal defects can be made; or

(3) Remove the rail from service.

Guidance. This paragraph specifies the three options available to a railroad following a non-test due to rail surface conditions. These options must be exercised prior to the expiration of time or tonnage limits specified in the paragraph (a) of this section. If doubts exist concerning a defective rail's disposition, Inspectors should review the track owner's records, under §213.241(c). When conducting a records inspection, Inspectors will determine that the requirements of §§213.113(a)(2) and 213.237(e), are in compliance and have determined that valid inspections have occurred. The expiration of time and tonnage must be determined before any compliance action is taken.

Broken rails continue to be one of the leading causes of train accidents. Inspectors should examine records to assure railroad internal rail inspection frequency compliance and should be alert during track inspections to any rail that is marked as defective. During accident investigations where a broken rail is a factor, Inspectors should provide complete information on type of defects, results of last rail inspection, type of inspection equipment used, track usage since last inspection, and accumulated tonnage on that rail. See the guidance under §213.237(d) for a discussion of the situation where a valid search for internal rail defects could not be made because of rail surface conditions.

§213.239 Special inspections

In the event of fire, flood, severe storm, or other occurrence which might have damaged track structure, a special inspection shall be made of the track involved as soon as possible after the occurrence and, if possible, before the operation of any train over that track.

Guidance. This section is general in nature because it is not practical to specify all the conditions that could trigger a special inspection, nor the specific manner and timing. This section is not meant to imply that train operations must necessarily stop until the special inspection is made. However, all special inspections should be conducted for the primary purpose of determining whether the track structure is safe for the continued operation of trains. Inspectors are directed to review the significant impacts to railroad operations in regard to storms as discussed in any applicable safety advisory.

Because a number of train derailments have been caused by unexpected track damage from moving water in the past, the FRA deemed it appropriate to issue Safety Advisory 97-1 which recommends procedures that reflect effective industry practices for special track inspections. The procedures consist of:

(1) Prompt notification to dispatchers of expected bad weather;

(2) Limits on train speed on all track subject to flood damage, following the issuance of a flash flood warning, until a special inspection can be performed;

(3) Identification of bridges carrying Class 4 or higher track that are vulnerable to flooding and over which passenger trains operate;

(4) Availability of information about each bridge, such as identifying marks, for those who may be called to perform a special inspection;

(5) Training programs and refresher training for those who perform special inspections; and

(6) Availability of a bridge maintenance or engineering employee to evaluate the railroad track inspector's findings.

Although the advisory contains a sample list of sudden events that routinely occur in nature, this provision is not limited to only the occurrences listed or to only natural disasters. Section 213.239 addresses the need to inspect after "other occurrences" which include such natural phenomena as temperature extremes, as well as unexpected events that are human caused (e.g., a vehicle that falls on the tracks from an overhead bridge, a water main break that floods a track roadbed, or terrorist activity that damages track). This interpretation is not new; FRA has always viewed this section to encompass sudden events of all kinds that affect the safety and integrity of track.

Inspectors should determine the procedures that have been established by the railroad to comply with §213.239, mindful that advisory procedures are not mandatory. Procedures should include the method employed by the railroad to receive information on severe weather (e.g., who receives the information and what is done with that information). When the railroad is notified of a possible track damaging occurrence, a special inspection must be made. A track owner may designate any official to be responsible for making a determination on whether a special inspection, under §213.239, is required. The designation is not limited to any certain craft, but the official must be trained and qualified to assure a proper inspection was conducted. The TSS do not require railroads to keep written records of special inspections, and so FRA Inspectors will not have any such records to determine railroad compliance with this section. As a result, FRA Inspectors should look to other sources (e.g., train dispatcher hi-rail occupancy records) to determine compliance.

§213.241 Inspection records

241(a) Each owner of track to which this part applies shall keep a record of each inspection required to be performed on that track under this subpart.

Guidance. Each track owner is required to keep a record of each inspection according to the requirements under §§213.4, 213.119, 213.233, and 213.235. Each inspection report under these sections must be prepared on the day of inspection and signed by the person making the inspection.

The track owner may develop any form that meets the requirements of the TSS. If the owner requires inspections at more frequent intervals than specified by §213.233(c), then the only requirement is to prepare and maintain an inspection record to comply with the minimum inspection frequency. This section is explicit concerning the required information contained in the inspection records. They must specify the track inspected [including the provisions under §213.233(b)(3)], date of inspection, location and nature of any defect, and the remedial action taken by the person making the inspection. Railroad inspection reports are required to reflect the actual conditions, as they exist in the track structure. The railroad inspector must include the specific measurement of the track parameter, whenever appropriate, when describing the nature of the defect per §213.241(b). For example: “wide gage exceeds allowable for Class 4 track - 58 inches - track slow ordered to 10 m.p.h.” When defects are discovered, the track owner’s inspectors and immediately initiate remedial action, in accordance with §213.5. If a speed restriction is used as remedial action, the reduced speed should be shown in the inspection records.

Railroad track inspectors are required to list all deviations from the TSS on their inspection record. FRA Inspectors should review railroad inspection records to determine if the reported data accurately reflects the track conditions, as they exist in the field. Railroad inspectors are not limited to recording deviations from the TSS (e.g., railroad maintenance items). FRA Inspectors should compare the defects they find with the railroad inspectors reports to determine the level of compliance with the railroad’s inspection program. If multiple tracks are being inspected, the records must designate the track(s) traversed, and any tracks not inspected due to visibility obstruction or excessive distance as required under §213.233.

When two qualified persons inspect multiple tracks in accordance with §213.233(b), one report or two reports may be optionally prepared. If one report is used, the report must include a notation such as signature, initials or printed name of the second inspector.

Rail inspection records must be maintained by the track owner for at least two years after the inspection and for one year after the last remedial action is taken. The record must specify the location and nature of any rail defects found through internal inspection and the remedial action taken and the date thereof. This record may consist of log sheets combined with a standard rail defect and change out report, computer records, or other data kept by the track owner and containing all the required information.

The rail inspection records must specify the locations of any rail that, due to rail surface conditions, prohibit the railroad from conducting a valid search for internal defects at the required frequency. If a valid search cannot be conducted before the time or tonnage frequency expires, the remedial action and date of remedial action must be recorded on the inspection records.

241(b) Each record of an inspection under §213.4 [excepted track], §213.119 [continuous welded rail], §213.233 [inspections], and §213.235 [switch & crossing inspections] shall be prepared on the day the inspection is made and signed by the person making the inspection. Records shall specify the track inspected, date of inspection, location and nature of any deviation from the requirements of this part, and the remedial action taken by the person making the inspection. The owner shall designate the location(s) where each original record shall be maintained for at least one year after the inspection covered by the record. The owner shall also designate one location, within 100 miles of each state in which they conduct operations, where copies of records which apply to those operations are either maintained or can be viewed following 10 days notice by the Federal Railroad Administration.

Guidance. FRA has added §213.119 to the list of sections in paragraph (b), thereby requiring that inspections of joints made pursuant to §213.119 comply with the inspection record requirements found in §213.241(b).

In reviewing compliance with this section, Inspectors should determine if the track owner is properly recording the location and date when each switch that is held in position only by the operating mechanism and a connecting rod are operated in every three month period [(§213.235(c)]. In addition, the record should reflect when each siding was actually traversed by a vehicle or on foot at the required frequency [§213.233(c)].

The regulation allows railroads to designate a location within 100 miles of each state (designated locations) where Inspectors can view records. Inspectors are required to give 10 days advance notice before conducting the record keeping inspection of designated locations. The regulation does not require the railroads to maintain the records at these designated locations, only to be able to provide viewing of them at the locations within 10 days after notification. The TSS stipulates locations within 100 miles of each state, rather than locations in each state, to accommodate those railroads whose operations may cross a state's line by only a few miles. In those cases, the railroad could designate a location in a neighboring state, provided the location is within 100 miles of that state's border. Records must be kept for at least one year after the inspection covered by the report. It is appropriate for the Inspector to expect all records will be available for inspection up to the date of notification.

241(c) Rail inspection records shall specify the date of inspection, the location and nature of any internal defects found, the remedial action taken and the date thereof, and the location of any intervals of track not tested per §213.237(d). The owner shall retain a rail inspection record for at least two years after the inspection and for one year after remedial action is taken.

Guidance. This paragraph requires a track owner to record any locations where a proper rail inspection cannot be performed because of rail surface conditions. Section §213.237(d), specifies that if rail surface conditions prohibit the railroad from conducting a proper search for rail defects, a test of that rail does not fulfill the requirements of §213.237(a) which requires a search for internal defects at specific intervals. Subsection (c) requires a record keeping of those instances.

(d) Each owner required to keep inspection records under this section shall make those records available for inspection and copying by the Federal Railroad Administration.

(e) For purposes of compliance with the requirements of this section, an owner of track may maintain and transfer records through electronic transmission, storage, and retrieval provided that;

(1) The electronic system be designed so that the integrity of each record is maintained through appropriate levels of security such as recognition of an electronic signature, or other means, which uniquely identify the initiating person as the author of that record. No two persons shall have the same electronic identity;

(2) The electronic storage of each record shall be initiated by the person making the inspection within 24 hours following the completion of that inspection;

(3) The electronic system shall ensure that each record cannot be modified in any way, or replaced, once the record is transmitted and stored;

(4) Any amendment to a record shall be electronically stored apart from the record which it amends. Each amendment to a record shall be uniquely identified as to the person making the amendment;

(5) The electronic system shall provide for the maintenance of inspection records as originally submitted without corruption or loss of data;

(6) Paper copies of electronic records and amendments to those records, that may be necessary to document compliance with this part shall be made available for inspection and copying by the Federal Railroad Administration at the locations specified in paragraph (b) of this section; and

(7) Track inspection records shall be kept available to persons who performed the inspections and to persons performing subsequent inspections.

Guidance. This paragraph contains requirements for maintaining and retrieving electronic records of track inspections. This allows each railroad to design its own electronic system as long as the system meets the specified criteria to safeguard the integrity and authenticity of each record. The provision also requires that railroads make available paper copies of electronic records, when needed by the FRA Inspector or by railroad track inspectors.

A track owner may elect to maintain and transfer records through electronic transmission, storage, and retrieval procedures. Each record must have sufficient security to maintain the integrity of the record. Levels of security must identify the person making the inspection as the author of the record. No two individuals will have or share the same electronic signature or identity. If individuals use an electronic signature or identity other than their own, violations or personal liability action should be considered for all parties involved. The integrity of electronic inspection record systems is an extremely sensitive issue. Should the system integrity be compromised, an Inspector should immediately contact the appropriate Regional Track Specialist. Should the Regional Track Specialist be unavailable the Inspector will notify the appropriate Regional Administrator. Headquarters Track Division will also be notified.

The system must ensure that no record can be replaced, deleted, or modified in any way, once the record has been transmitted and stored. Each amendment to a record shall be stored separately from the record it amends. Each amendment must identify the person making the amendment and have sufficient security to maintain the integrity of the amendment.

For electronic records, inspection records must be completed the day of the inspection either on computer or temporarily on paper. The electronic record must then be uploaded to the permanent electronic storage system where the record will be maintained for one year. The uploading of each inspection record must be completed within 24 hours following the completion of the inspection.

An advantage of an electronic system is the associated reduction in paperwork. Therefore, Inspectors must rely on viewing records on a terminal or monitor screen whenever it is made available for viewing by the railroad. Although printouts of records must be made available to FRA Inspectors, Inspectors are discouraged from requesting paper copies of electronic records unless necessary to document non-compliance. A paper copy of an electronic record may be marked “original” and included in the documentation necessary for a violation report when recommending civil penalties.

The railroad inspection records will be furnished upon request at the location specified by the railroad as required in paragraph (b) of this section. A paper copy of any electronic inspection record or amendment will be made available to the railroad inspector or any subsequent railroad inspectors performing inspections of the same territory upon request.

Appendix

Appendix A - Superelevation in Inches/Speed MPH

Curve	Table A1 – Elevation Inches – Three Inches Unbalance												
Degree	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6
0º30'	93	100	107	113	120	125	131	136	141	146	151	156	160
0º40'	80	87	93	98	103	109	113	118	122	127	131	135	139
0º50'	72	78	83	88	93	97	101	106	110	113	117	121	124
1º00'	66	71	76	80	85	89	93	96	100	104	107	110	113
1º15'	59	63	68	72	76	79	83	86	89	93	96	99	101
1º30'	54	58	62	66	69	72	76	79	82	85	87	90	93
1º45'	50	54	57	61	64	67	70	73	76	78	81	83	86
2º00'	46	50	54	57	60	63	66	68	71	73	76	78	80
2º15'	44	47	50	54	56	59	62	64	67	69	71	74	76
2º30'	41	45	48	51	54	56	59	61	63	66	68	70	72
2º45'	40	43	46	48	51	54	56	58	60	62	65	66	68
3º00'	38	41	44	46	49	51	54	56	58	60	62	64	66
3º15'	36	39	42	45	47	49	51	54	56	57	59	61	63
3º30'	35	38	40	43	45	47	50	52	54	55	57	59	61
3º45'	34	37	39	41	44	46	48	50	52	54	55	57	59
4º00'	33	35	38	40	42	44	46	48	50	52	54	55	57
4º30'	31	33	36	38	40	42	44	45	47	49	50	52	54
5º00'	29	32	34	36	38	40	41	43	45	46	48	49	51
5º30'	28	30	32	34	36	38	40	41	43	44	46	47	48
6º00'	27	29	31	33	35	36	38	39	41	42	44	45	46
6º30'	26	28	30	31	33	35	36	38	39	41	42	43	45
7º00'	25	27	29	30	32	34	35	36	38	39	40	42	43
8º00'	23	25	27	28	30	31	33	34	35	37	38	39	40
9º00'	22	24	25	27	28	30	31	32	33	35	36	37	38
10º00'	21	22	24	25	27	28	29	31	32	33	34	35	36
11º00'	20	21	23	24	26	27	28	29	30	31	32	33	34
12º00'	19	20	22	23	24	26	27	28	29	30	31	32	33

Curve	Table A2 - Elevation Inches – Four Inches Unbalance												
Degree	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6
0º30'	107	113	120	125	131	136	141	146	151	156	160	165	169
0º40'	93	98	104	109	113	118	122	127	131	135	139	143	146
0º50'	83	88	93	97	101	106	110	113	117	121	124	128	131
1º00'	76	80	85	89	93	96	100	104	107	110	113	116	120
1º15'	68	72	76	79	83	86	89	93	96	99	101	104	107
1º30'	62	65	69	72	76	79	82	85	87	90	93	95	98
1º45'	57	61	64	67	70	73	76	78	81	83	86	88	90
2º00'	53	57	60	63	65	68	71	73	76	78	80	82	85
2º15'	50	53	56	59	62	64	67	69	71	73	76	78	80
2º30'	48	51	53	56	59	61	63	65	68	70	72	74	76
2º45'	46	48	51	53	56	58	60	62	64	66	68	70	72
3º00'	44	46	49	51	53	56	58	60	62	64	65	67	69
3º15'	42	44	47	49	51	53	55	57	59	61	63	65	66
3º30'	40	43	45	47	49	52	53	55	57	59	61	62	64
3º45'	39	41	44	46	48	50	52	53	55	57	59	60	62
4º00'	38	40	42	44	46	48	50	52	53	55	57	58	60
4º30'	36	38	40	42	44	45	47	49	50	52	53	55	56
5º00'	34	36	38	40	41	43	45	46	48	49	51	52	53
5º30'	32	34	36	38	39	41	43	44	46	47	48	50	51
6º00'	31	33	35	36	38	39	41	42	44	45	46	48	49
6º30'	30	31	33	35	36	38	39	41	42	43	44	46	47
7º00'	29	30	32	34	35	36	38	39	40	42	43	44	45
8º00'	27	28	30	31	33	34	35	37	38	39	40	41	42
9º00'	25	27	28	30	31	32	33	35	36	37	38	39	40
10º00'	24	25	27	28	29	30	32	33	34	35	36	37	38
11º00'	23	24	25	27	28	29	30	31	32	33	34	35	36
12º00'	22	23	24	26	27	28	29	30	31	32	33	34	35

Appendix B - Defect Code/Penalty Schedule

Defect Description (sorted by paragraph)	Code (unsorted)	Violation	Willful Violation
Subpart A General			
213.4 Excepted track			
(a) Excepted track segment not identified in appropriate record	4.01	2,500	5,000
(b) Excepted track segment located within 30 feet of an adjacent track subject to simultaneous operation at speeds in excess of 10 mph	4.02	2,500	5,000
(c) Excepted track not inspected in accordance with §213.233(c) and 213.235 as specified for Class 1 track	4.03	2,500	5,000
(d) Train with a car required to be placarded by 49 CFR Part 172 operated over excepted track within 100 feet of a bridge or in a public street or highway	4.07	2,500	5,000
(e) Excepted track operations			
(1) Train speed exceeds 10 mph on excepted track	4.04	5,000	7,500
(2) Occupied passenger train operated on excepted track	4.05	7,000	10,000
(3) Freight train operated on excepted track with more than five cars required to be placarded in accordance with 49 CFR Part 172	4.06	7,000	10,000
(4) The gage on excepted track exceeds 4'10¼ inches [use 213.53.05]		5,000	7,500
(f) Failure to notify FRA of removal of trackage from excepted status	4.08	2,000	4,000
213.7 Designation of qualified persons to supervise certain renewals and inspect track			
(a) Failure of track owner to designate qualified persons to supervise restorations & renewals	7.02	1,000	2,000
(b) Failure of track owner to designate qualified persons to inspect track for defects	7.06	1,000	2,000
(c) Failure to use qualified person to pass trains over broken rails or pull aparts	7.03	1,000	2,000

(c) Train speed exceeds 10 m.p.h. over broken rails or pull aparts	7.04	1,000	2,000
(c) Failure to promptly notify and dispatch person fully qualified under §213.7 to the location of the broken rail or pull apart	7.05	1,000	2,000
(d) Failure of track owner to properly maintain written records of designation	7.07	1,000	2,000
213.9 Classes of track: Operating speed limits			
(a) Class of track table [reference only]			
(b) Failure to restore other than excepted track to compliance with Class 1 standards within 30 days after a person designated under §213.7(a) has determined that operations may safely continue over defect(s) not meeting Class 1 or excepted track standards	9.01	2,500	2,500
(b) Failure of track owner to enforce, over Class 1 defects, the limiting conditions imposed by person designated under §213.7(a)	9.02	2,500	2,500
213.11 Restoration or renewal of track under traffic conditions			
Proper qualified supervision not provided at work site during work hours when track is being restored or renewed under traffic conditions	11.01	2,500	2,500
213.13 Measuring track not under load			
Failure to add dynamic movement to static measurement	13.01	1,000	2,000
Subpart B Roadbed			
213.33 Drainage			
Drainage or water-carrying facility not maintained	33.01	2,500	5,000
Drainage or water-carrying facility obstructed by debris	33.02	2,500	5,000
Drainage or water-carrying facility collapsed	33.03	2,500	5,000
Drainage or water-carrying facility obstructed by vegetation	33.04	2,500	5,000
Drainage or water-carrying facility obstructed by silt	33.05	2,500	5,000
Drainage or water-carrying facility deteriorated to allow subgrade saturation	33.06	2,500	5,000

Uncontrolled water undercutting track structure or embankment	33.07	2,500	5,000
213.37 Vegetation			
(a) Combustible vegetation around track-carrying structures	37.01	1,000	2,000
(b) Vegetation obstructs visibility of railroad signs and fixed signals	37.02	1,000	2,000
(b)(2) Vegetation obstructs visibility of grade crossing warning signs and signals by the traveling public	37.10	1,000	2,000
(c) Vegetation obstructs passing of day and night signals by railroad employees	37.03	1,000	2,000
(c) Vegetation interferes with railroad employees performing normal trackside duties	37.04	1,000	2,000
(c) Excessive vegetation in toepaths and around switches that interferes with employees performing normal trackside duties.	37.08	1,000	2,000
(d) Vegetation prevents proper functioning of signal and/or communication lines	37.05	1,000	2,000
(e) Excessive vegetation at train order office, depot, interlocking plant, a carman's building, etc., prevents employees on duty from visually inspecting moving equipment when their duties so require	37.06	1,000	2,000
(e) Excessive vegetation at train meeting points prevents proper inspection of moving equipment by railroad employees	37.07	1,000	2,000
(e) Vegetation brushing sides of rolling stock that prevents employees from visually inspecting moving equipment from their normal duty stations	37.09	1,000	2,000

Subpart C Track Geometry			
213.53 Gage			
(a) Gage is measured between the heads of the rails at right angles to the rails in a plane five-eighths of an inch below the top of the rail head [reference only]			
(b) Gage dimension exceeds allowable on tangent track	53.01	5,000	7,500
(b) Gage dimension is less than allowable on tangent track	53.02	5,000	7,500
(b) Gage dimension exceeds allowable on curved track	53.03	5,000	7,500
(b) Gage dimension is less than allowable on curved track	53.04	5,000	7,500
(b) Gage dimension exceeds allowable for excepted track	53.05	5,000	7,500
213.55 Alinement			
Alinement deviation of tangent track exceeds allowable	55.01	5,000	7,500
Alinement deviation of curved track exceeds allowable for a 62-foot chord	55.02	5,000	7,500
Alinement deviation of curved track exceeds allowable for a 31-foot chord	55.03	5,000	7,500
213.57 Curves; elevation and speed limitations			
Reserved	57.01		
(a) Maximum crosslevel on curve exceeds allowable	57.06	2,500	5,000
(b) Operating speed exceeds allowable for 3 inches of unbalance, based on curvature and elevation	57.02	2,500	5,000
(c) Operating speed exceeds allowable for 4 inches of unbalance, based on curvature and elevation	57.03	2,500	5,000
(d) Qualification of equipment for (c) above [reference only]			
(e) A track owner, or an operator of a passenger or commuter service, who provides passenger or commuter service over trackage of more than one track owner… [reference only]			

(f) Equipment presently operating at curving speeds allowed under the formula in paragraph (c) of this section… [reference only]			
(g) Operating speed exceeds allowable for a FRA approved unbalance based on curvature and elevation approved for track contiguous to high speed track	57.04	2,500	5,000
Reserved	57.05		
(a) Maximum crosslevel on curve exceeds allowable	57.06	2,500	5,000
213.59 Elevation of curved track; runoff		2,500	2,500
(a) If a curve is elevated, the full elevation must be provided throughout the curve… [reference only]			
213.63 Track surface			
Runoff in any 31-feet of rail at end of raise exceeds allowable	63.01	5,000	7,500
Deviation from uniform profile on either rail exceeds allowable	63.02	5,000	7,500
Reserved	63.03		
Reserved	63.04		
Deviation from zero crosslevel at any point on tangent exceeds allowable	63.05	5,000	7,500
Reserved	63.06		
Difference in crosslevel between any two points less than 62-feet apart on tangents exceeds allowable.	63.07	5,000	7,500
Difference in crosslevel between any two points less than 62-feet apart on curves between spirals exceeds allowable	63.08	5,000	7,500
Difference in crosslevel between any two points less than 62-feet apart on spirals exceeds allowable	63.09	5,000	7,500
Reverse elevation on curve exceeds allowable	63.10	5,000	7,500
Variation in crosslevel per 31-feet exceeds allowable on restricted length spiral	63.11	5,000	7,500

Difference in crosslevel within 62-feet between a point on a curve that equals or exceeds 6 inches and a point with greater elevation exceed allowable	63.12	5,000	7,500
Crosslevel differences for six or more consecutive pairs of staggered joints exceeds allowable	63.13	5,000	7,500
Subpart D -- Track Structure			
213.103 Ballast; general			
(a)-(d) Insufficient Ballast	103.01	2,500	5,000
(a)-(d) Fouled Ballast	103.02	2,500	5,000
213.109 Crossties			
(a) Crossties made of unsound material	109.01	1,000	2,000
(b) Crossties not effectively distributed to support a 39-foot segment of track	109.03	2,500	5,000
(c) Sufficient number of nondefective ties [Paragraph (c) has been superseded by (d) which became effective on September 21, 2000]			
(d) Fewer than minimum allowable number of non-defective ties per 39 feet for tangent and curved track less than 2 degrees	109.04	1,000	2,000
(d) Fewer than minimum allowable number of non-defective ties per 39 feet for turnouts and curved track over 2 degrees	109.05	1,000	2,000
(e) Crossties counted to satisfy the requirements set forth in the table in paragraph (d) of this section shall not be... [reference only]			
(f) No effective support ties within the prescribed distance from a joint	109.02	2,500	5,000
(g) Track constructed without crossties does not effectively support track structure.	109.06	2,500	5,000
213.110 Gage Restraint Measurement Systems			
(a) Failure to notify FRA at least 30 days prior to the designation of a GRMS line segment	110.01	2,500	5,000
(a) Failure to notify FRA at least 10 days prior to the removal of a line segment from GRMS designation	110.02	2,500	5,000

(b) Failure to provide required information identifying a GRMS line segment	110.03	2,500	5,000
(c) Failure to provide sufficient technical data to establish compliance with minimum GRMS design requirements	110.04	2,500	5,000
(c) Failure to maintain and operate GRMS within minimum design requirements over designated GRMS line segments	110.05	2,500	5,000
(d)-(f) GRMS calculations [reference only]			
(g) Failure of GRMS to provide analog trace of specified parameters	110.06	2,500	5,000
(h) Failure of GRMS to provide exception report listing of specified parameters	110.07	2,500	5,000
(i) Failure to provide exception report listing to §213.7 individual prior to next inspection required under §213.233	110.08	2,500	5,000
(j) Failure to maintain and make available documented calibration procedures on GRMS vehicle	110.09	2,500	5,000
(j) Failure to initiate a daily instrument verification procedure	110.10	2,500	5,000
(j) Failure to maintain PTLF accuracy within five-percent of 4,000-pound reading	110.11	2,500	5,000
(j) Failure to make available GRMS training program	110.12	2,500	5,000
(k) Failure of GRMS training program to meet minimum requirements	110.13	2,500	5,000
(k) Failure to provide GRMS training to §213.7 individual whose territory is subject to requirements of §213.110	110.14	2,000	4,000
(l) Failure to initiate required remedial action for exceptions listed on GRMS record of lateral restraint	110.15	5,000	7,500
(l) Gage widening exceeds allowable measured with PTLF	110.16	5,000	7,500
(m) Failure to provide functional PTLF to §213.7 individual whose territory is subject to requirements of §213.110	110.17	5,000	7,500
(m) Failure to restore contact between rail and lateral rail restraint components	110.18	5,000	7,500
(n) Failure to keep GRMS records as required	110.19	2,000	4,000

(o) Failure to conduct GRMS inspections at required frequency	110.20	5,000	7,500
213.113 Defective rails			
(a) Transverse fissure	113.01	5,000	7,500
(a) Compound fissure	113.02	5,000	7,500
(a) Horizontal split head	113.03	5,000	7,500
(a) Vertical split head	113.04	5,000	7,500
(a) Split web	113.05	5,000	7,500
(a) Piped rail	113.06	5,000	7,500
(a) Bolt hole crack	113.07	5,000	7,500
(a) Head web separation	113.08	5,000	7,500
(a) Broken base	113.09	5,000	7,500
(a) Detail fracture	113.10	5,000	7,500
(a) Engine burn fracture	113.11	5,000	7,500
(a) Ordinary break	113.12	5,000	7,500
(a) Broken or defective weld	113.13	5,000	7,500
(a) Damaged rail	113.14	5,000	7,500
(a) Flattened rail	113.15	5,000	7,500
(a) Rail defect originating from bond wire attachment [Where a defect results from a bond wire attachment, FRA inspectors must cite this defect code and also include a description of the applicable rail defect as described in §213.113]	113.16		
213.115 Rail end mismatch			
Rail-end mismatch on tread of rail exceeds allowable (jointed track)	115.01	2,500	5,000
Rail-end mismatch on gage side of rail exceeds allowable (jointed track)	115.02	2,500	5,000

Rail-end mismatch on tread of rail exceeds allowable (CWR)	115.03	2,500	5,000
Rail-end mismatch on gage side of rail exceeds allowable (CWR)	115.04	2,500	5,000
213.119 Continuous welded rail			
Failure of track owner to develop and implement written CWR procedures	119.01	5,000	7,500
(a) Failure to comply with written CWR procedures	119.02	5,000	7,500
(b) Failure to comply with written CWR procedures - anchoring requirements	119.10	5,000	7,500
(c) Failure to comply with written CWR procedures - rail neutral temperature	119.11	5,000	7,500
(d) Failure to comply with written CWR procedures - monitoring procedures	119.12	5,000	7,500
(e) Failure to comply with written CWR procedures - train speed	119.13	5,000	7,500
(f) Failure to comply with written CWR procedures - inspection procedures	119.14	5,000	7,500
(g) Failure of track owner to institute required provisions for inspecting joints in CWR	119.05	5,000	7,500
(g)(2) Failure to record the location of, conditions of, and remedial action for joints in CWR, as required	119.06	5,000	7,500
(g)(2)(v)Failure to inspect joints in CWR at required frequency	119.07	5,000	7,500
(g)(3) Railroad using alternate methods to inspect joints in CWR without seeking approval from FRA	119.08	5,000	7,500
(g)(3)(ii) Railroad using alternate methods to inspect joints in CWR before approval has been granted	119.09	5,000	7,500
(h) Failure of track owner to develop a training program for the implementation of their written CWR procedures	119.03	5,000	7,500
(i) Failure to keep CWR records as required	119.04	5,000	7,500
213.121 Rail joints			
(a) Rail joint not of structurally sound design and dimension (jointed track)	121.01	2,500	5,000
(a) Rail joint not of structurally sound design and dimension (CWR)	121.11	2,500	5,000

(b) Cracked or broken joint bar in Classes 3 through 5 track (other than center-break) (jointed track)	121.02	2,500	5,000
(b) Cracked or broken joint bar in Classes 3 through 5 track (other than centerbreak) (CWR)	121.12	2,500	5,000
(b) Cracked or broken insulated joint bar in Classes 3 through 5 track (other than centerbreak) (CWR)	121.17	2,500	5,000
(b) Worn joint bar allows excessive vertical movement of rail in joint in Classes 3 through 5 track (jointed track)	121.04	2,500	5,000
(b)Worn joint bar allows excessive vertical movement of rail in joint in Classes 3 through 5 track (CWR)	121.14	2,500	5,000
(c) Center cracked or broken joint bar (jointed track)	121.03	5,000	7,500
(c) Center cracked or broken joint bar (CWR)	121.13	5,000	7,500
(c) Center cracked or broken insulated joint bar (CWR)	121.15	5,000	7,500
(d) Less than 2 bolts per rail at each joint for conventional jointed rail in Classes 2 through 5 track	121.05	2,500	5,000
(d) Less than 1 bolt per rail at each joint for conventional jointed rail in Class 1 track	121.06	2,500	5,000
(e) Less than two bolts per rail at any joint in continuous welded rail	121.07	2,500	5,000
(f) Loose joint bars (jointed track)	121.08	2,500	5,000
(f) Loose joint bars (CWR)	121.18	2,500	5,000
(g) Torch-cut or burned-bolt hole in rail in Classes 2 through 5 track (jointed track)	121.09	2,500	5,000
(g) Torch-cut or burned-bolt hole in rail in Classes 2 through 5 track (CWR)	121.19	2,500	5,000
(h) Joint bar reconfigured by torch cutting in Classes 3 through 5 track (jointed track)	121.10	5,000	7,500
(h) Joint bar reconfigured by torch cutting in Classes 3 through 5 track (CWR)	121.20	5,000	7,500
Reserved	121.16		

213.122 Torch cut rail			
(a) Torch cut rail applied in Class 3 through 5 track for other than emergency	122.01	2,500	5,000
(a) Failure to remove torch cut rails within specified time frame	122.02	2,500	5,000
(b) Failure to remove non-inventoried torch cut rail within 30 days of discovery	122.03	2,500	5,000
(b) Train speed exceeds allowable over non-inventoried torch cut rail	122.04	2,500	5,000
213.123 Tie plates			
(a) Insufficient tie plates in Class 3 through 5 track	123.01	1,000	2,000
(b) Object between base of rail and the bearing surface of the tie plate causing concentrated load	123.02	1,000	2,000
213.127 Rail fastenings			
Insufficient fasteners in a 39-foot track segment	127.01	2,500	5,000
Fasteners in a 39-foot track segment not effectively maintaining gage	127.02	2,500	5,000
213.133 Turnouts and track crossings, generally			
(a) Loose, worn, or missing switch clips	133.01	1,000	1,000
(a) Loose, worn, or missing clip bolts (transit, side jaw, eccentric, vertical).	133.02	1,000	1,000
(a) Loose, worn, or defective connecting rod	133.03	1,000	1,000
(a) Loose, worn, or defective connecting rod fastening	133.04	1,000	1,000
(a) Loose, worn, or defective switch rod	133.05	1,000	1,000
(a) Loose, worn, or missing switch rod bolt	133.06	1,000	1,000
(a) Worn or missing cotter pins	133.07	1,000	1,000
(a) Loose or missing rigid rail braces	133.08	1,000	1,000
(a) Loose or missing adjustable rail braces	133.09	1,000	1,000

(a) Missing switch, frog, or guard rail plates	133.10	1,000	1,000
(a) Loose or missing switch point stops	133.11	1,000	1,000
(a) Loose, worn, or missing frog bolts	133.12	1,000	1,000
(a) Loose, worn, or missing guard rail bolts	133.13	1,000	1,000
(a) Loose, worn or missing guard rail clamps, wedge, separator block, or end block	133.14	1,000	1,000
(a) Obstruction between switch point and stock rail	133.15	1,000	1,000
(a) Obstruction in flangeway of frog	133.16	1,000	1,000
(a) Obstruction in flangeway of guard rail	133.17	1,000	1,000
(a) Turnout or track crossing fastenings not intact or maintained	133.20	1,000	1,000
(b) Insufficient anchorage to restrain rail movement	133.18	1,000	1,000
(c) Flangeway less than 1½ inches wide	133.19	1,000	1,000
213.135 Switches			
(a) Stock rail not securely seated in switch plates	135.01	2,500	5,000
(a) Stock rail canted by overtightening rail braces	135.02	2,500	5,000
(b) Improper fit between switch point and stock rail	135.03	2,500	5,000
(b) Excessive lateral or vertical movement of switch point	135.05	2,500	5,000
(c) Outer edge of wheel contacting gage side of stock rail	135.04	2,500	5,000
(d) Heel of switch insecure	135.06	2,500	5,000
(e) Insecure switch stand or switch machine	135.07	2,500	5,000
(e) Insecure connecting rod	135.08	2,500	5,000
(f) Throw lever operable with switch lock or keeper in place	135.09	2,500	5,000
(g) Switch position indicator not clearly visible	135.10	2,500	5,000

(h) Unusually chipped or worn switch point	135.11	5,000	7,500
(h) Improper switch closure due to metal flow	135.12	5,000	7,500
(i) Use of tongue and plane mate where speeds exceed class one	135.13		
213.137 Frogs			
(a) Insufficient flangeway depth	137.01	2,500	5,000
(b) Frog point chipped, broken, or worn in excess of allowable	137.02	2,500	5,000
(c) Tread portion of frog worn in excess of allowable	137.03	2,500	5,000
(d) Use of flange bearing frog where speed exceeds that permitted by Class 1	137.04	2,500	5,000
Frog condition not otherwise provided [This code is intended for advisory purposes only, not for citing defects]	137.99		
213.139 Spring rail frogs			
(a) Outer edge of wheel contacting side of spring wing rail	139.01	2,500	5,000
(b) Toe of wing rail not fully bolted and tight	139.02	2,500	5,000
(b) Ties under or wing rail not solidly tamped	139.03	2,500	5,000
(c) Bolt hole defect in frog	139.04	2,500	5,000
(c) Head and web separation in frog	139.05	2,500	5,000
(d) Insufficient tension in spring to hold wing rail against point rail	139.06	2,500	5,000
(e) Excessive clearance between hold-down housing and horn	139.07	2,500	5,000
213.141 Self-guarded frogs			
(a) Raised guard worn excessively	141.01	2,500	5,000
(b) Frog point rebuilt before restoring guarding face	141.02	2,500	5,000
213.143 Frog guard rails and guard faces; gage			
Guard check gage less than allowable	143.01	2,500	5,000

Guard face gage exceeds allowable	143.02	2,500	5,000
Cracked or broken guard rail	143.03	2,500	5,000
Subpart E – Track appliances and track-related devices			
213.205 Derails			
(a) Derail not clearly visible	205.01	2,500	5,000
(b) Derail operable when locked	205.02	2,500	5,000
(c) Improperly installed derail	205.05	2,500	5,000
(c) Loose, worn, or defective parts of derail	205.06	2,500	5,000
(d) Improper size derail	205.04	2,500	5,000
Reserved	205.03		
Subpart F – Inspection			
213.233 Track inspections			
(a) Track inspected by other than qualified designated individual	233.01	2,000	4,000
(b) Track being inspected at excessive speed	233.02	2,000	4,000
(b) One Inspector inspecting more than two tracks	233.05	2,000	4,000
(b) Two Inspectors inspecting more than four tracks	233.06	2,000	4,000
(b)(3) Inspection performed on track outside of maximum allowable track center distances	233.07	2,000	4,000
(b)(3) Main track not traversed within the required frequency	233.08	2,000	4,000
(b)(3) Siding track not traversed within the required frequency	233.09	2,000	4,000
(c) Failure to inspect at required frequency	233.03	2,000	4,000
(d) Failure to initiate remedial action for deviations found	233.04	2,000	4,000

213.235 Switches, crossings, transition devices			
(a) Failure to inspect turnouts at required frequency	235.01	2,000	4,000
(a) Failure to inspect track crossings at required frequency	235.02	2,000	4,000
(a) Failure to inspect lift rail assemblies or other transition devices on moveable bridges at required frequency	235.03	2,000	4,000
(b) Failure to operate specified switches in Classes 3 through 5	235.04	2,000	4,000
213.237 Inspection of rail			
(a) Failure to inspect rail for internal defects at required frequency	237.01	2,500	5,000
(b) Failure of equipment to inspect rail at joints	237.02	2,500	5,000
(c) Defective rail not marked properly	237.03	2,500	5,000
(d) Invalid test due to rail surface conditions track cannot be considered as a search for internal defects under §213.237(a)			
(e) Failure to reduce operating speed until valid rail inspection is performed	237.04	2,500	5,000
213.239 Special inspections			
Failure to conduct special inspections when required	239.01	2,500	5,000
213.241 Inspection records			
(a) Failure to keep records as required	241.01	1,000	1,000
(b) Failure of Inspector to complete report at time of inspection	241.02	1,000	1,000
(b) Failure of inspector to sign report	241.03	1,000	1,000
(b) Failure of Inspector to provide required information	241.04	1,000	1,000
(b) Failure to record required CWR joint inspection	241.15	1,000	1,000
(c) Failure of rail inspection record to provide required information	241.05	1,000	1,000

(d) Failure to make records available for copying and inspection	241.06	1,000	1,000
(e)(1) Electronic system does not maintain the integrity of each record	241.07	1,000	1,000
(e)(2) Electronic storage not initiated within 24 hours	241.14	1,000	1,000
(e)(3) Electronic system allows record or amendments to be modified	241.08	1,000	1,000
(e)(4) Electronic amendments not stored separately from record	241.09	1,000	1,000
(e)(4) Person making electronic amendment not identified	241.10	1,000	1,000
(e)(5) Electronic system corrupts or losses data	241.11	1,000	1,000
(e)(6) Paper copies of records not made available for inspection and copying	241.12	1,000	1,000
(e)(7) Inspection reports not available to Inspector or subsequent Inspectors	241.13	1,000	1,000

Note – defect code descriptions are not regulatory language. They are analytical instruments only and are subject to change as needed.

Appendix C - Rail Mill Branding and Key Dimensions

Weight	Type	Rail Mill/Branding Designations														
		U.S. Steel	Bethlehem	Illinois	Old Illinois	Carnegie	Tennessee	Lackawanna	Midvale	Colorado	Inland	Cambria	MD/PA	Dominion	Algoma	Sydney
70	ARA-A			7020		7020	7020	7031								
70	ARA-B		174	7030		7030	7030	7032								
70	ASCE	7040	70AS	7040	7010	7040	7040	700	532	701			237			
70	Bangor Aroostook		70-BA					703					97			
70	Chicago & Alton				7002											
70	Pennsylvania			7033	7005	7033	7033		504				57			
72	CP Sandberg															
72	Chicago NW	7250	72NP	7250	7201	7250	7250		581							
72	Spokane							722								
74	MD/PA												146			
75	ASCE	7540	75AS	7540	7506	7540	7540	750	529	753			214			
75	Boston & Maine		92					752					92			
75	Lackawanna		75-C					753								
75	Int. Great Northern			7551		7551	7551									
75	Miscellaneous															
75	Missouri Pacific	7550	75MP	7550	7512	7550	7550	754	528							
75	Nat. Ry. Mexico		128													
75	NYC. (Dudley)															
75	MD/PA												87			
75	Seaboard (Dudley)		75DY	7522		7522	7522						221			
75	Union Pacific		75-B	7523	7513	7523	7523			754			249			
75	Union Pacific	7524	75SP	7524		7524	7524			757						
76	MD/PA												216			
78	Great Northern				77501			775								
78	Old Colony		78-OC										98			
79	MD/PA												76			
80	Frictionless		79.5-C													
80	ARA-A	8020	80-RA	8020		8020	8020	8031		801						
80	ARA-B	8030	80-RB	8030		8030	8030	8032	569	802						

Weight	Type	Rail Mill/Branding Designations														
		U.S. Steel	Bethlehem	Illinois	Old Illinois	Carnegie	Tennessee	Lackawanna	Midvale	Colorado	Inland	Cambria	MD/PA	Dominion	Algoma	Sydney
80	ASCE	8040	80AS	8040		8040	8040	800	530	800	8040		251			
80	Canadian Northern		804	8010		8010	8010	804								
80	DUDLEY	8022	80DY	8022		8022	8022						220			
80	Frictionless		80-MC-F													
80	Great Northern				8009			802								
80	Hocking Valley								540							
80	New York Central		220	8022	8008	8022	8022	801	543							
85	Asce	8540	85AS	8540	8504	8540	8540	850	531	851	8540		235			
85	C.B. & Q.	8543	85-CB	8543	8506	8543	8543	855		852						
85	Canadian Pacific	8524	85CP	8524		8524	8524	856			8524			8501	113	
85	Head Free – CP													8504	137	
85	Denver & RG									850						
85	D. & R.G. / C & S									853						
85	Great Northern		854	8553	8509	8553	8553	854								
85	Missouri Pacific	8550	853	8550	8507	8550	8550									
85	N.Y.C. & Stl. / Kcs		85-NK	8521		8521	8521	8531			8521					
85	Pennsylvania	8531	85PS	8531	8530	8531	8531	8530	559		8531					
85	Pennsylvania		85-PR	8533	8503	8533	8533	852	500				67			
85	Seaboard (Dudley)		85DY	8522		8522	8522	851					261			
85	Soo Line	8520		8520		8520	8520									
85	Western Pacific															
90	ARA-A	9020	90RA	9020		9020	9020	9031	563	902	9020					
90	ARA-B	9030	90RB	9030		9030	9030	9032	561	905	9030					
90	ASCE	9040	90AS	9040	9002	9040	9040	900	535		9040		245			
90	A.T. & SF	9021	90SF	9021		9021	9021	9033		903	9021					
90	Chicago NW	9035	90OM	9035		9035	9035	904								
90	Denver Rio Grande									906						
90	Frictionless			9039		9039	9039									
90	Frictionless			9029		9029	9029									
90	Great Northern	9024	90GH	9024		9024	9024			908	9024					
90	Great Northern			9036		9036										
90	Great Northern		90-GN	9034	9010	9034	9034	9030	560	904						

Weight	Type	Rail Mill/Branding Designations														
		U.S. Steel	Bethlehem	Illinois	Old Illinois	Carnegie	Tennessee	Lackawanna	Midvale	Colorado	Inland	Cambria	MD/PA	Dominion	Algoma	Sydney
90	Head Free - R.A.	9027	90RA-T	9027		9027	9027			TC1013						
90	Interborough R. T.	9050	90RT	9050		9050	9050	902					77			
90	Lehigh Valley															
90	N.Y.C. (Dudley)		90DY					901								
90	Union Pacific	9023		9023	9003	9023	9023			901						
91	Lackawanna		91- DL	9133		9133	9133	911								
92	Frictionless		304													
93	Frictionless		93-NH-F					932								
95	ASCE							950					267			
95	Boston & Albany															
95	W & H Ry. (Dudley)		95-DY					951								
97	Frictionless		97-CO-F													
98	Frictionless		98-PS-F													
100	ARA-A	10020	100RA	10020		10020	10020	10031	565	1003	10020					
100	ARA-B	10030	100RB	10030		10030	10030	10032	564	1002	10030					
100	AREA	10025	100RE	10025		10025	10025			10025	10025					
100	ASCED	10040	100 AS	10040	10001	10040	10040	1000	536				247			
100	Canadian Pacific															100CP-RE
100	Chicago NW	10035	100-OM	10035		10035	10035	1006			10035					
100	Elgin Joliet & East.			10050		10050	10050									
100	Great Northern	10036	100GN	10036		10036	10036	1008								
100	Head Free - R.A.		100RA-T											10004	136	
100	Head Free - R.E.		100RE-T													
100	Interborough R. T.	10005	100RT	10005		10005	10005	1005								
100	N.Y., N.H. & H.	10034	100NH	10034	10004	10034	10034	1002					100			
100	New York Central		100-DY	10022	10003	10022	10022	1001								
100	Pennsylvania	10031	100PS	10031		10031	10031	10030	558		10031					
100	Pennsylvania	10033	100PR	10033	10002	10033	10033	1003	520				96			
100	Reading	10032	100RG	10032		10032	10032	1007								
100	R.W. Hunt.															
101	Lackawanna	10133	101DL	10133		10133	10133	10130								
105	Lackawanna	10533	105DL	10533		10533	10533	1052								

Weight	Type	Rail Mill/Branding Designations														
		U.S. Steel	Bethlehem	Illinois	Old Illinois	Carnegie	Tennessee	Lackawanna	Midvale	Colorado	Inland	Cambria	MD/PA	Dominion	Algoma	Sydney
105	Dudley	10524	105DY	10524		10524	10524				10524					
105	New York Central		105-B	10522		10522	10522	1051								
106	Miscellaneous.									1060						
107	N.Y., N.H. & H.	10734	107NH	10734		10734	10734	1072								
110	AREA	11025	110RE	11025		11025	11025			1100	11025					
110	ASCE												268			
110	C.T.A.	11050														
110	Great Northern	11036	110GN	11036		11036	11036				11036					
110	Head Free - AREA	11027	110RE-T	11027		11027	11027				11027					
110	Lehigh Valley	11033	110LV	11033		11033	11033									
112	AREA	11228	112RE	11228		11228	11228			1121	11228					
112	Head Free – R.E.	11227	112RE-T	11227		11227	11227				11227HF					
112	CB & Q – TR	11229		11229		11229	11229			1122						
113	Head Free – SP	11327	113RE-T	11327		11327	11327			1130						
115	AREA	11525	115RE	11525		11525	11525			1150	11525					
115	D.R.G.W.									1155						
115	Dudley	11522/23	115DY	11523		11523	11523									
115	Miscellaneous.															
118	Lackawanna		118DL-M													
119	Area	11937								1190	11937					
120	Area			12025		12025	12025									
120	Mfg. Std.		120-MS													
120	New York Central		120-DY					1201								
122	CB (B&O)		122-CB													
125	Pennsylvania		308	12531		12531	12531	12530	584							
126	Frictionless		125.5-PSF													
127	Dudley	12723	127DYM								12723					
127	New York Central		127-DY	12722		12722	12722				12722					
129	CB & Q – TR	12929		12929		12929	12929				12929					
130	AREA	13025	130RE	13025		13025	13025			1300	13025					
130	Head Free – P.S.		130PS-T													
130	Head Free – R.E.	13027	130RE-T	13027		13027	13027				13027			13001	138	

Weight	Type	Rail Mill/Branding Designations														
		U.S. Steel	Bethlehem	Illinois	Old Illinois	Carnegie	Tennessee	Lackawanna	Midvale	Colorado	Inland	Cambria	MD/PA	Dominion	Algoma	Sydney
130	Phil. & Reading		130RG													
130	Pennsylvania	13031	130PS	13031		13031	13031	13030	589	1302	13031					
131	Area	13128	131RE	13128		13128	13128			1311	13128					
131	Head Free – R.E.	13127														
132	Area	13225	132RE	13225		13225	13225			1321	13225					
132	Head Free – S.P.	13227	132RE-T	13227		13227	13227			1320						
133	Area	13331	133RE	13331		13331	13331			1330	13331					
135	Central of NJ		135CR													
136	AREA	13637	136RE							1360						
136	Lehigh Valley	13633	136LV	13633		13633	13633									
136	Lehigh Valley		136-LV													
136	Lehigh Valley		136-LV-M													
136	New York Central		136NYC													
140	AREA/PS	14031	140RE	14031		14031	14031									
141	AREA		141RE													
152	Pennsylvania	15222	152PS	15224		15224	15224									
155	Pennsylvania	15531	155PS	15531		15531	15531									

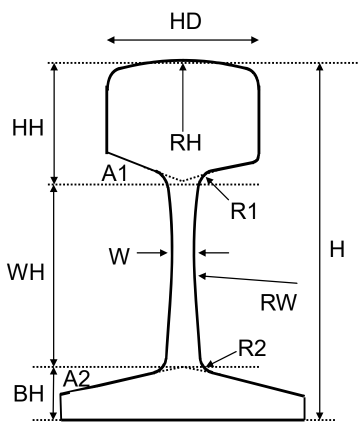
		Key Rail Dimensions											
		Rail Height	Head Width	Web Thickness	Head Height	Web Height Fishing	Base Height	Head Radius	Web Radius	Top Fillet Radius	Bottom Fillet Radius	Head Bottom Angle	Base Angle
Weight	Type	H	HD	W	HH	WH	BH	RH	RW	R1	R2	A1	A2
70	ARA-A	4 ¾	2 3/8	1/2	1 11/32	2 1/2	29/32	14	14	0.375	0.375	1 to 4	1 to 4
70	ARA-B	4 35/64	2 3/8	33/64	1 23/64	2 17/64	59/64	12	12	0.3125	0.3125	13 deg.	13 deg.
70	ASCE	4 5/8	2 7/16	33/64	1 11/32	2 15/32	13/16	12	12	0.25	0.25	13 deg.	13 deg.
70	Bangor Aroostook	4 ¾	2 7/16	1/2	1 13/32	2 19/32	3/4	12	12	0.25	0.25	12 deg.	12 deg.
70	Chicago & Alton	4 3/8	2 23/64	35/64	1 45/64	1 59/64	3/4					12 deg.	12 deg.
70	Pennsylvania	4 ½	2 7/16	1/2	1 19/32	2 1/8	25/32	10	8	0.25	0.25	13 deg.	13 deg.
72	CP (Sandberg)	4 15/16	2 1/4	1/2	1 5/8	2 25/64	59/64	6	VERT.	0.375	0.375	15 deg.	15 deg.
72	Chicago NW	4 ¾	2 3/8	9/16	1 13/32	2 1/2	27/32					14 deg.	14 deg.
72	Spokane Int'l. Ry.	4 45/64	2 7/16	33/64	1 27/64	2 15/32	13/16	12	12	0.25	0.25	13 deg.	13 deg.
74	MD/PA	4 11/16	2 7/16	9/16	1 3/4	2 3/16	3/4	15	15	0.3125	0.3125	17 deg.	13 deg.
75	ASCE	4 13/16	2 15/32	17/32	1 27/64	2 35/64	27/32	12	12	0.25	0.25	13 deg.	13 deg.
75	Boston & Maine	5	2 1/2	9/16	1 7/16	2 47/64	53/64	12	STR.	0.25	0.25	13 deg.	13 deg.
75	Lackawanna	4 11/16	2 1/2	1/2	1 43/64	2 13/64	13/16	10.5	10	0.3125	0.3125	18 deg.	12° 45'
75	Int. & Grt. Nor	4 ¾	2 1/2	9/16	1 7/16	2 15/32	27/32					13 deg.	13 deg.
75	Miscellaneous	4 ¾	2 1/2	1/2	1 27/32	2 1/8	25/32					13 deg.	13 deg.
75	Missouri Pacific	4 ¾	2 9/16	9/16	1 7/16	2 15/32	27/32	12	30	0.25	0.25	13 deg.	13 deg.
75	Nat. Ry. Mex.	5	2 3/4	1/2	1 3/8	2 7/8	3/4					12 deg.	12 deg.
75	N.Y.C. (Dudley)	5	2 5/8	17/32	1 3/8	2 3/4	7/8	14	14	0.5	0.3125	14 deg.	14 deg.
75	MD/PA	4 3/4	2 1/2	9/16	1 1/2	2 7/16	13/16	12	VERT.	0.25	0.25	13 deg.	13 deg.
75	Seaboard (Dudley)	5	2 9/16	1/2	1 3/8	2 3/4	7/8	14	14	0.5	0.3125	14 deg.	14 deg.
75	Union Pacific	5	2 9/16	33/64	1 3/8	2 13/16	13/16	12	12	0.25	0.25	13 deg.	13 deg.
75	Union Pacific	4 15/16	2 7/16	33/64	1 3/8	2 5/8	15/16	14	14	0.375	0.375	1 to 4	1 to 4
76	MD/PA	4 3/4	2 1/2	1/2	1 11/16	2 1/4	13/16	20	VERT.	0.3125	0.3125	14° 30'	12 deg.
78	Great Northern	5	2 3/8	5/8	1 11/16	2 1/2	13/16					14 deg.	14 deg.
78	Old Colony	4 3/4	2 1/2	17/32	1 3/4	2 7/32	25/32	12	12	0.4375	0.4375	14 deg.	12° 15'
79	MD/PA	4 3/4	2 5/8	5/8	1 5/8	2 11/32	25/32	12	9	0.25	0.25	13 deg.	13 deg.
80	Frictionless	5 3/16	1 15/16	9/16	2 1/32	2 9/32	7/8					13 deg.	13 deg.
80	ARA-A	5 1/8	2 1/2	33/64	1 7/16	2 23/32	31/32	14	14	0.375	0.375	1 to 4	1 to 4
80	ARA-B	4 15/16	2 7/16	35/64	1 15/32	2 15/32	1	12	12	0.3125	0.3125	13 deg.	13 deg.
80	ASCE	5	2 1/2	35/64	1 1/2	2 5/8	7/8	12	12	0.25	0.25	13 deg.	13 deg.
80	Canadian Northern	5	2 9/16	35/64	1 13/32	2 11/16	29/32					13 deg.	13 deg.

		Key Rail Dimensions											
		Rail Height	Head Width	Web Thickness	Head Height	Web Height Fishing	Base Height	Head Radius	Web Radius	Top Fillet Radius	Bottom Fillet Radius	Head Bottom Angle	Base Angle
Weight	Type	H	HD	W	HH	WH	BH	RH	RW	R1	R2	A1	A2
80	Dudley	5 1/8	2 21/32	17/32	1 1/2	2 3/4	7/8	14	14	0.5	0.3125	1 to 4	1 to 4
80	Frictionless	5 3/16	1 15/16	9/16	2 1/32	2 9/32	7/8					13 deg.	13 deg.
80	Great Northern	5	2 13/32	5/8	1 5/8	2 1/2	7/8					14 deg.	14 deg.
80	Hocking Valley	5	2 31/64	29/64	1 3/4	2 25/64	7/8					13 deg.	13 deg.
80	New York Central	5 1/8	2 21/32	17/32	1 1/2	2 3/4	7/8	14	14	0.5	0.3125	1 to 4	1 to 4
85	ASCE	5 3/16	2 9/16	9/16	1 35/64	2 3/4	57/64	12	12	0.25	0.25	13 deg.	13 deg.
85	C.B. & Q.	5 3/16	2 21/32	9/16	1 35/64	2 3/4	57/64					13 deg.	13 deg.
85	Canadian Pacific	5 1/8	2 1/2	9/16	1 7/16	2 11/16	1	8	8	0.375	0.375	1 to 4	1 to 4
85	Head Free – CP	5 1/4	2 29/64	9/16	1 9/16	2 11/16	1	8	8	0.375	0.375	1 to 4	1 to 4
85	Denver & RG	5 1/4	2 1/2	9/16	1 3/4	2 5/8	7/8					13 deg.	13 deg.
85	D. & R.G. / C & S	5 3/8	2 1/2	9/16	1 15/32	2 29/32	1					1 to 4	1 to 4
85	Great Northern	5	2 21/32	21/32	1 19/32	2 1/2	29/32					14 deg.	14 deg.
85	Missouri Pacific	5 7/32	2 15/32	19/32	1 3/4	2 39/64	55/64					13 deg.	13 deg.
85	N.Y.C. & Stl. / Kcs	5 3/8	2 17/32	17/32	1 29/64	2 15/16	63/64	14	14	0.375	0.375	1 to 4	1 to 4
85	Pennsylvania	5 1/8	2 1/2	17/32	1 21/32	2 15/32	1	10	10	0.25	0.25	15 deg.	13 deg.
85	Pennsylvania	5	2 9/16	17/32	1 3/4	2 3/8	7/8	10	8	0.25	0.25	13 deg.	13 deg.
85	Seaboard (Dudley)	5 1/4	2 11/16	17/32	1 5/8	2 3/4	7/8	14	14	0.5	0.3125	1 to 4	1 to 4
85	Soo Line	5 3/8	2 1/2	9/16	1 15/32	2 29/32	1					14° 2' 11"	14° 2' 11"
85	Western Pacific	5 1/4	2 1/2	9/16	1 3/4	2 5/8	7/8	10	VERT.	0.3125	0.3125	13 deg.	13 deg.
90	ARA-A	5 5/8	2 9/16	9/16	1 15/32	3 5/32	1	14	14	0.375	0.375	1 to 4	1 to 4
90	ARA-B	5 17/64	2 9/16	9/16	1 39/64	2 5/8	1 1/32	12	12	0.3125	0.3125	13 deg.	13 deg.
90	ASCE	5 3/8	2 5/8	9/16	1 19/32	2 55/64	59/64	12	12	0.25	0.25	13 deg.	13 deg.
90	AT & SF	5 5/8	2 9/16	9/16	1 15/32	3 5/32	1					1 to 4	1 to 4
90	Chicago NW	5 17/32	2 1/2	1/2	1 17/32	2 31/32	1 1/32	12	12	0.3125	0.3125	13 deg.	13 deg.
90	Denver & RG	5 1/2	2 9/16	9/16	1 5/8	2 7/8	1					14 deg.	14 deg.
90	Frictionless	5 5/8	2 1/4	9/16	2	2 5/8	1					13 deg.	13 deg.
90	Frictionless	6 3/32	1 59/64	9/16	1 15/16	3 5/32	1					1 to 4	1 to 4
90	Great Northern	5 3/8	2 5/8	9/16	1 15/32	2 7/8	1 1/32	12	14	0.4375	0.625	13 deg.	13 deg.
90	Great Northern	5 3/8	2 5/8	19/32	1 15/32	2 7/8	1 1/32					13 deg.	13 deg.
90	Great Northern	5 3/8	2 5/8	5/8	1 1/2	2 7/8	1	14	14	0.375	0.375	13 deg.	13 deg.
90	Head Free - R.A.	5 25/32	2 31/64	9/16	1 5/8	3 5/32	1	14	14	0.375		1 to 4; U = 54°	1 to 4
90	Interborough R.T.	5	2 7/8	11/16	1 25/32	2 11/32	7/8	12	9	0.25	0.25	13 deg.	13 deg.
90	Lehigh Valley	5	2 3/4	5/8	1 53/64	2 15/64	15/16	12	9	0.25	0.25	14 deg.	14 deg.

		Key Rail Dimensions											
		Rail Height	Head Width	Web Thickness	Head Height	Web Height Fishing	Base Height	Head Radius	Web Radius	Top Fillet Radius	Bottom Fillet Radius	Head Bottom Angle	Base Angle
Weight	Type	H	HD	W	HH	WH	BH	RH	RW	R1	R2	A1	A2
90	N.Y.C. (Dudley)	5 1/2	2 21/32	9/16	1 1/2	3 1/32	31/32	14	14	0.5	1	1 to 4	1 to 4
90	Union Pacific	5 3/4	2 3/4	17/32	1 1/2	3 3/8	7/8					13 deg.	13 deg.
91	Lackawanna	5 1/4	2 5/8	5/8	1 41/64	2 11/16	59/64	10	8	0.25	0.25	13 deg.	13 deg.
92	Frictionless	5 7/16	1 15/16	5/8	2 3/32	2 5/16	1 1/32					13 deg.	13 deg.
93	Frictionless	6 1/8	2 1/8	19/32	1 13/16	3 3/8	15/16					13 deg.	13 deg.
95	ASCE	5 9/16	2 11/16	9/16	1 41/64	2 63/64	15/16	12	12	0.25	0.25	13 deg.	13 deg.
95	Boston & Albany	5 1/32	3	5/8	1 9/16	2 15/32	1	14	14	0.5	0.3125	14 deg.	14 deg.
95	W & H Ry. (Dudley)	5 1/32	3	5/8	1 9/16	2 15/32	1	14	14	0.5	0.3125	1 to 4	1 to 4
97	Frictionless	5 7/8	2 1/4	9/16	1 15/16	2 55/64	1 5/64					13 deg.	13 deg.
98	Frictionless	5 27/32	2 1/2	9/16	1 31/32	2 25/32	1 3/32					15 deg.	13 deg.
100	ARA-A	6	2 3/4	9/16	1 9/16	3 3/8	1 1/16	14	14	0.375	0.375	1 to 4	1 to 4
100	ARA-B	5 41/64	2 21/32	9/16	1 45/64	2 55/64	1 5/64	12	12	0.3125	0.3125	13 deg.	13 deg.
100	AREA	6	2 11/16	9/16	1 21/32	3 9/32	1 1/16	14	14	0.375	0.625	1 to 4	1 to 4
100	ASCE	5 3/4	2 3/4	9/16	1 45/64	3 5/64	31/32	12	12	0.25	0.25	13 deg.	13 deg.
100	Canadian Pacific	6 1/16	2 11/16	9/16	1 23/32	3 9/32	1 1/16	14	14	0.375	0.625	1 to 4	1 to 4
100	Chicago NW	5 45/64	2 9/16	9/16	1 39/64	2 61/64	1 9/64	12	12	0.3125	0.3125	13 deg.	13 deg.
100	Elgin Joliet & East.	5 9/16	2 21/32	9/16	1 37/64	2 51/64	1 3/16					1 to 4	1 to 4
100	Great Northern	5 3/4	2 3/4	9/16	1 5/8	3	1 1/8					1 to 4	1 to 4
100	Head Free - R.A.	6 5/32	2 11/16	9/16	1 23/32	3 3/8	1 1/16	14	14	0.375		1 to 4; U = 49°	1 to 4
100	Head Free - R.E.	6 1/16	2 39/64	9/16	1 23/32	3 9/32	1 1/16					1 to 4; U = 57°	1 to 4
100	Interborough R. T.	5 3/4	2 7/8	9/16	1 45/64	3 5/64	31/32	12	12	0.25	0.25	13 deg.	13 deg.
100	N.Y., N.H. & H.	6	2 3/4	19/32	1 23/32	3 11/32	15/16	12	12	0.25	0.25	13 deg.	13 deg.
100	New York Central	6	3	19/32	1 5/8	3 13/32	31/32	14	14	0.5	0.3125	1 to 4	1 to 4
100	Pennsylvania	5 11/16	2 43/64	9/16	1 13/16	2 25/32	1 3/32	10	10	0.3125	0.3125	15 deg.	13 deg.
100	Pennsylvania	5 1/2	2 13/16	5/8	1 7/8	2 11/16	15/16	10	8	0.25	0.25	13 deg.	13 deg.
100	Reading	5 5/8	2 21/32	9/16	1 45/64	2 55/64	1 1/16	12	12	0.3125	0.3125	13 deg.	13 deg.
100	R.W. Hunt.	6	2 9/16	9/16	1 19/32	3 21/64	1 5/64	12	12	0.375	0.375	14 deg.	14 deg.
101	Lackawanna	5 7/16	2 3/4	5/8	1 23/32	2 11/16	1 1/32	10	8	0.25	0.25	13 deg.	13 deg.
105	Lackawanna	6	2 3/4	5/8	1 23/32	3 1/4	1 1/32	10	8	0.25	0.25	13 deg.	13 deg.
105	Dudley	6	3	5/8	1 5/8	3 13/32	31/32	14	14	0.5	0.75	1 to 4	1 to 4
105	New York Central	6	3	5/8	1 5/8	3 13/32	31/32	14	14	0.5	1	1 to 4	1 to 4
106	Misc.	6 3/16	2 21/32	19/32	1 3/4	3 3/8	1 1/16					1 to 4	1 to 4
107	N.Y., N.H. & H.	6 1/8	2 3/4	19/32	1 23/32	3 11/32	1 1/16	12	12	0.25	0.25	13 deg.	13 deg.

		Key Rail Dimensions											
		Rail Height	Head Width	Web Thickness	Head Height	Web Height Fishing	Base Height	Head Radius	Web Radius	Top Fillet Radius	Bottom Fillet Radius	Head Bottom Angle	Base Angle
Weight	Type	H	HD	W	HH	WH	BH	RH	RW	R1	R2	A1	A2
110	AREA	6 1/4	2 25/32	19/32	1 23/32	3 13/32	1 1/8	14	14	0.375	0.625	1 to 4	1 to 4
110	ASCE	6 1/8	2 7/8	37/64	1 25/32	3 11/32	1	12	12	0.25	0.25	13 deg.	13 deg.
110	C.T.A.	7	2 3/4	9/16	1 7/8	4 5/16	13/16					14 deg.	9 deg.
110	Great Northern	6 1/2	2 3/4	19/32	1 5/8	3 3/4	1 1/8	14	14	0.5	0.625	1 to 4	1 to 4
110	Head Free - AREA	6 7/16	2 11/16	19/32	1 29/32	3 13/32	1 1/8	14	14	0.375		1 to 4; U = 55° 30'	1 to 4
110	Lehigh Valley	6	2 7/8	19/32	1 7/8	3 1/16	1 1/16					1 to 4	1 to 4
112	AREA	6 5/8	2 23/32	19/32	1 11/16	3 13/16	1 1/8	24	10 & 23	0.375	0.625	1 to 4	1 to 4
112	Head Free - R.E.	6 3/4	2 11/16	19/32	1 13/16	3 13/16	1 1/8	14	10 & 23	0.375		1 to 4; U = 58°	1 to 4
112	CB & Q – TR	6 3/4	2 1/2	5/8	1 3/4	3 7/8	1 1/8					1 to 4; U = 77° 45'	1 to 4
113	Head Free – SP	6 13/16	2 11/16	19/32	1 7/8	3 13/16	1 1/8	14	10 & 23	0.375		1 to 4; U = 58°	1 to 4
115	AREA	6 5/8	2 23/32	5/8	1 11/16	3 13/16	1 1/8	10	3 & 14	0.75	0.75	1 to 4	1 to 4
115	D.R.G.W.	6 5/8	2 23/32	3/4	1 11/16	3 13/16	1 1/8					13 deg.	13 deg.
115	Dudley	6 1/2	3	5/8	1 11/16	3 3/4	1 1/16	14	14	0.5	0.75	1 to 4	1 to 4
115	Miscellaneous	6	2 15/16	21/32	1 7/8	3 1/16	1 1/16					1 to 4	1 to 4
118	Lackawanna	6 1/2	2 7/8	5/8	1 29/32	3 1/2	1 3/32					13 deg.	13 deg.
119	AREA	6 13/16	2 21/32	5/8	1 7/8	3 13/16	1 1/8	14	3 & 14	0.75	0.75	1 to 4	1 to 4
120	AREA	6 1/2	2 7/8	5/8	1 25/32	3 17/32	1 3/16					1 to 4	1 to 4
120	Mfg. Std.	6 1/4	2 7/8	5/8	1 29/32	3 5/32	1 3/16	12	12	0.375	0.375	14 deg.	14 deg.
120	New York Central	7	3	21/32	1 5/8	4 5/16	1 1/16	14	20	0.5	1	1 to 4	1 to 4
122	CB (B&O)	6 25/32	2 15/16	21/32	1 15/16	3 39/64	1 15/64	10	3 & 14	0.75	0.75	1 to 2 3/4	1 to 2 3/4, 1 to 13.7
125	Pennsylvania	6 1/2	3	21/32	1 7/8	3 13/32	1 7/32	12	16	0.5	0.75	18 deg.	14 deg.
126	Frictionless	7	1 13/16	11/16	2 3/8	3 13/32	1 7/32					18 deg.	14 deg.
127	Dudley	7	3	21/32	1 11/16	4 5/32	1 5/32					1 to 4	1 to 4
127	New York Central	7	3	21/32	1 11/16	4 5/32	1 5/32	14	18	0.5	0.75	1 to 4	1 to 4
129	CB & Q – TR	7 5/16	2 5/8	21/32	1 27/32	4 9/32	1 3/16					1 to 4	1 to 4
130	AREA	6 3/4	2 15/16	21/32	1 27/32	3 11/16	1 7/32	14	14	0.5	0.75	1 to 4	1 to 4
130	Head Free - P.S.	6 13/16	3	21/32	2 3/16	3 3/8	1 7/32					18°; U = 58° 30'	14 deg.
130	Head Free - R.E.	6 13/16	2 27/32	21/32	2 1/32	3 11/16	1 7/32	14	14	0.5		1 to 4; U = 61°	1 to 4
130	Phil. & Reading	6 27/32	2 15/16	21/32	1 15/16	3 11/16	1 7/32					1 to 4	1 to 4
130	Pennsylvania	6 5/8	3	11/16	2	3 13/32	1 7/32	12	16	0.5	0.75	18 deg.	14 deg.
131	AREA	7 1/8	3	21/32	1 3/4	4 3/16	1 3/16	24	10 & 23	0.5	0.75	1 to 4	1 to 4
131	Head Free - R.E.	7 1/4	2 31/32	21/32	1 7/8	4 3/16	1 3/16	14	10 & 23	0.5		1 to 4; U = 60° 30'	1 to 4
132	AREA	7 1/8	3	21/32	1 3/4	4 3/16	1 3/16	10	8 & 16	3/4 & 5/16	0.875	1 to 4	1 to 4

		Key Rail Dimensions											
		Rail Height	Head Width	Web Thickness	Head Height	Web Height Fishing	Base Height	Head Radius	Web Radius	Top Fillet Radius	Bottom Fillet Radius	Head Bottom Angle	Base Angle
Weight	Type	H	HD	W	HH	WH	BH	RH	RW	R1	R2	A1	A2
132	Head Free – S.P.	7 5/16	2 31/32	21/32	1 15/16	4 3/16	1 3/16	14	10 & 23	0.5		1 to 4; U = 60° 30'	1 to 4
133	AREA	7 1/16	3	11/16	1 15/16	3 15/16	1 3/16	10	8 & 16	3/4 & 7/16	0.75	1 to 3	1 to 4.011
135	Central of NJ	6 1/2	3 5/32	3/4	2	3 9/32	1 7/32					14 deg.	14 deg.
136	AREA	7 5/16	2 15/16	11/16	1 15/16	4 3/16	1 3/16	14	8 & 20	3/4 & 5/16	0.75	1 to 4	1 to 4
136	Lehigh Valley	7	2 15/16	21/32	1 7/8	3 7/8	1 1/4					1 to 4	1 to 4
136	Lehigh Valley	7 3/8	2 15/16	11/16	1 25/32	4 3/8	1 7/32					1 to 4	1 to 4
136	Lehigh Valley	7	2 15/16	11/16	1 7/8	3 7/8	1 1/4					1 to 4	1 to 4
136	New York Central	7 9/32	2 15/16	11/16	1 7/8	4 5/32							
140	AREA/PS	7 5/16	3	3/4	2 1/16	4 1/16	1 3/16	10	8 & 27	3/4 & 7/16	0.75	1 to 3	1 to 4
141	AREA	7 7/16	3 1/16	11/16	2 5/32	4 3/32	1 3/16		19 31/32	¾	3/4	18.4 deg.	14 deg.
152	Pennsylvania	8	3	11/16	1 27/32	4 7/8	1 9/32	24	6&30	0.5	0.75	14 deg.	14 deg.
155	Pennsylvania	8	3	3/4	2 1/16	4 21/32	1 9/32					18° 26' 10"	14 deg.



Appendix D - Source/Activity Codes

Activity Codes		Source Codes																
		Reg Insp	Complaint	Accident	Special Assessment	Waiver	Asist Other Fed Agencey	Other	Nuclear Route	ATIP	ATIP Follow Up	Inspect from Train	Regular STRACNET	Special STRACNET	ATIP STRACNET	Reinspect	Manut. Facility	Focused Inspection
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	R	V	W
Remedial Action	209							x										
Camp Car	218C	x	x	x	x	x	x	x	x				x	x		x		x
FRA Geometry	ATIP									x	x				x			
Barrier Plan	BAP	x	x	x	x	x	x	x	x				x	x		x		x
Bridge Worker	BWK	x	x	x	x	x	x	x	x				x	x		x		x
CWR Plans	CWRP	x	x	x	x	x	x	x	x				x	x		x		x
Derail	DER	x	x	x	x	x	x	x	x		x		x	x		x		x
GRMS - Govt	GRMG		x		x		x	x	x									x
GRMS - Railroad	GRMS	x	x	x	x	x	x	x					x	x		x		
Highway Rail Vegetation	HGCT	x	x	x	x	x	x	x	x				x	x		x		x
Lift Rail	LRA	x	x	x	x	x	x	x	x		x		x	x		x		x
Bridge Inspection	MSB	x	x	x	x		x	x	x				x	x		x		x
Main Track Hi Rail	MTH	x	x	x	x	x	x	x	x		x		x	x		x		x
Main Track Walk	MTW	x	x	x	x	x	x	x	x		x		x	x		x		x
Noise	NOIS	x	x	x	x	x	x	x					x	x		x		x
Qualification Test Plan	QTP	x	x	x	x	x	x	x	x				x	x		x		x

Activity Codes		Source Codes																
		Reg Insp	Complaint	Accident	Special Assessment	Waiver	Asist Other Fed Agencey	Other	Nuclear Route	ATIP	ATIP Follow Up	Inspect from Train	Regular STRACNET	Special STRACNET	ATIP STRACNET	Reinspect	Manut. Facility	Focused Inspection
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	R	V	W
Vehicle Qualification Test	QVT	x	x	x	x	x	x	x	x				x	x		x		x
Rail Mill Facility	RMI				x	x	x	x	x							x	x	x
Roadway Maintenance Machine	RMM	x	x	x	x	x	x	x	x		X	x	x	x		x		x
Right of Way Plan	RWOP	x	x	x	x	x	x	x	x				x	x		x		x
Roadway Worker Protection	RWP	x	x	x	x	x	x	x	x		X	x	x	x		x		x
Rail Crossing Main	RXM	x	x	x	x	x	x	x	x		X		x	x		x		x
Rail Crossing Yard	RXY	x	x	x	x	x	x	x	x		x		x	x		x		x
Speed (Radar)	SPCL	x	x	x	x		x	x	x				x	x		x		x
Railroad Geometry Car	TGMS	x	x	x	x	x	x	x	x				x	x		x		
Turnout Main	TOM	x	x	x	x	x	x	x	x		x		x	x		x		x
Turnout Yard	TOY	x	x	x	x	x	x	x	x		x		x	x		x		x
Track Inspection Records	TREC	x	x	x	x	x	x	x	x				x	x		x		x
Inspect From Train	TRM	x	x	x	x	x	x	x	x			x	x	x		x		x
Yard Track Hi Rail	YTH	x	x	x	x	x	x	x	x		x		x	x		x		x
Yard Track Walk	YTW	x	x	x	x	x	x	x	x		x		x	x		x		x
Vehicle/Track Interaction	VTI	x	x		x	x	x	x	x				x	x		x		x
Welding Plant	WPI		x	x	x	x	x	x								x	x	x

Activity and source codes are analytical instruments only for use with FRA's Railroad Inspection System for the PC (RISPC) software program. These codes are specific to the track discipline only and use additional codes for other activities as appropriate.

Appendix E – Use of portable track-loading fixture (PTLF) in non-GRMS territory

Note – The use of the PTLF for compliance purposes outside GRMS territory has been temporality suspended.

CHAPTER 6

Track Safety Standards Classes 6 through 9

Subpart G General

§213.301 Scope of subpart

This subpart applies to all track used for the operation of trains at a speed greater than 90 m.p.h. for passenger equipment and greater than 80 m.p.h. for freight equipment.

Application

Subpart G applies to track required to support the passage of passenger and freight equipment in specific speed ranges higher than those permitted over Class 5 track. For those speeds above Class 5, the track and the vehicles operated on the track must be considered as an integral system. This subpart does not apply to technologies such as magnetic levitation that do not use flanged wheel equipment. Subpart G begins at a speed greater than 90 m.p.h. for <u>qualified</u> passenger equipment and a speed greater than 80 m.p.h. for <u>qualified</u> freight equipment.

The safety requirements for high speed track classes are contained in Subpart G of the Track Safety Standards (TSS) which covers track Classes 6 through 9. As are the standards for the lower track classes, the rules prescribed herein are minimum requirements for safety and the high speed railroad is encouraged and expected to maintain higher standards.

This subpart is intended to function as "stand alone" regulations governing any track belonging to one of these higher track classes. In other words, the track owner needs to refer only to Subpart G for compliance with the TSS for track over which railroads operate trains at the speeds associated with the high speed track classes. However, if that same track does not meet the requirements in Subpart G at any time, the other subparts (A through F) apply.

These requirements constitute only one of several components comprising a regulatory program permitting trains to travel at high speeds. The FRA may also address high speed issues in regulations outside of Part 213, such as emergency preparedness, wheel conditions, braking systems, and grade crossings. The TSS are an integral part of that larger regulatory scheme.

This Subpart provides the necessary information for FRA and State personnel to properly interpret and enforce the TSS for the higher track classes. It is not to be construed as a modification, alteration, or revision of the TSS as published.

The Inspector should refer to this manual as often as necessary to understand the intent of any particular standard. The requirements prescribed in this part apply to specific track and vehicle/track interaction conditions. As in the lower classes, a combination of track conditions, none of which individually amounts to a deviation from the requirements in this part, may require remedial action to provide for safe operations over that track.

The high speed TSS is based on the fundamental principle that vehicles in the high speed regime must demonstrate that they will not exceed minimum vehicle/track performance safety limits when operating on specified track. Specific requirements are included for the qualification of persons engaged in the inspection and maintenance of high speed track, high speed track geometry, track structure, and both automated and visual inspections.

The high speed standards address conditions that exist alone and combinations of track and vehicle/track interaction which, while individually not in violation of any standard, could nonetheless present a hazard to the safe movement of trains. As in the inspection of the lower classes, if the inspector should encounter a rare event the Inspector should bring the condition to the attention of the accompanying railroad official, explain the hazard of such a condition and encourage its rapid removal. Where the Inspector is unable, using professional experience, to convince the railroad to initiate some action, the Inspector should apply to the Regional Track Specialist for assistance. It is unlikely to find railroad resistance in the removal of recognized safety hazards.

§213.303 Responsibility for compliance

(a) Any owner of track to which this subpart applies who knows or has notice that the track does not comply with the requirements of this subpart, shall --

(1) Bring the track into compliance; or

(2) Halt operations over that track.

(b) If an owner of track to which this subpart applies assigns responsibility for the track to another person (by lease or otherwise), notification of the assignment shall be provided to the appropriate FRA Regional Office at least 30 days in advance of the assignment. The notification may be made by any party to that assignment, but shall be in writing and include the following --

(1) The name and address of the track owner;

(2) The name and address of the person to whom responsibility is assigned (assignee);

(3) A statement of the exact relationship between the track owner and the assignee;

(4) A precise identification of the track;

(5) A statement as to the competence and ability of the assignee to carry out the duties of the track owner under this subpart;

(6) A statement signed by the assignee acknowledging the assignment to that person of responsibility for purposes of compliance with this subpart.

(c) The Administrator may hold the track owner or the assignee or both responsible for compliance with this subpart and subject to the penalties under §213.15.

Application

This section describes the action that must be taken by the track owner once the owner knows that the track is not in compliance with the TSS. The track owner must:

(1) Bring the track into compliance by either repairing the defects or imposing an appropriate speed restriction; or

(2) Remove the track from service.

Only two response options are available under this paragraph. Track owners who know or have notice of non-compliance with this subpart may either bring the track into compliance with the subpart or halt operations over that track. This section does not offer the railroad the option of operating under this subpart with the supervision of a qualified person, as in the standards for track Classes 1 through 5. Such an option would permit too much potential for human error. Under this subpart, if a track does not comply with the requirements of its class, it must be repaired immediately or train speeds must be reduced to the maximum speed for the track class with which the track complies. It may be necessary on occasion for the track owner to reduce the

class of track to Class 5 or below. When this occurs, the requirements for the lower classes (1-5) will apply.

This section also provides that the party responsible for compliance can be someone other than the actual owner. The FRA may hold responsible any party contracted by the track owner to ensure compliance with this part. The FRA may hold the track owner, the assignee, or both responsible.

This section gives a track owner the responsibility to notify the FRA, through the appropriate regional office, when the responsibility for compliance with this part is assigned. Notification must contain the specific information required in this paragraph and shall be made 30 days prior to the assignment of the responsibility.

Inspectors must determine the responsible party when recommending civil penalties for non-compliance and alert Chief Counsel when violation reports involve parties other than the track owner.

For class specific defects, it is explicitly apparent to the track owner that they have the option of reclassifying the track to a lower class to bring the track into compliance. For example, §213.351, Rail Joints, states that "if a joint bar is cracked, broken, or because of wear allows vertical movement of either rail when all bolts are tight, it must be replaced." Obviously, one of the remedial actions available to the carrier would be to place a speed restriction and reclassify the track to class 1 or 2. For other defects in the standards, specific classes or remedial actions are not printed in the appropriate section.

Track owners often have questions regarding the remedial actions available when inspectors discover and record turnout defects such as missing or loose frog bolts. The carrier will not find the required remedial action in §213.353. Because turnouts are designed with certain redundancies, some maintenance personnel suggest that loose or missing components should not always be considered defects unless they present an immediate hazard. However, it is also recognized that these conditions will only deteriorate if left un-repaired.

One loose frog bolt out of several would seldom constitute an immediate hazard, provided that the frog was otherwise secure. On the other hand, a missing cotter pin in a critical location such as in a connecting rod could have serious consequences.

Consider the example of loose or missing rail braces. One or two loose braces are usually not considered to be an immediate hazard, provided that the other braces are in acceptable functional condition to support the stock rail. On the other hand, several consecutively loose braces, especially in the higher track classes, could be much more serious.

Intermittent patches of vegetation that brush the sides of rolling stock may not be an immediate hazard, but more severe vegetation might have the potential of contributing to the injury of an employee who is riding on the side of a car or looking out locomotive cab windows.

As the above examples illustrate, non-class specific defects must be considered in the context of the specific circumstances involved. The existence of a non-class specific defect under one set of circumstances may not be serious while the identical condition under other circumstances may constitute a serious safety concern.

Although some non-class specific defects may not present an immediate hazard, these conditions will only degrade under train traffic. Therefore, it is important for carrier and FRA inspectors to record these defects so that they will not be left un-repaired. In summary:

(1) FRA inspectors should record all non-complying conditions, including non-class specific defects such as loose or missing frog bolts or switch braces. Care must be taken to conduct a thorough inspection, recording the location, type and size of each defect discovered.

(2) The FRA inspectors should evaluate the remedial action taken by the carrier. If an inspector becomes aware that the remedial action, or lack thereof, for a non-class specific defect is not sufficient based on the circumstances, the inspector should seek a more appropriate action from the carrier. For a non-class specific defect which is an imminent hazard such as a missing nut on a connecting rod, the inspector should immediately inquire as to the remedial action planned by the carrier.

(3) If the railroad does not institute an appropriate remedial action, the inspector should consider recommending a violation. If the railroad has been advised that a violation has been recommended and has not initiated appropriate remedial action, the inspector should be prepared to issue a Special Notice for Repairs, under the guidelines described in Chapter 4 of the this manual.

(4) In the case of a non-class specific defect that did not pose an immediate hazard when the defect was recorded, and the inspector discovers that no action was taken within a reasonable time frame after the carrier had knowledge of the defect, the inspector should consider the enforcement options described in item 3 above. In any case, if no appropriate action

was taken within a 30-day period, the inspector should consider the enforcement tools outlined above.

When a railroad inspector discovers a non-class specific defect, as with all defects, the railroad inspector must initiate immediate action in accordance with §213.365(d). The remedial action taken by the railroad inspector must be recorded in accordance with §213.369(b). For non-class specific defects, the record must show a reasonable explanation of the action taken. For example, "repaired before next train" would be appropriate for serious conditions. On the other hand, a notation for a defect such as vegetation that indicates the vegetation is scheduled to be cut by a weed mower by a specific date within 30 days may be appropriate. The 30-day period represents only a maximum period that FRA would expect that all non-class specific defects are repaired or other appropriate action taken and is not intended to create a 30-day "grace period" for all defects.

A non-class specific defect may not pose an immediate hazard for one train movement, but the condition may deteriorate to become a hazard to following trains. It is reasonable to expect that conditions such as loose or missing frog bolts or braces are repaired as quickly as possible. However, a qualified railroad representative under §213.305 may determine that the condition is not an immediate hazard and decide to call for assistance to make the repairs, or the representative may decide to end the inspection, retrieve the necessary repair materials, and return later to make the repairs. In some cases, the representative may determine that a speed restriction is appropriate.

§213.305 Designation of qualified individuals; general qualifications

Each track owner to which this subpart applies shall designate qualified individuals responsible for the maintenance and inspection of track in compliance with the safety requirements prescribed in this subpart. Each individual, including a contractor or an employee of a contractor who is not a railroad employee, designated to:

(a) Supervise restorations and renewals of track shall meet the following minimum requirements:

(1) At least;

(i) Five years of responsible supervisory experience in railroad track maintenance in track Class 4 or higher and the successful completion of a course offered by the employer or by a college level engineering program, supplemented by special on the job training emphasizing the techniques to be employed in the supervision, restoration, and renewal of high speed track; or

(ii) A combination of at least one year of responsible supervisory experience in track maintenance in Class 4 or higher and the successful completion of a minimum of 80 hours of specialized training in the maintenance of high speed track provided by the employer or by a college level engineering program, supplemented by special on the job training provided by the employer with emphasis on the maintenance of high speed track; or

(iii) A combination of at least two years of experience in track maintenance in track Class 4 or higher and the successful completion of a minimum of 120 hours of specialized training in the maintenance of high speed track provided by the employer or by a college level engineering program supplemented by special on the job training provided by the employer with emphasis on the maintenance of high speed track.

(2) Demonstrate to the track owner that the individual:

(i) Knows and understands the requirements of this subpart;

(ii) Can detect deviations from those requirements; and

(iii) Can prescribe appropriate remedial action to correct or safely compensate for those deviations; and

(3) Be authorized in writing by the track owner to prescribe remedial actions to correct or safely compensate for deviations from the requirements of this subpart and successful completion of a recorded examination on this subpart as part of the qualification process.

(b) Inspecting track for defects shall meet the following minimum qualifications:

(1) At least:

(i) Five years of responsible experience inspecting track in Class 4 or above and the successful completion of a course offered by the employer or by a college level engineering program, supplemented by special on the job training emphasizing the techniques to be employed in the inspection of high speed track; or

(ii) A combination of at least one year of responsible experience in track inspection in Class 4 or above and the successful completion of a minimum of 80 hours of specialized training in the inspection of high speed track provided by the employer or by a college level engineering program, supplemented by special on the job training provided by the employer with emphasis on the inspection of high speed track; or

(iii) A combination of at least two years of experience in track maintenance in Class 4 or above and the successful completion of a minimum of 120 hours of specialized training in the inspection of high speed track provided by the employer or from a college level engineering program, supplemented by special on the job training provided by the employer with emphasis on the inspection of high speed track.

(2) Demonstrate to the track owner that the individual:

(i) Knows and understands the requirements of this subpart;

(ii) Can detect deviations from those requirements; and

(iii) Can prescribe appropriate remedial action to correct or safely compensate for those deviations; and

(3) Be authorized in writing by the track owner to prescribe remedial actions to correct or safely compensate for deviations from the requirements in this subpart and successful completion of a recorded examination on this subpart as part of the qualification process.

(c) Individuals designated under paragraphs (a) or (b) of this section that inspect continuous welded rail (CWR) track or supervise the installation, adjustment, and maintenance of CWR in accordance with the written procedures established by the track owner shall have:

(1) Current qualifications under either paragraph (a) or (b) of this section;

(2) Successfully completed a training course of at least eight hours duration specifically developed for the application of written CWR procedures issued by the track owner; and

(3) Demonstrated to the track owner that the individual:

(i) Knows and understands the requirements of those written CWR procedures;

(ii) Can detect deviations from those requirements; and

(iii) Can prescribe appropriate remedial action to correct or safely compensate for those deviations; and

(4) Written authorization from the track owner to prescribe remedial actions to correct or safely compensate for deviations from the requirements in those procedures and successful completion of a recorded examination on those procedures as part of the qualification process. The recorded examination may be written, or it may be a computer file with the results of an interactive training course.

(d) Persons not fully qualified to supervise certain renewals and inspect track as outlined in paragraphs (a), (b) and (c) of this section, but with at least one year of maintenance of way or signal experience, may pass trains over broken rails and pull aparts provided that –

(1) The track owner determines the person to be qualified and, as part of doing so, trains, examines, and re-examines the person periodically within two years after each prior examination on the following topics as they relate to the safe passage of trains over broken rails or pull aparts: rail defect identification, crosstie condition, track surface and alinement, gage restraint, rail end mismatch, joint bars, and maximum distance between rail ends over which trains may be allowed to pass. The sole purpose of the examination is to ascertain the person's ability to effectively apply these requirements and the examination may not be used to disqualify the person from other duties. A minimum of four hours training is adequate for initial training;

(2) The person deems it safe, and train speeds are limited to a maximum of 10 m.p.h. over the broken rail or pull apart;

(3) The person shall watch all movements over the broken rail or pull apart and be prepared to stop the train if necessary; and

(4) Person(s) fully qualified under § 213.305 of this subpart are notified and dispatched to the location as soon as practicable for the purpose of authorizing movements and effectuating temporary or permanent repairs.

(e) With respect to designations under paragraphs (a), (b), (c) and (d) of this section, each track owner shall maintain written records of:

(1) Each designation in effect;

(2) The basis for each designation, including but not limited to:

(i) The exact nature of any training courses attended and the dates thereof;

(ii) The manner in which the track owner has determined a successful completion of that training course, including test scores or other qualifying results;

(3) Track inspections made by each individual as required by §213.369. These records shall be made available for inspection and copying by the Federal Railroad Administration during regular business hours.

Application

Work on or about a track structure supporting qualified high speed passenger trains demands the employees be fully aware of the need to perform work properly.

A person may be qualified to perform restorations and renewals under this subpart in three ways. First, the person may combine five or more years of supervisory experience in track maintenance for Class 4 or higher and the successful completion of a course offered by the employer or by a college level engineering program, supplemented by special on-the-job training. Second, a person may be qualified by a combination of at least one year of supervisory experience in track maintenance of Class 4 or higher, 80 hours of specialized training or in a college level program, supplemented with on-the-job training. Under the third option, a railroad employee with at least two years of experience in maintenance of high speed track can achieve qualification status by completing 120 hours of specialized training in maintenance of high speed track, provided by the employer or by a college level engineering program, supplemented by special on-the-job training. For the third option, all or part of the experience required may be non-supervisory.

Similarly, a person may be qualified to perform track inspections in Classes 6, 7, 8 and 9 by attaining five or more years of experience in inspection in track Class 4 or higher and by completing a course taught by the employer or by a college level engineering program, supplemented by special on-the-job training. Or, the person may be qualified by attaining a combination of at least one year

of experience in track inspection in Class 4 and higher and by successfully completing 80 hours of specialized training in the inspection of high speed track provided by the employer or by a college level engineering program, supplemented with on-the-job training. Finally, a person may be qualified by attaining two years of experience in track maintenance in Class 4 and above and by successfully completing 120 hours of specialized training in the inspection of high speed track provided by the employer or by a college level engineering program, supplemented by special on-the-job training provided by the employer with emphasis on the inspection of high speed track. For the third option, all or part of the experience required may be non-supervisory. The third option is primarily intended to provide a way for employees with two years of experience in the maintenance of high speed track to gain the necessary training to be qualified to inspect track.

This section also includes specific requirements for qualifications of persons charged with maintaining and inspecting CWR. Training of employees in CWR procedures is essential for high speed operations. Each person inspecting and maintaining CWR must understand how CWR behaves and how to prevent track buckles and other adverse track reactions to thermal and dynamic loading.

Paragraph (d) allows employees to be qualified for the specific purpose of authorizing train movements over broken rails or pull aparts. This section requires the employees to have at least one year of maintenance of way or signal experience and a minimum of four hours of training and examination on requirements related to the safe passage of trains over broken rails and pull aparts. The purpose of the examination is to ascertain the person's ability to effectively apply these requirements. A railroad may use the examination to determine whether or not a person should be allowed to authorize train movements over broken rails or pull aparts.

The maximum speed over broken rails and pull aparts shall not exceed 10 m.p.h. However, movement authorized by a person qualified under this subsection may further restrict speed, if warranted, by the particular circumstances. The person qualified under this paragraph must be present at the site and able to instantly communicate with the train crew so that the movement can be stopped immediately, if necessary.

Fully qualified persons under §213.305 must be notified and dispatched to the location promptly to assume responsibility for authorizing train movements and effecting repairs. The word "promptly" is meant to provide the railroad with some flexibility in the event that there is only one train to pass over the condition prior to the time when a fully qualified person would report for a regular tour of duty, or where a train is due to pass over the condition before a fully qualified

person is able to report to the scene. Railroads should not use persons qualified under §213.305(d) to authorize multiple train movements over such conditions for an extended period of time.

Inspectors may request of an owner, verification of the experience and qualifications of his supervisory and track inspection personnel and those supervisory and track personnel who inspect and maintain CWR and those qualified to pass trains over broken rails or pull aparts. Each Inspector shall maintain an up-to-date list of the owner's qualified personnel to determine the effectiveness of their inspection or work. The submission of a seniority roster or job awarding bulletin is not to be considered as satisfactory identification of qualified employees or as a basis for their designation. Specific names of individuals should be made available in writing by the owner.

If the Inspector is in doubt as to the qualifications of the owner's supervisory or inspection personnel, the Inspector should examine the owner's inspection records. The TSS require the retention of required track inspection reports for one year at the owner's division office. Should the records consistently fail to reflect the actual track condition, question can be raised as to the competence and/or qualifications of the person(s) establishing the record.

When in doubt as to the qualifications of an owner's supervisors or inspectors, the Inspector should discuss the matter with the owner.

Failure of the owner to have and maintain written records designating employees or the basis for each designation is a deviation from the TSS. Incomplete qualification records would also constitute a deviation from the standards. Designated employees include supervisors, inspectors, those supervisors and inspectors qualified on CWR, and those partially qualified to pass trains over broken rails and pull aparts.

Defect Codes	
305.01	No written record of names of qualified persons to supervise restorations and renewals of track under traffic and/or to inspect track for defects, or to pass trains over broken rails or pull-aparts, or to maintain or inspect CWR.
305.02	Failure of track owner to provide written authorization to qualified designated individuals.
305.03	Failure to use qualified person to pass trains over broken rails or pull aparts.
305.04	Train speed exceeds 10 m.p.h. over broken rails or pull aparts.
305.05	Failure to promptly notify and dispatch person fully qualified under §213.305 to the location of the broken rail or pull apart.

§213.307 Class of track; operating speed limits

(a) Except as provided in paragraph (b) of this section and §§213.329, 213.337(a) and 213.345(c), the following maximum allowable operating speeds apply:

Over track that meets all of the requirements prescribed in this subpart for	The maximum allowable operating speed for trains [1] is
Class 6 track	110 m.p.h.
Class 7 track	125 m.p.h.
Class 8 track	160 m.p.h[2]
Class 9 track	200 m.p.h.

1 Freight may be transported at passenger train speeds if the following conditions are met:

(1) The vehicles utilized to carry such freight are of equal dynamic performance and have been qualified in accordance with Sections 213.345 and 213.329(d) of this subpart.

(2) The load distribution and securement in the freight vehicle will not adversely affect the dynamic performance of the vehicle. The axle loading pattern is uniform and does not exceed the passenger locomotive axle loadings utilized in passenger service operating at the same maximum speed.

(3) No carrier may accept or transport a hazardous material, as defined at 49 CFR 171.8, except as provided in Column 9A of the Hazardous Materials Table (49 CFR 172.101) for movement in the same train as

a passenger-carrying vehicle or in Column 9B of the Table for movement in a train with no passenger-carrying vehicles.

[2] Operating speeds in excess of 150 m.p.h. are authorized by this part only in conjunction with a rule of particular applicability addressing other safety issues presented by the system.

(b) If a segment of track does not meet all of the requirements for its intended class, it is to be reclassified to the next lower class of track for which it does meet all of the requirements of this subpart. If a segment does not meet all of the requirements for Class 6, the requirements for Classes 1 through 5 apply.

Application

As in the lower classes, the high speed standards classify track solely on the basis of authorized speeds of freight and passenger trains, irrespective of traffic density, axle loads, trailing tonnage, curvature, grades, or rail weight. Tolerances are specified in the TSS for each class of track. A deviation beyond the limiting tolerances requires repair, or reduction of speeds to the appropriate class. If the condition does not meet the requirements for track Classes 6 through 9, the owner may reduce the speed to comply with the requirements for Classes 1 through 5.

The exceptions for the maximum allowable operating speeds for each class of track parallels the standards for the lower classes, including the maximum operating curving speed required under §213.329 and rail defects under §213.337, except that a speed of 10 m.p.h. over the maximum intended operating speeds is permitted during the qualification phase per §213.345.

All equipment, whether used for passenger or freight, must demonstrate the same vehicle/track performance and be qualified on the high speed track. Hazardous materials, except for limited and small quantities, may not move in bulk on trains operated at high speeds.

Operating speeds in excess of 150 m.p.h. are authorized only in conjunction with a Rule of Particular Applicability addressing other safety issues presented by the system, except that a speed of 160 m.p.h. is authorized during the qualification of the vehicle/track system per §213.345.

Defect Codes	
307.01	Train speed exceeds 200 m.p.h. without FRA approval.
307.02	Freight transported at passenger train speeds in unqualified vehicles.
307.03	Load distribution & securement in the freight vehicle adversely affects the dynamic performance of the vehicle or the axle loading pattern is not uniform & exceeds the passenger locomotive axle loadings in passenger trains at the same maximum speed.
307.04	Carrier accepted or transported a hazardous material defined in 49 CFR Part 171.8 which is not acceptable for movement.
307.05	Trains operated in excess of 150 m.p.h. not in conjunction with a Rule of Particular Applicability addressing other safety issues presented by the system.

§213.309 Restoration or renewal of track under traffic conditions

(a) Restoration or renewal of track under traffic conditions is limited to the replacement of worn, broken, or missing components or fastenings that do not affect the safe passage of trains.

(b) The following activities are expressly prohibited under traffic conditions:

(1) Any work that interrupts rail continuity, e.g., as in joint bar replacement or rail replacement;

(2) Any work that adversely affects the lateral or vertical stability of the track with the exception of spot tamping an isolated condition where not more than 15 lineal feet of track are involved at any one time and the ambient air temperature is not above 95 degrees Fahrenheit; and

(3) Removal and replacement of the rail fastenings on more than one tie at a time within 15 feet.

Application

The term "restoration and renewal" in this section does not have the same meaning as in the context of §213.11, restoration or renewal of track under traffic conditions, in the low speed standards. The essential difference between this section and §213.11 is that the options for a qualified person to authorize movements over a work area at a speed determined by that person are severely restricted. Under §213.11, a qualified person may determine that it is safe to permit a train to pass through a work area at any speed up to the permanent speed on the track. Under §213.309, these options are further

limited because of the potential for human error and the speeds involved. Options available in the lower classes for a designated person to perform general restorations under traffic and set train speeds is not available under this section. Any restoration under traffic conditions beyond the replacement of worn, broken or missing components or fastenings or minor levels of spot surfacing is prohibited or a speed restriction must be imposed to place the track below Class 6 where the requirements for track Classes 1 through 5 apply. The section does not limit any restoration work while the track is "out-of-service" and then restored to service.

This section addresses two elements of concern: 1) that the stability of the track structure is significantly degraded; and 2) that roadway worker safety is compromised.

Defect Codes	
309.01	Reserved
309.02	Work performed during a period of restoration and renewal under traffic conditions which interrupts rail continuity.
309.03	Work performed during a period of restoration and renewal under traffic conditions which adversely affects track stability.
309.04	Removal and replacement of the rail fastenings on more than one tie at a time within 15 feet during a period of restoration and renewal under traffic conditions.

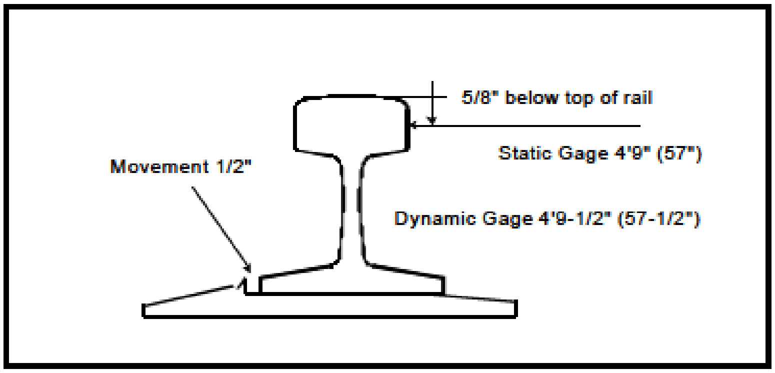
§213.311 Measuring track not under load

When unloaded track is measured to determine compliance with requirements of this subpart, evidence of rail movement, if any, that occurs while the track is loaded shall be added to the measurements of the unloaded track.

Application

In addition to the static (unloaded) geometry measurements taken, the amount of visually detectable dynamic (loaded) deflection that occurs under train movement must be considered. This includes the amount of vertical or lateral rail deflection occurring between rail base and tie plate, a tie plate and crosstie, from voids between the crosstie and ballast section resulting from elastic compression, or any combinations of the above must be added. Each deflection under the running rails must be measured and properly considered when computing the collective deviations under a load. It is very important that consideration be given to both rails when measuring these deflections. Figure 6-1 illustrates this concept in relation to lateral rail movement in a tie plate.

Figure 6-1



Vertical and lateral deflections may be found at locations such as rail joints and turnout locations with poor wooden crossties and conventional cut-spike fastening conditions; at bridge abutments and over culverts where the subgrade has settled; or where incipient geometry conditions exist. The word "incipient" means "beginning to appear."

§213.317 Waivers

(a) Any owner of track to which this subpart applies may petition the Federal Railroad Administrator for a waiver from any or all requirements prescribed in this subpart.

(b) Each petition for a waiver under this section shall be filed in the manner and contain the information required by §§211.7 and 211.9 of this chapter.

(c) If the Administrator finds that a waiver is in the public interest and is consistent with railroad safety, the Administrator may grant the waiver subject to any conditions the Administrator deems necessary. Where a waiver is granted, the Administrator publishes a notice containing the reasons for granting the waiver.

Application

Inspectors have no authority to grant waivers from the TSS.

Any petition for waiver must be filed by the owner with the Docket Clerk, Office of Chief Counsel, in Washington, D.C. Refer to Chapter 3 of this manual for more information regarding Waiver procedures.

§213.319 Drainage

Each drainage or other water carrying facility under or immediately adjacent to the roadbed must be maintained and kept free of obstruction, to accommodate expected water flow for the area concerned.

Application

One of the most essential element of track maintenance is a comprehensive drainage system. Drainage facilities (bridges, trestles or culverts) must be given careful, detailed consideration. Drainage facilities must be examined during inspections. Openings under the track are used to channel and divert water from one side of the roadbed to the other.

The TSS specifies that each drainage structure is maintained and the Inspector should observe conditions that would affect the integrity of the structure such as culvert pull-apart or separations, crushing or uneven settlement due to failure of or lack of head walls, coupled with frost action, too steep a gradient, and insufficient support.

Drainage openings must also be inspected and notice given where debris has accumulated to such an extent that expected water flow cannot be accommodated.

Most railroad drainage structures have existed for many years, and if properly maintained and kept free of debris, they are considered to be adequately designed to accommodate expected water flow even though recent high water marks may be slightly above the inlet opening.

Culverts designed with submerged inlets are common. Where questions are raised concerning the adequacy of drainage structures, the Track Specialist should be consulted.

The Inspector must take note of the conditions of:

- Right-of-way ditches;
- Culvert, trestles and bridge inlets;
- Water carrying structures or passageways;
- Outlets or tail ditches;
- Berm ditches;
- Scouring of embankments, piling or piers in channels or at abutments;
- Filling in of passageways from silting, sand wash, or debris.

Inspectors must call to the attention of the track owner any drainage condition deemed hazardous or potentially hazardous to the safety of train operations over the track and subgrade.

Defect Codes	
319.01	Drainage or water-carrying facility not maintained.
319.02	Drainage or water-carrying facility obstructed by debris.
319.03	Drainage or water-carrying facility collapsed.
319.04	Drainage or water-carrying facility obstructed by vegetation.
319.05	Drainage or water-carrying facility obstructed by silting.
319.06	Drainage or water-carrying facility deteriorated to allow subgrade saturation.
319.07	Uncontrolled water undercutting track structure or embankment.

§213.321 Vegetation

Vegetation on railroad property which is on or immediately adjacent to roadbed shall be controlled so that it does not --

(a) Become a fire hazard to track-carrying structures;

(b) Obstruct visibility of railroad signs and signals:

(1) Along the right of way, and

(2) At highway-rail crossings;

(c) Interfere with railroad employees performing normal trackside duties;

(d) Prevent proper functioning of signal and communication lines; or

(e) Prevent railroad employees from visually inspecting moving equipment from their normal duty stations.

Application

Inspectors must be aware that live and dead growth, drift, tumbleweeds, debris, etc., can constitute fire hazards to timber bridges, trestles, wooden box culverts, and other track-carrying structures.

Obstruction of the visibility of railroad signs and signals by vegetation is a deviation from the TSS. Although all signals are important, the visibility of certain signals must be closely observed: i.e., block signals, interlocking signals, speed signs (or other signs affecting the movement of trains), close clearance signs, whistle posts, and mileposts.

- Paragraph (b) includes a requirement to clear vegetation from signs and signals along railroad rights-of-way and at highway rail grade crossings. Because the scope of Part 213 limits vegetation requirements to railroad property, this is not intended to be an attempt to dictate standards for surrounding landowners. This paragraph intends only to cover the clearing of vegetation at highway-rail grade crossings on railroad property to provide adequate visibility to the traveling public of railroad signs and signals. It is not intended to cover or preempt state or local requirements for the clearing of vegetation on railroad rights-of-way at highway-rail grade crossings.

- Judgment must be exercised by the Inspector in determining whether trackside vegetation will interfere with the railroad employees' performance of normal trackside duties. Weeds covering the track that hinder the ability of an Inspector to see track structure components is not necessarily a non-complying condition.

- Before citing the railroad for vegetation interfering with signal or communication lines, the Inspector must confirm that the line is active. Occasionally, however, Inspectors may observe vegetation in lines that appear to be no longer functioning. Communication between the Track Inspector and the FRA Signal and Train Control Inspector is necessary if the railroad representative cannot confirm the status of a signal or communication line. When interfering with active lines, vegetation may cause false signal indications and/or disrupt communications that are vital to safe train operations. When there are questions with regard to vegetation and the signal lines, joint inspections by track and signal personnel are encouraged. Violation reports, if necessary, will be executed by the Track Inspector with concurrence of the Signal Inspector.

- Judgment must be exercised by the Inspector in determining whether or not vegetation will prevent railroad employees from visually inspecting rolling stock from their normal duty stations.

Defect Codes	
321.01	Combustible vegetation around track-carrying structures.
321.02	Vegetation obstructs visibility of railroad signs and fixed signals.
321.03	Vegetation obstructs passing of day and night signals by railroad employees.
321.04	Vegetation interferes with railroad employees performing normal trackside duties.
321.05	Vegetation prevents proper functioning of signal and/or communication lines.
321.06	Excessive vegetation at train order office, depot, interlocking plant, a carman's building, etc., prevents employees on duty from visually inspecting moving equipment when their duties so require.
321.07	Excessive vegetation at train meeting points prevents proper inspection of moving equipment by railroad employees.
321.08	Excessive vegetation in toepaths and around switches where employees are performing normal trackside duties.
321.09	Vegetation brushing sides of rolling stock.
321.10	Vegetation obstructs visibility of grade crossing warning signs and signals by the traveling public.

§213.323 Track gage

(a) Gage is measured between the heads of the rails at right-angles to the rails in a plane five-eighths of an inch below the top of the rail head.

(b) Gage shall be within the limits prescribed in the following table:

Class of track	The gage must be at least	But not more than	The change of gage within 31 feet must not be greater than
6	4' 8"	4' 9-1/4"	1/2"
7	4' 8"	4' 9-1/4"	1/2"
8	4' 8"	4' 9-1/4"	1/2"
9	4' 8-1/4"	4' 9-1/4"	1/2"

Application

This rule established the minimum and maximum limits for gage, and the variation in gage differs with the authorized speed. An abrupt change in gage can produce significant wheel forces at high speeds. The minimum and maximum limits for gage values, Classes 6, 7, 8, and 9, were set to minimize the onset of truck hunting.

Inspectors will make measurements at sufficient intervals to assure that track is being maintained within the prescribed limits.

Particular attention will be given to gage in turnouts or where high lateral train forces would be expected.

Gage should be measured where line or surface irregularities are observed by the Inspector. Remember to observe evidence of lateral rail movement.

An accurate standard track gage or a ruler graduated in inches is an acceptable measuring device. Gage not within the specified limits of the TSS is a defect.

FRA Inspectors may use a Portable Track Loading Fixture (PTLF) described in §213.110 for the purposes of measuring loaded gage.

Defect Codes	
323.01	Gage dimension exceeds allowable on tangent track.
323.02	Gage dimension is less than allowable on tangent track.
323.03	Gage dimension exceeds allowable on curved track.
323.04	Gage dimension is less than allowable on curved track.
323.05	Reserved
323.06	Gage variation within 31 feet exceeds allowable.

§213.327 Alinement

(a) Uniformity at any point along the track is established by averaging the measured mid-chord offset values for nine consecutive points centered around that point and which are spaced according to the following table:

Chord Length	Spacing
31'	7' 9"
62'	15' 6"
124'	31' 0"

(b) For a single deviation, alinement may not deviate from uniformity more than the amount prescribed in the following table:

Class of track	The deviation from uniformity of the mid-chord offset for a 31-foot chord may not be more than	The deviation from uniformity of the mid-chord offset for a 62-foot chord may not be more than	The deviation from uniformity of the mid-chord offset for a 124-foot chord may not be more than
6	1/2"	3/4"	1-1/2"
7	1/2"	1/2"	1-1/4"
8	1/2"	1/2"	3/4"
9	1/2"	1/2"	3/4"

(c) For three or more non-overlapping deviations from uniformity in track alinement occurring within a distance equal to five times the specified chord length, each of which exceeds the limits in the following table, each owner of the track to which this subpart applies shall maintain the alinement of the track within the limits prescribed for each deviation:

Class of track	The deviation from uniformity of the mid-chord offset for a 31-foot chord may not be more than	The deviation from uniformity of the mid-chord offset for a 62-foot chord may not be more than	The deviation from uniformity of the mid-chord offset for a 124-foot chord may not be more than
6	3/8"	1/2"	1"
7	3/8"	3/8"	7/8"
8	3/8"	3/8"	1/2"
9	3/8"	3/8"	1/2"

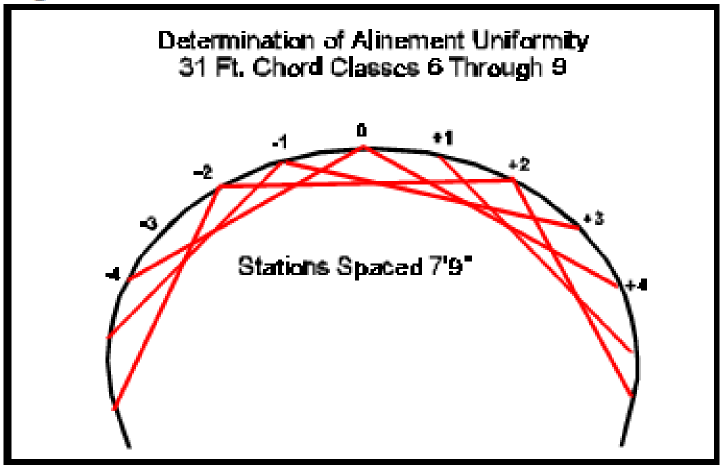
Application

In some cases, particularly for repeating noncomplying alinement anomalies, the alinement condition may be difficult to locate without the aid of a qualified geometry car. However, Inspectors have the responsibility to identify non-complying geometry conditions whenever possible. Whether located through visual or automated means, the condition must be field verified using conventional methods. Inspectors must be aware that, in addition to the

geometry car, other automated inspections will identify geometry anomalies that contribute to degraded vehicle/track interaction.

Uniformity at any point along the track is established by averaging the measured mid-chord offset (MCO) values for nine consecutive points centered around that point, and which are spaced according to the table in this section. For example, to establish uniformity for the 31-foot chord the Inspector should mark the point of concern plus four stations in each direction for a total of nine stations. Stations for the 31-foot chord are set at 7-foot 9 inch intervals. The MCO values are then obtained at each station and averaged. It is difficult to determine compliance with the 124-foot chord in the field using conventional manual methods. The method of determining uniformity is determined in this manner for tangents, spirals, and curves. Figure 6-2 illustrates the method to determine uniformity for the 31-foot chord measurement.

Figure 6-2

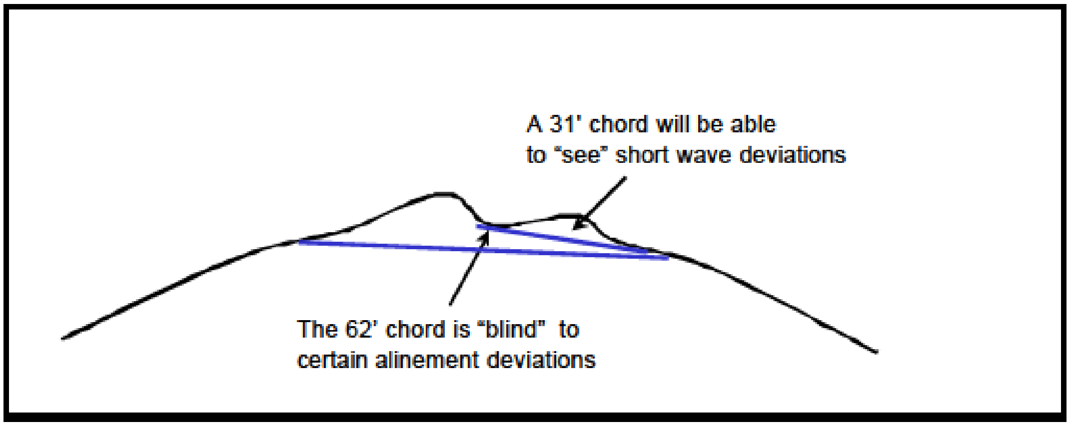


The TSS establishes maximum limits for alinement for track in Classes 6 through 9, tangent and curved track (including spirals), as measured with three chords, 31-foot, 61-foot and 124-foot. An alinement deviation may be present for any one or more of the chords. If an anomaly of uniformity exists for more than one chord, it shall be reported as a single defect line with a note describing other deviations in noncompliance with another chord. For example, “5/8-inch deviation from uniformity for a 31-foot chord. Note: defect is also a 3/4-inch deviation from uniformity for a 62-foot chord.”

The point of greatest alinement deviation can usually be detected visually and marked as the point where mid-offset will be required. However, Inspectors should use the locations identified by the automated inspection methods whenever possible to identify the location of deviation, and then visually verify the location.

For curves in Classes 6 through 9, an alinement condition may be in noncompliance with either the maximum limits for the 31-foot chord, or the 62-foot chord, or the 124-foot chord. As shown in Figure 6-3, certain alinement defects may be "blind" to some chords and "visible" to others. For example, the 31-foot chord is particularly necessary for the determination of short alinement deviations, and the 124-foot chord is useful for locating long wavelengths.

Figure 6-3



The line will be held taut against the rail 5/8-inch below the rail head using offset blocks if necessary. Methods establishing a line with laser or similar methods may also be used.

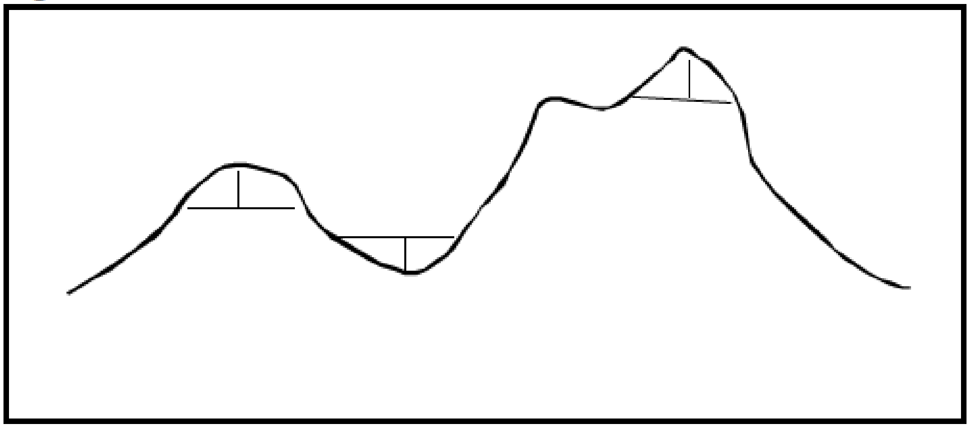
Paragraph (c) establishes alinement requirements for repeated deviations (three or more non-overlapping deviations) which occur within a distance equal to five times the specified chord length. Each occurrence of three or more deviations within a distance of five times the chord length, each of which exceeds the limit in the table, is considered one defective condition.

Repeated alinement deviations may excite a vehicle's natural resonance and cause adverse vehicle reaction. Although repeated alinement deviations are rare they are usually identified by automated inspections. However, the Inspector must be aware of their significance.

Repeated alinement defects are specific to one rail at a time. If an Inspector believes that a geometry condition on the opposite rail within the same area may contribute to the excitation, the Inspector should inform the railroad representative and note the condition on the inspection report.

The term "non-overlapping" is a common term but clarifies the concept in relation to track geometry inspection vehicles. Within one alinement "swing," normally several midchord offset measurements will exceed the specified threshold. However, for an alinement deviation to be considered as a repeating defect, the chords themselves must not overlap. Figure 6-4 illustrates three repeating alinement deviations.

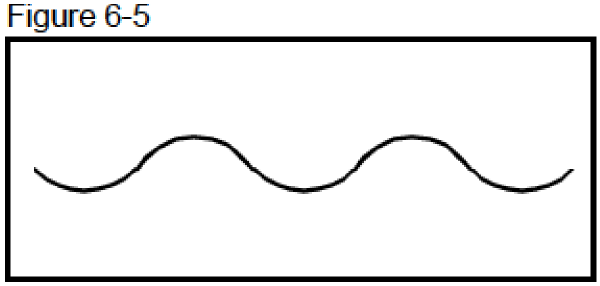
Figure 6-4



The concept is that one "swing" is not counted more than once.

Multiple alinement deviations may excite harmonic motion in the vehicle. Multiple deviations are three or more non-overlapping deviations from uniformity in track profile occurring within a distance equal to five times the specified chord length. The repeated condition, not each alinement deviation, is considered one defect. However, in the rare case where deviations repeat beyond the distance of five times the specified chord length, the Inspector shall consider all the sets of deviations as one exception. However, the total length the repeating condition occurs in feet must be reported along with the number of repeating deviations and the magnitude of each deviation.

Figure 6-5



Defect Codes	
327.01	Reserved
327.02	Reserved
327.03	Reserved
327.04	The alinement of track exceeds the allowable deviation for a 31-foot chord for a single deviation.
327.05	The alinement of track exceeds the allowable deviation for a 62-foot chord for a single deviation.
327.06	The alinement of track exceeds the allowable deviation for a 124-foot chord for a single deviation.
327.07	The alinement of track exceeds the allowable deviation for a 31-foot chord for three or more deviations.
327.08	The alinement of track exceeds the allowable deviation for a 62-foot chord for three or more deviations.
327.09	The alinement of track exceeds the allowable deviation for a 124-foot chord for three or more deviations.

§213.329 Curves, elevation and speed limitations

(a) The maximum crosslevel on the outside rail of a curve may not be more than 7 inches. The outside rail of a curve may not be more than 1/2 inch lower than the inside rail.

(b) The maximum allowable operating speed for each curve is determined by the following formula:

$$V_{max} = \sqrt{\frac{E_a + 3}{0.0007D}}$$

where --

V_{max} = Maximum allowable operating speed (m.p.h.).
E_a = Actual elevation of the outside rail (inches)[1].
D = Degree of curvature (degrees)[2].
3 = 3 inches of unbalance.

Appendix A includes tables showing maximum allowable operating speeds computed in accordance with this formula for various elevations and degrees of curvature for track speeds greater than 90 m.p.h.

(c) For rolling stock meeting the requirements specified in paragraph (d) of this section, the maximum operating speed for each curve may be determined by the following formula:

$$Vmax = \sqrt{\frac{E_a + E_u}{0.0007D}}$$

where --

V_{max} = Maximum allowable operating speed (m.p.h.).
E_a = Actual elevation of the outside rail (inches)[1].
D = Degree of curvature (degrees)[2].
E_u = Unbalanced elevation (inches).

[1] *Actual elevation for each 155 foot track segment in the body of the curve is determined by averaging the elevation for 10 points through the segment at 15.5 foot spacing. If the curve length is less than 155 feet, average the points through the full length of the body of the curve. If E_u exceeds 4 inches, the Vmax formula applies to the spirals on both ends of the curve.*

[2] *Degree of curvature is determined by averaging the degree of curvature over the same track segment as the elevation.*

(d) Qualified equipment may be operated at curving speeds determined by the formula in paragraph (c) of this section, provided each specific class of equipment is approved for operation by the Federal Railroad Administration and the railroad demonstrates that --

(1) When positioned on a track with uniform superelevation, E_a, reflecting the intended target cant deficiency, E_u, no wheel of the equipment unloads to a value of 60 percent or less of its static value on perfectly level track and, for passenger-carrying equipment, the roll angle between the floor of the vehicle and the horizontal does not exceed 5.7 degrees.

(2) When positioned on a track with a uniform 7-inch superelevation, no wheel unloads to a value less than 60% of its static value on perfectly level track and, for passenger-carrying equipment, the angle, measured about the roll axis, between the floor of the vehicle and the horizontal does not exceed 8.6 degrees.

(e) The track owner shall notify the Federal Railroad Administrator no less than thirty calendar days prior to any proposed implementation of the higher curving speeds allowed when the "E_u" term, above, will exceed three inches. This notification shall be in writing and shall contain, at a minimum, the following information:

(1) A complete description of the class of equipment involved, including schematic diagrams of the suspension system and the location of the center of gravity above top of rail;

(2) A complete description of the test procedure[1] and instrumentation used to qualify the equipment and the maximum values for wheel unloading and roll angles which were observed during testing;

[1] *The test procedure may be conducted in a test facility whereby all wheels on one side (right or left) of the equipment are raised or lowered by six and then seven inches, the vertical wheel loads under each wheel are measured and a level is used to record the angle through which the floor of the vehicle has been rotated.*

(3) Procedures or standards in effect which relate to the maintenance of the suspension system for the particular class of equipment;

(4) Identification of line segment on which the higher curving speeds are proposed to be implemented.

(f) A track owner, or an operator of a passenger or commuter service, who provides passenger or commuter service over trackage of more than one track owner with the same class of equipment, may provide written notification to the Federal Railroad Administrator with the written consent of the other affected track owners.

Application

Paragraph (a) does not imply that more than six inches of superelevation is recommended in a curve; rather the paragraph limits the amount of crosslevel in a curve to control the unloading of the wheels on the high rail, especially at low speeds. The crosslevel limits notwithstanding, this standard establishes the maximum crosslevel at any point on the curve which may not be more than seven inches. In curves, crosslevel is measured by subtracting the relative difference in height between the top surface (tread) of the inside (low) rail from the tread of the outside (high) rail.

The Associate Administrator for Safety shall reach a decision regarding the railroad's request for approval of a level of cant deficiency for specific equipment types based on the staff's review of the engineering information submitted by the railroad. When requested by Headquarters and Regional

Track Specialists, the Inspector may be asked to provide a memorandum containing recommendations concerning the railroad's request.

Paragraph (b) prescribes the formula to be used when determining the maximum train velocity in curves based on actual limiting curve alinement, in degrees, and the superelevation at the same point. Several combinations of curvature and elevation resulting in speed limitations may exist and should be considered throughout the curve when determining compliance with this section.

The formula in paragraph (b) for calculating maximum allowable operating speed is commonly referred to as the three-inch unbalance formula since it permits three inches less superelevation than would be required for equilibrium conditions at the same speed. Actual elevation and actual curvature for each 155-foot track segment in the body of the curve are determined by averaging the measurements for 10 points through the segment at 15-foot six inches spacing.

Paragraph (c) permits a railroad to operate at higher levels of cant deficiency provided that the railroad submits required engineering information (static lean test, etc.) and the FRA Associate Administrator for Safety approves the level of cant deficiency.

To determine the basic vehicle performance in curves, FRA rules require a "static lean" test as an indicator of the behavior of the vehicle suspension components. The car or locomotive is placed so that the entire vehicle stands on a track with one rail uniformly higher than the other, causing the vehicle to lean toward the lower rail. The vehicle s response to this situation is determined by its weight distribution and by the presence of free play and the stiffness of its overall suspension system.

Equipment with tilting capability can use the tilting mechanism to reduce the roll angle at high levels of cant deficiency. On a track with a given elevation, a "top-heavy" vehicle or a vehicle with a high center of gravity, and a very flexible (soft) suspension system will lean at a much greater angle than a vehicle with a lower center of gravity and a very stiff suspension system. This static behavior mimics the vehicle's response to the forces encountered in passing through track curves at a cant deficiency. This particular test was selected because it is very straightforward and practical to perform and requires only very basic measurement capabilities. Nevertheless, it provides very useful information about the vehicle performance when in motion on curves.

The requirements for roll angle measurements in a static condition, in effect limit the steady state carbody acceleration on a smooth curve to no more than 0.1g at the maximum intended cant deficiency which is consistent with § 238.427 of the Passenger Equipment Standards. This steady state acceleration is directly proportional to the centrifugal force experience by passengers when the equipment is going around a curve. Too many "g's" can result in a safety hazard to the occupants of the high speed passenger equipment.

Inspectors should compute allowable speeds through curves to determine compliance with this section and report defects when train speed exceeds the allowable based on this formula.

Speed becomes more critical if surface conditions have deteriorated or curvature has increased due to misalignment near the point of limiting speed and Inspectors need to determine compliance with the surface standard in §213.331 or the alinement standard in §213.327, which in some cases will be more restrictive.

Where railroads have not initiated remedial action to bring the surface and alinement of track into agreement with the operating speed based on the standard for three inches of unbalance, Inspectors will consider violation work when train speed exceeds four inches of cant deficiency. When train operation has been approved by the FRA for curving speeds producing more than three inches of unbalance (cant deficiency), Inspectors should only consider recommending a violation when the cant deficiency exceeds the approved level by more than a marginal amount. For example, if the FRA approved five inches of cant deficiency for specific equipment, Inspectors would not recommend a violation for marginal level of 5.2 or 5.4 inches of cant deficiency. On the other hand, violations should be considered at higher levels. The following formula should be used to calculate unbalance based on field measurements and known maximum authorized speed.

$$E_u = V_{max}^2(.0007D) - E_a$$

Normally, curves exist in high speed track are designed. However, it is possible that a curve may be introduced as a result of maintenance or geometry degradation. In either case, superelevation may or may not be present and trains may experience an unbalanced condition. The deviations from uniform profile and uniform alinement, as outlined in §§213.331 and 213.327, will not preclude longer wavelength misalinements on the order of 200 feet or greater that resemble the characteristics of a curve from being treated as curves for which the unbalance formula defined in this section will be applied.

Defect Codes	
329.01	Reserved
329.02	Operating speed exceeds allowable for 3-inches of unbalance, based on curvature and elevation.
329.03	Reserved
329.04	Reserved
329.05	Operating speed exceeds allowable for a FRA approved unbalance based on curvature and elevation.
329.06	Maximum crosslevel on curve exceeds allowable.

§213.331 Track surface

(a) For a single deviation in track surface, each owner of the track to which this subpart applies shall maintain the surface of its track within the limits prescribed in the following table:

Track surface	Class of track			
	6	7	8	9
The deviation from uniform[1] profile on either rail at the midordinate of a 31-foot chord may not be more than	1"	1"	3/4"	1/2"
The deviation from uniform profile on either rail at the midordinate of a 62-foot chord may not be more than	1"	1"	1"	3/4"
The deviation from uniform profile on either rail at the midordinate of a 124-foot chord may not be more than	1-3/4"	1-1/2"	1-1/4"	1-1/4"
The difference in crosslevel between any two points less than 62 feet apart may not be more than[2]	1-1/2"	1-1/2"	1-1/2"	1-1/2"

[1] *Uniformity for profile is established by placing the midpoint of the specified chord at the point of maximum measurement.*

[2] *However, to control harmonics on jointed track with staggered joints, the crosslevel differences shall not exceed 1-1/4 inches in all of six consecutive pairs of joints, as created by 7 joints. Track with joints staggered less than 10 feet shall not be considered as having staggered joints. Joints within the 7 low joints outside of the regular joint spacing shall not be considered as joints for purposed of this footnote.*

(b) For three or more non-overlapping deviations in track surface occurring within a distance equal to five times the specified chord length, each of which exceeds the limits in the following table, each owner of the track to which this subpart applies shall maintain the surface of the track within the limits prescribed for each deviation:

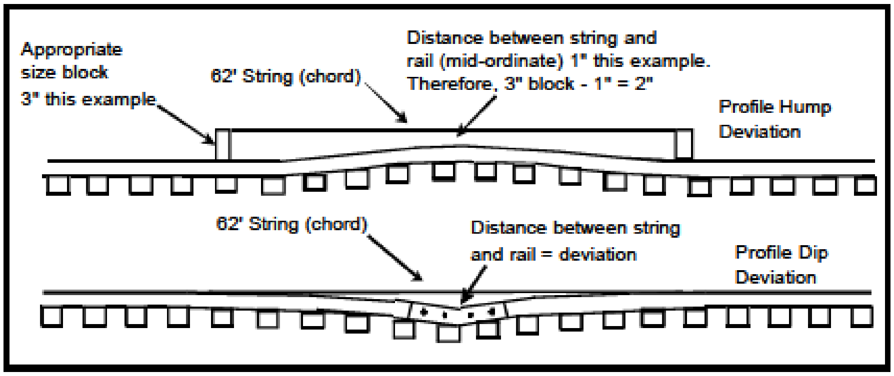
Track surface	Class of track			
	6	7	8	9
The deviation from uniform profile on either rail at the mid-ordinate of a 31-foot chord may not be more than	3/4"	3/4"	1/2"	3/8"
The deviation from uniform profile on either rail at the midordinate of a 62-foot chord may not be more than	3/4"	3/4"	3/4"	1/2"
The deviation from uniform profile on either rail at the midordinate of a 124-foot chord may not be more than	1-1/4"	1"	7/8"	7/8"

Application

As in alinement, deviation from uniform profile must be checked by using three chords: 31-foot, 62-foot, and 124-foot. A profile condition may be in noncompliance with any or all the chords. The measurement using all chords is required to cover the necessary wavelengths of interest that may excite undesirable vehicle responses.

Uniformity for profile is different than uniformity established for alinement. In the case of alinement, uniformity as described in §213.327(a) is determined by averaging mid-chord offset values for nine consecutive points centered around that point. However, uniformity for profile, as described in footnote 1 below the table, is a straight line placed across the deviation in such a manner as to measure the largest mid-ordinate. Figure 6-6 illustrates this procedure using a 62-foot chord. Depending upon the length of the profile perturbation, a particular chord may be inside or span the perturbation.

Figure 6-6



Multiple profile deviations may excite harmonic motion in the vehicle. Multiple deviations are three or more non-overlapping deviations from uniformity in track profile, occurring within a distance equal to five times the specified chord length. Refer to §213.327 for a description of "non-overlapping." The repeated condition, not each profile deviation, is considered one defect. However, similar to alinement, in the rare case where deviations repeat beyond the distance of five times the specified chord length, the Inspector shall consider all the sets of deviations as one exception. However, the total length in feet that the repeating condition occurs must be reported along with the number of repeating deviations when the magnitude of each deviation.

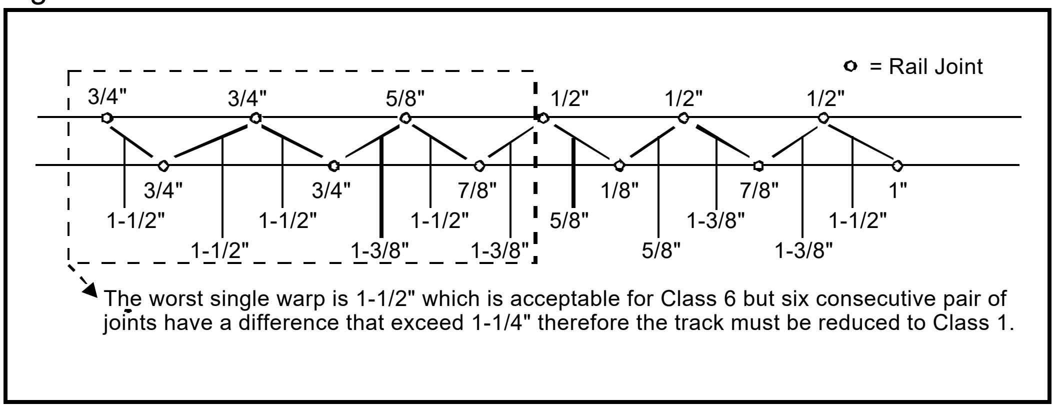
Repeated profile defects are specific to one rail at a time. If an Inspector believes that a geometry condition on the opposite rail within the same area may contribute to the excitation, the Inspector should inform the railroad representative and note the condition on the inspection report.

As in the standards for Classes 1 through 5, the "warp" condition is equally valid in contributing to vehicle twist and wheel climb. The difference in crosslevel between any two points less than 62 feet apart may not be more than the limit specified.

Jointed track is not typical for high speed track. However, Inspectors should check for a harmonic rock off condition whenever several joints in a row are low as indicated in footnote 2. Joint stagger that is not identical from stagger to stagger, such as in a curve or when a rail longer than the original construction is installed, shall be considered in the harmonic calculation. Additional joint(s) introduced because of the installation of short rail(s) are ignored in evaluating a harmonic condition.

Construction consisting of 79-foot or 80-foot rails does not result in harmonic rock off conditions since they occur outside of vehicle truck spacing. For 79-foot or 80-foot rails and stagger spacing less than 10 feet, this footnote is not applicable and Inspectors shall review the condition for compliance with other track surface parameters. Figure 6-7 illustrates a harmonic condition. Inspectors shall carefully apply the provisions of this footnote. An acceptable remedial action is to raise and tamp one or two joints in the middle of the consecutive low joints. This will break up the harmonics.

Figure 6-7



Defect Codes	
331.01	Reserved
331.02	Reserved
331.03	Reserved
331.04	Reserved
331.05	Reserved
331.06	Reserved
331.07	Difference in crosslevel between any two points less than 62 feet apart on tangents exceeds allowable.
331.08	Difference in crosslevel between any two points less than 62 feet apart on curves between spirals exceeds allowable.
331.09	Difference in crosslevel between any two points less than 62 feet apart on spirals exceeds allowable.
331.10	Reserved
331.11	Reserved
331.12	Reserved
331.13	Crosslevel differences for six or more consecutive pairs of staggered joints exceeds allowable
331.14	The profile of track exceeds the allowable deviation for a 31-foot chord for a single deviation.
331.15	The profile of track exceeds the allowable deviation for a 62-foot chord for a single deviation.
331.16	The profile of track exceeds the allowable deviation for a 124-foot chord for a single deviation.
331.17	The profile of track exceeds the allowable deviation for a 31-foot chord for three or more deviations.
331.18	The profile of track exceeds the allowable deviation for a 62-foot chord for three or more deviations.
331.19	The profile of track exceeds the allowable deviation for a 124-foot chord for three or more deviations.

§213.333 Automated vehicle inspection systems

(a) For track Class 7, a qualifying Track Geometry Measurement System (TGMS) vehicle shall be operated at least twice within 120 calendar days with not less than 30 days between inspections. For track Classes 8 and 9, it shall be operated at least twice within 60 days with not less than 15 days between inspections.

(b) A qualifying TGMS shall meet or exceed minimum design requirements which specify that --

(1) Track geometry measurements shall be taken no more than 3 feet away from the contact point of wheels carrying a vertical load of no less than 10,000 pounds per wheel;

(2) Track geometry measurements shall be taken and recorded on a distance-based sampling interval which shall not exceed 2 feet; and

(3) Calibration procedures and parameters are assigned to the system which assure that measured and recorded values accurately represent track conditions. Track geometry measurements recorded by the system shall not differ on repeated runs at the same site at the same speed more than 1/8 inch.

(c) A qualifying TGMS shall be capable of measuring and processing the necessary track geometry parameters, at an interval of no more than every 2 feet, which enables the system to determine compliance with: §213.323, Track gage; §213.327, Alinement; §213.329, Curves; elevation and speed limitations; and §213.331, Track surface.

(d) A qualifying TGMS shall be capable of producing, within 24 hours of the inspection, output reports that –

(1) Provide a continuous plot, on a constant-distance axis, of all measured track geometry parameters required in paragraph (c) of this section;

(2) Provide an exception report containing a systematic listing of all track geometry conditions which constitute an exception to the class of track over the segment surveyed.

(e) The output reports required under paragraph (c) of this section shall contain sufficient location identification information which enable field forces to easily locate indicated exceptions.

(f) Following a track inspection performed by a qualifying TGMS, the track owner shall, within two days after the inspection, field verify and institute remedial action for all exceptions to the class of track.

(g) The track owner shall maintain for a period of one year following an inspection performed by a qualifying TGMS, copy of the plot and the exception printout for the track segment involved, and additional records which:

(1) Specify the date the inspection was made and the track segment involved; and

(2) Specify the location, remedial action taken, and the date thereof, for all listed exceptions to the class.

(h) For track Classes 8 and 9, a qualifying Gage Restraint Measurement System (GRMS) shall be operated at least once annually with at least 180 days between inspections to continuously compare loaded track gage to unloaded gage under a known loading condition. The lateral capacity of the track structure shall not permit a gage widening ratio (GWR) greater than 0.5 inches.

(i) A GRMS shall meet or exceed minimum design requirements which specify that --

(1) Gage restraint shall be measured between the heads of the rail --

(I) At an interval not exceeding 16 inches;

(ii) Under an applied vertical load of no less than 10,000 pounds per rail;

(iii) Under an applied lateral load which provides for lateral/vertical load ratio of between 0.5 and 1.25[1], and a load severity greater than 3,000 pounds but less than 8,000 pounds per rail. Load severity is defined by the formula --

$$S = L - cV$$

where

S = Load severity, defined as the lateral load applied to the fastener system (pounds).

L = Actual lateral load applied (pounds).

c = Coefficient of friction between rail/tie which is assigned a nominal value of (0.4).

V = Actual vertical load applied (pounds).

(2) The measured gage value shall be converted to a gage widening ratio (GWR) as follows:

$$GWR = \frac{(LTG - UTG)}{L} \times 16{,}000$$

Where --

UTG= Unloaded track gage measured by the GRMS vehicle at a point no less than 10 feet from any lateral or vertical load application.

LTG= Loaded track gage measured by the GRMS vehicle at the point of application of the lateral load.

L= Actual lateral load applied (pounds).

[1] *GRMS equipment using load combinations developing L/V ratios which exceed 0.8 shall be operated with caution to protect against the risk of wheel climb by the test wheelset.*

(j) At least one vehicle in one train per day operating in Classes 8 and 9 shall be equipped with functioning on-board truck frame and carbody accelerometers. Each track owner shall have in effect written procedures for the notification of track personnel when on-board accelerometers on trains in Classes 8 and 9 indicate a possible track-related condition.

(k) For track Classes 7, 8, and 9, an instrumented car having dynamic response characteristics that are representative of other equipment assigned to service or a portable device that monitors on-board instrumentation on trains shall be operated over the track at the revenue speed profile at a frequency of at least twice within 60 days with not less than 15 days between inspections. The instrumented car or the portable device shall monitor vertically and laterally oriented accelerometers placed near the end of the vehicle at the floor level. In addition, accelerometers shall be mounted on the truck frame. If the carbody lateral, carbody vertical, or truck frame lateral safety limits in the following table of vehicle/track interaction safety limits are exceeded, speeds will be reduced until these safety limits are not exceeded.

(l) For track Classes 8 and 9, an instrumented car having dynamic response characteristics that are representative of other equipment assigned to service shall be operated over the track at the revenue speed profile annually with not less than 180 days between inspections. The instrumented car shall be equipped with functioning instrumented wheelsets to measure wheel/rail forces. If the wheel/rail force limits in the following table of vehicle/track interaction safety limits are exceeded, speeds will be reduced until these safety limits are not exceeded.

(m) The track owner shall maintain a copy of the most recent exception printouts for the inspections required under paragraphs (k) and (l) of this section.

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Vehicle/Track Interaction Safety Limits

Parameter	Safety Limit	Filter/ Window	Requirements
Wheel/Rail Forces[1]			
Single Wheel Vertical Load Ratio	≥ 0.1	5 ft	No wheel of the equipment shall be permitted to unload to less than 10% of the static vertical wheel load. The static vertical wheel load is defined as the load that the wheel would carry when stationary on level track. The vertical wheel load limit shall be increased by the amount of measurement error.
Single Wheel L/V Ratio	$\leq \frac{\tan\delta - .5}{1 + .5\tan\delta}$	5 ft	The ratio of the lateral force that any wheel exerts on an individual rail to the vertical force exerted by the same wheel on the rail shall be less than the safety limit calculated for the wheel's flange angle (δ).
Net Axle L/V Ratio	≤ 0.5	5 ft	The net lateral force exerted by any axle on the track shall not exceed 50% of the static vertical load that the axle exerts on the track.
Truck Side L/V Ratio	≤ 0.6	5 ft	The ratio of the lateral forces that the wheels on one side of any truck exert on an individual rail to the vertical forces exerted by the same wheels on that rail shall be less than 0.6.
Accelerations			
Carbody Lateral[2]	≤ 0.5 g peak-to-peak	10 Hz 1 sec window	The peak-to-peak accelerations, measured as the algebraic difference between the two extreme values of measured acceleration in a one second time period, shall not exceed 0.5 g.
Carbody Vertical[2]	≤ 0.6 g peak-to-peak	10 Hz 1 sec window	The peak-to-peak accelerations, measured as the algebraic difference between the two extreme values of measured acceleration in a one-second time period, shall not exceed 0.6 g.
Truck Lateral[3]	≤ 0.4 g RMS mean-removed	10 Hz 2 sec window	Truck hunting[4] shall not develop below the maximum authorized speed.

[1] The lateral and vertical wheel forces shall be measured with instrumented wheelsets with the measurements processed through a low pass filter with a

minimum cut-off frequency of 25 Hz. The sample rate for wheel force data shall be at least 250 samples/sec.

2 Carbody lateral and vertical accelerations shall be measured near the car ends at the floor level.

3 Truck accelerations in the lateral direction shall be measured on the truck frame. The measurements shall be processed through a filter having a pass band of 0.5 to 10 Hz.

4 Truck hunting is defined as a sustained cyclic oscillation of the truck which is evidenced by lateral accelerations in excess of 0.4 g root mean square (mean-removed) for 2 seconds.

Application

- This section includes important automated inspection methods for high speed track safety including the track geometry measurement system, the gage restraint measurement system, and the systems necessary to monitor vehicle/track interaction (acceleration and wheel/rail force requirements).

- For track Classes 7, 8, and 9 this section requires the periodic inspection (twice within 120 calendar days for Class 7 and twice within 60 days for classes 8 and 9) using a qualified Track Geometry Measurement System (TGMS). Railroads that operate trains at speeds above 110 m.p.h. universally employ automatic track geometry measuring systems to generate data to point out train safety hazards in the track geometry. Reliance upon only visual inspections to locate small track irregularities is difficult.

  The railroad TGMS must be a vehicle that measures at the intervals and under the loading regime specified. If an Inspector has doubt as to the capabilities of the TGMS, the Inspector should request that the Regional Track Specialist seek the assistance of Headquarter's Specialists to evaluate the system.

  Inspectors should periodically ride the TGMS and monitor the specified compliance with the safety limits. Specifically, Inspectors must ensure that the track is being inspected at the specified frequency and that exceptions are being corrected. Inspectors must determine if exceptions are being field verified and corrected. Output records must be produced within 24 hours of the survey and the railroad must field verify and institute remedial action within two days of the inspection. The two-day period in which to field verify locations found by the geometry car does not relieve the railroad from initiating immediate action whenever the railroad knows or has notice that a condition does not comply with the track safety standards.

Along with normal review of visual track inspection records, the Inspector shall review TGMS records, to determine if the records specify the date of inspection, the track segment involved, the remedial action and other information required. These records must be maintained by the railroad for one year following each inspection.

This section requires the inspection of Classes 8 and 9 track by a Gage Restraint Measurement System (GRMS) to measure the gage restraint of the track, including the strength of the ties and the ability of the fastenings to maintain gage. The option of using a qualified GRMS in lieu of crosstie and fastener standard is not an option in the high speed standards. The GRMS must be operated annually. GRMS on concrete ties is effective in identifying defective ties and conditions with missing fasteners or a relaxation of toe load of rail fasteners. GRMS is important to measure the resistance of the track to forces generated by wheel flanging in the gaging space. The use of the GRMS is necessary to ensure sufficient gage restraint at the gage limits set to control truck hunting.

The GRMS safety criterion for high speed track is the gage-widening ratio (GWR), which is based on the unloaded track gage, loaded track gage and actual lateral load applied. The lateral track capacity of the track structure shall not permit a GWR greater than 1/2-inch.

Inspectors shall periodically ride the railroad GRMS. If in doubt as to the GRMS capability to measure gage restraint, the Inspector should consult with the Regional Track Specialist who will seek the assistance of Headquarter's Specialists to evaluate the system. No record keeping requirements are included for the GRMS.

Paragraph (j) of this section requires that at least one vehicle in one train per day operating in Class 8 or 9 track be equipped with functioning on-board truck frame and carbody accelerometers and that the high speed railroad have in effect written procedures for the notification of track personnel when the on-board accelerometers indicate a possible track-related condition.

This requirement accomplishes several important safety goals that cannot be achieved only by an inspection using accelerometers at the frequencies required in paragraph (k). For example, if the railroad inadvertently introduced a small geometry problem during maintenance or the track settled at a culvert, the accelerometers would indicate that the location should be investigated. The accelerometers may be portable or fixed and may be installed in any vehicle in the high speed train. Many high speed trains have lateral truck frame accelerometers on every vehicle, primarily to monitor for truck hunting. In these cases, the railroad must supplement the lateral truck frame accelerometers with functioning carbody accelerometers as described in this section.

The rule does not require a specific threshold or procedure that must be established by the railroad. The purpose of the rule is to foster the utilization of technologies which remove the subjective nature the traditional "rough track" report where engineers and other crew members call maintenance of way employees with requests to look at the track. Rather, the rule encourages the high speed railroad to have a system where accelerations are measured on a daily basis. The Federal or State Inspector should monitor the railroad's compliance with this requirement to confirm that a daily inspection is being accomplished over the route. Each track in a territory with more than one parallel track is not required to be covered on a daily basis. If the high speed trains do not operate for a period such as over the weekend, the railroad is not required to operate a non-revenue train over the route.

Paragraph (k) requires that an instrumented car having dynamic response characteristics representative of high speed equipment assigned to service, or a portable device that monitors on-board instrumentation on trains, shall be operated over the track at the specified inspection frequency at the speed normally operated by the trains. This is to monitor lateral and vertical carbody accelerometers and lateral truck-mounted accelerometers. If the carbody lateral, carbody vertical, or truck frame lateral safety limits in the Vehicle/Track Interaction safety table are exceeded, the speeds of all high speed passenger trains must be reduced for each location to a level at which the safety limits are not exceeded until the source of the exception is identified and corrected. The source may be a track condition, a vehicle condition, or a combination of both.

The Inspector must carefully monitor the railroad's activities in this area. Inspection records of the most recent inspection must be available for FRA review. The "representative" vehicle is established by the track owner and is usually a highly instrumented coach. Inspectors must periodically ride the inspection vehicle, which may or may not be the same vehicle as the TGMS and the vehicle required under paragraph (l), and make a determination of the railroad's compliance. If the Inspector has any doubt as to the effectiveness of this inspection program, the Inspector should contact the Regional Track Specialist who will request a technical evaluation team from Headquarters and its supporting agencies or contractors.

Paragraph (l) of this section requires that an instrumented car having dynamic response characteristics that are representative of other equipment assigned to service be operated over Class 8 and 9 track annually with not less than 180 days between inspections. The instrumented car shall be equipped with instrumented wheelsets, capable of accurately measuring wheel/rail forces.

These forces must be within the limits in the VTI table. If the wheel/rail force safety limits in the Vehicle/Track Interaction safety table are exceeded, the speeds of all high speed passenger trains must be reduced for each location to a level at which the safety limits are not exceeded until the source of the exception is identified and corrected. The Inspector must consult with the Regional Track Specialist to obtain the design wheel flange angle used to define the single wheel L/V ratio safety limit. The flange angle must be included in the information that the railroad must submit to the FRA Associate Administrator following testing required under §213.345.

It is of utmost importance that the Inspector monitor the railroad's compliance with this requirement. The term "representative" does not mean that every type of car which operates at Classes 8 and 9 speeds is required to be equipped with instrumented wheelsets to measure wheel/rail forces, but the instrumented car must be representative of the equipment operating at those speeds. If the Inspector has any doubt as to the effectiveness of the railroad's measurement of wheel/rail forces and its program to initiate remedial action, the Inspector should contact the Regional Track Specialist who shall seek the assistance of Headquarter's specialists to evaluate the railroad's program. The railroad must maintain a copy of the most recent exception report.

The vehicle/track interaction safety limits are the cornerstone of the high speed standards. Vehicle/track interaction has critical consequences in railroad safety, and so establishing safe parameters and developing a measurement system to adhere to those parameters is highly important for any track safety program. There are several hazardous and unacceptable vehicle/track interaction events that are well-known in railroad engineering, and for the most part, may occur on existing high speed operations, including wheel climb, rail roll-over, vehicle overturning, gage widening, and track panel shift.

Defect Codes	
333.01	Failure to inspect using TGMS at required frequency.
333.02	Failure to operate qualified TGMS as required.
333.03	Failure to keep TGMS records as required.
333.04	Failure of TGMS report to provide required information.
333.05	Failure to field verify an TGMS exception within two days.
333.06	Failure to initiate remedial action for TGMS exception within two days.
333.07	Failure to make TGMS records available for inspection.
333.08	Failure to operate GRMS at required frequency.
333.09	Lateral track capacity of track structure permits a gage widening ratio greater than allowed.
333.10	Failure to equip at least one vehicle per day with required accelerometers.
333.11	Failure to have written procedures for notification of track personnel when daily accelerometer measurements indicate a possible track-related condition.
333.12	Failure to follow written procedures for notification of track personnel when daily accelerometer measurements indicate a possible track-related condition.
333.13	Failure to operate an instrumented car or portable device to measure carbody and truck frame accelerations at required frequency.
333.14	Failure to reduce train speeds when carbody and truck frame accelerations exceed allowable.
333.15	Failure to keep records of acceleration measurements as required.
333.16	Failure to operate an inspection vehicle with instrumented wheelsets to measure wheel/rail forces at required frequency.
333.17	Failure to reduce train speed when wheel/rail forces exceed allowable.

§213.334 Ballast; general

Unless it is otherwise structurally supported, all track shall be supported by material which will --

(a) Transmit and distribute the load of the track and railroad rolling equipment to the subgrade;

(b) Restrain the track laterally, longitudinally, and vertically under dynamic loads imposed by railroad rolling equipment and thermal stress exerted by the rails;

(c) Provide adequate drainage for the track; and

(d) Maintain proper track crosslevel, surface, and alinement.

Application

Ballast may consist of crushed slag, crushed stone, screened gravel, pit-run gravel, chat, cinders, scoria, pumice, sand, mine waste, or other native material, and is an integral part of the track structure.

Ballast, regardless of the material, must satisfy the requirements stated in the TSS.

Inspectors should consider the overall condition of a track when citing fouled ballast. For example, fouled ballast would be appropriate for a track that has a poor drainage system coupled with incipient track surface conditions at the area in question.

Defect Codes	
334.01	Insufficient Ballast
334.02	Fouled Ballast

§213.335 Crossties

(a) Crossties shall be made of a material to which rail can be securely fastened.

(b) Each 39 foot segment of track shall have --

(1) A sufficient number of crossties which in combination provide effective support that will –

(i) Hold gage within the limits prescribed in §213.323(b);

(ii) Maintain surface within the limits prescribed in §213.331; and

(iii) Maintain alinement within the limits prescribed in §213.327.

(2) The minimum number and type of crossties specified in paragraph (c) of this section effectively distributed to support the entire segment; and

(3) Crossties of the type specified in paragraph (c) of this section that are(is) located at a joint location as specified in paragraph (e) of this section.

(c) For non-concrete tie construction, each 39 foot segment of Class 6 track shall have fourteen crossties; Classes 7, 8 and 9 shall have 18 crossties which are not --

(1) Broken through;

(2) Split or otherwise impaired to the extent the crossties will allow the ballast to work through, or will not hold spikes or rail fasteners;

(3) So deteriorated that the tie plate or base of rail can move laterally 3/8 inch relative to the crossties;

(4) Cut by the tie plate through more than 40 percent of a crosstie's thickness;

(5) Configured with less than 2 rail holding spikes or fasteners per tie plate; or

(6) So unable, due to insufficient fastener toeload, to maintain longitudinal restraint and maintain rail hold down and gage.

(d) For concrete tie construction, each 39 foot segment of Class 6 track shall have fourteen crossties, Classes 7, 8 and 9 shall have 16 crossties which are not--

(1) So deteriorated that the prestress strands are ineffective or withdrawn into the tie at one end and the tie exhibits structural cracks in the rail seat or in the gage of track;

(2) Configured with less than 2 fasteners on the same rail;

(3) So deteriorated in the vicinity of the rail fastener such that the fastener assembly may pull out or move laterally more than 3/8-inch relative to the crosstie;

(4) So deteriorated that the fastener base plate or base of rail can move laterally more than inch relative to the crossties;

(5) So deteriorated that rail seat abrasion is sufficiently deep so as to cause loss of rail fastener toeload;

(6) Completely broken through; or

(7) So unable, due to insufficient fastener toeload, to maintain longitudinal restraint and maintain rail hold down and gage.

(e) Class 6 track shall have one non-defective crosstie whose centerline is within 18 inches of the rail joint location or two crossties whose center lines are within

24 inches either side of the rail joint location. Class 7, 8, and 9 track shall have two non-defective ties within 24 inches each side of the rail joint.

(f) For track constructed without crossties, such as slab track and track connected directly to bridge structural components, the track structure shall meet the requirements of paragraphs (b)(1)(i), (ii), and (iii) of this section.

(g) In Classes 7, 8 and 9 there shall be at least three non-defective ties each side of a defective tie.

(h) Where timber crossties are in use there shall be tie plates under the running rails on at least nine of 10 consecutive ties.

(I) No metal object which causes a concentrated load by solely supporting a rail shall be allowed between the base of the rail and the bearing surface of the tie plate.

Application

When determining compliance with this section, the Inspector must ascertain that crossties meet the "definitional" requirements of soundness, and make geometry measurements to verify that each 39-foot segment of track has:

- A sufficient number of effective ties to maintain geometry;
- The required number of sound ties for the track class as described in paragraph (c) and (d);and
- The proper placement of sound ties as described and positioned in paragraph (e) to support joints.

The failure of the crossties to meet any of the three above criteria constitutes a deviation from the TSS.

If track geometry measurements fail to meet the requirements of §§213.323, 213.327 and 213.331, and there is a insufficient number of sound crossties, both geometry and crossties could be cited as defects. If geometry measurements exceed the allowable tolerance, but a determination cannot be made that crossties are at fault, it is appropriate to cite only the defective geometry condition.

Each tie must be evaluated individually by the criteria described for timber crossties in Subsection (c) and for concrete crossties in Subsection (d).

When determining compliance with the minimum number of non-defective crossties per 39-foot segment, Inspectors are reminded that the 39-foot segment may be taken anywhere along the track and need not coincide with joint locations. This portion of the rule applies independently of any other provision of the TSS; it does not require associated evidence of actual or incipient geometry defects or other defective conditions.

A non-defective joint tie must be found within the prescribed distance of the centerline of the joint measured at the rail and not at the centerline of track. Where a very short piece of rail exists within the joint bar, measure from the bar centerline. Where non-symmetrical bars exist (five-hole bars), measure from the design point where rail ends normally abut.

Effective distribution has not been defined, but must not be interpreted by the Inspector as synonymous with equally-spaced. The language is intended to address situations where all of the non-defective ties exist in a group at a short area of the 39-foot segment of track in question. Evidence that crossties are not effectively distributed primarily includes indications of actual or incipient deviations from the geometry standards. The word “incipient” means “beginning to appear.”

When citing Defect Code 213.335.03, the Inspector must show evidence of one or more of the geometry conditions cited in §213.335(b)(1). Several factors should be documented if the defect is being cited as a violation. These factors include, but are not limited to:

- Geometry conditions
- Class of track
- Curvature
- Traffic density (annual tonnage)
- Rail weight and condition
- Condition of other components of the track

FRA Inspectors may use a Portable Track Loading Fixture (PTLF) described in §213.110 for the purposes of measuring loaded gage to determine effective distribution of crossties.

The Inspector must use judgment and discretion in the application of the crosstie standards. They should be used to describe conditions that constitute a risk to the safe operation of trains, and should not be applied in doubtful cases.

No criterion now exists for the maximum distance between non-defective ties, and this measurement should not be used to describe a tie defect. If such a

description is appropriate, it should be in terms of the number of adjacent non-defective ties in a group.

The TSS also addresses track constructed without conventional crossties, such as concrete-slab track in which the running rails are secured through fixation to another structural member. Railroads are required to maintain gage, surface, and alinement to the standards specified in subsections (b)(1)(i), (ii), and (iii).

For non-concrete-tied construction, the requirements for ties parallel those of the lower standards, except that permissive lateral movement of tie plates is set at 3/8-inch instead of 1/2-inch and a requirement for rail holding spikes is added.

An absolute requirement in Classes 7, 8, and 9 exists that there shall be at least three non-defective ties of each side of a defective tie. Inspectors must determine the effectiveness of the ties using the criteria listed in subsection (b) and (c).

During an inspection, if the Inspector finds a missing tie plate under the rails, the Inspector must determine that tie plates are under at least nine out of 10 consecutive ties.

The reference to a metal object in paragraph (j) is intended to include only those items of track material which pose the greatest potential for broken base rails such as track spikes, rail anchors, and shoulders of tie plates. The phrase "causes a concentrated load by solely supporting a rail" further clarifies the intent of the regulation to apply only in those instances where there is clear physical evidence that the metal object is placing substantial load on the rail base, as indicated by lack of load on adjacent ties.

Defect Codes	
335.01	Fewer than minimum allowable number of non-defective ties per 39 feet.
335.02	No effective support ties within the prescribed distance from a joint.
335.03	Crossties not effectively distributed to support a 39-foot segment of track.
335.04	Reserved
335.05	Reserved
335.06	Track constructed without crossties does not effectively support track structure
335.07	Fewer than three non-defective ties each side of an effective tie.
335.08	Less than nine out of 10 consecutive ties with tie plates.
335.09	Metal object causing concentrated load between base of rail and bearing surface of tie plate.
335.10	Insufficient tie plates.

§213.337 Defective rails

(a) When an owner of track to which this part applies learns, through inspection or otherwise, that a rail in that track contains any of the defects listed in the following table, a person designated under §213.305 shall determine whether or not the track may continue in use. If the person determines that the track may continue in use, operation over the defective rail is not permitted until --

(1) The rail is replaced; or
(2) The remedial action prescribed in the table is initiated –

REMEDIAL ACTION					
Defect	Length of defect (inch)		Percent of rail head cross-sectional area weakened by defect		If defective rail is not replaced, take the remedial action prescribed in note
	More than	But not more than	Less than	But not less than	
Transverse fissure Compound fissure			70	5	B
			100	70	A2
				100	A
Detail fracture Engine burn fracture Defective weld			25	5	C
			80	25	D
			100	80	[A2] or [E and H]
				100	[A] or [E and H]
Horizontal split head Vertical split head Split web Piped rail Head web separation	1	2			H and F
	2	4			I and G
	4				B
	(1)				A
Bolt hole crack	1/2	1			H and F
	1	1-1/2			H and G
	1-1/2				B
	(1)				A
Broken Base	1	6			D
	6				[A] or [E and I]
Ordinary break					A or E
Damaged rail					D
Flattened rail	Depth ≥ 3/8 and Length ≥ 8				H.

([1]) Break out in rail head.

Notes:

A. Assign person designated under § 213.305 to visually supervise each operation over defective rail.

A2. Assign person designated under § 213.305 to make visual inspection. That person may authorize operation to continue without visual supervision at a maximum of 10 m.p.h. for up to 24 hours prior to another such visual inspection or replacement or repair of the rail.

B. Limit operating speed over defective rail to that as authorized by a person designated under §213.305(a)(1)(i) or (ii). The operating speed cannot be over 30 m.p.h.

C. Apply joint bars bolted only through the outermost holes to defect within 20 days after it is determined to continue the track in use. Limit operating speed over defective rail to 30 m.p.h. until joint bars are applied; thereafter, limit speed to 50 m.p.h. When a search for internal rail defects is conducted under §213.339 and defects are discovered which require remedial action C, the operating speed shall be limited to 50 m.p.h., for a period not to exceed 4 days. If the defective rail has not been removed from the track or a permanent repair made within 4 days of the discovery, limit operating speed over the defective rail to 30 m.p.h. until joint bars are applied; thereafter, limit speed to 50 m.p.h.

D. Apply joint bars bolted only through the outermost holes to defect within 10 days after it is determined to continue the track in use. Limit operating speed over the defective rail to 30 m.p.h. or less as authorized by a person designated under §213.305(a)(1)(i) or (ii) until joint bars are applied; thereafter, limit speed to 50 m.p.h.

E. Apply joint bars to defect and bolt in accordance with §213.351(d) and (e).

F. Inspect rail 90 days after it is determined to continue the track in use.

G. Inspect rail 30 days after it is determined to continue the track in use.

H. Limit operating speed over defective rail to 50 m.p.h.

I. Limit operating speed over defective rail to 30 m.p.h.

(b) As used in this section –

(1) *Transverse Fissure* means a progressive crosswise fracture starting from a crystalline center or nucleus inside the head from which it spreads outward as a smooth, bright, or dark, round or oval surface substantially at a right angle to the length of the rail. The distinguishing features of a transverse fissure from other types of fractures or defects are the crystalline center or nucleus and the nearly smooth surface of the development which surrounds it.

(2) *Compound Fissure* means a progressive fracture originating in a horizontal split head which turns up or down in the head of the rail as a smooth, bright, or dark surface progressing until substantially at a right angle to the length of the rail. Compound fissures require examination of both faces of the fracture to locate the horizontal split head from which they originate.

(3) *Horizontal Split Head* means a horizontal progressive defect originating inside of the rail head, usually one-quarter inch or more below the running surface and progressing horizontally in all directions, and generally accompanied by a flat spot on the running surface. The defect appears as a crack lengthwise of the rail when it reaches the side of the rail head.

(4) *Vertical Split Head* means a vertical split through or near the middle of the head, and extending into or through it. A crack or rust streak may show under the head close to the web or pieces may be split off the side of the head.

(5) *Split Web* means a lengthwise crack along the side of the web and extending into or through it.

(6) *Piped Rail* means a vertical split in a rail, usually in the web, due to failure of the shrinkage cavity in the ingot to unite in rolling.

(7) *Broken Base* means any break in the base of the rail.

(8) *Detail Fracture* means a progressive fracture originating at or near the surface of the rail head. These fractures should not be confused with transverse fissures, compound fissures, or other defects which have internal origins. Detail fractures may arise from shelly spots, head checks, or flaking.

(9) *Engine Burn Fracture* means a progressive fracture originating in spots where driving wheels have slipped on top of the rail head. In developing downward they frequently resemble the compound or even transverse fissures with which they should not be confused or classified.

(10) *Ordinary Break* means a partial or complete break in which there is no sign of a fissure, and in which none of the other defects described in this paragraph (b) are found.

(11) *Damaged Rail* means any rail broken or injured by wrecks, broken, flat, or unbalanced wheels, slipping, or similar causes.

(12) *Flattened Rail* means a short length of rail, not a joint, which has flattened out across the width of the rail head to a depth of inch or more below the rest of the rail. Flattened rail occurrences have no repetitive regularity and thus do not include corrugations, and have no apparent localized cause such as a weld or engine burn. Their individual length is relatively short, as compared to a condition such as head flow on the low rail of curves.

(13) *Bolt Hole Crack* means a crack across the web, originating from a bolt hole, and progressing on a path either inclined upward toward the rail head or inclined downward toward the base. Fully developed bolt hole cracks may continue horizontally along the head/web or base/web fillet, or they may progress into and through the head or base to separate a piece of the rail end from the rail. Multiple cracks occurring in one rail end are considered to be a single defect. However, bolt hole cracks occurring in adjacent rail ends within the same joint shall be reported as separate defects.

(14) *Defective Weld* means a field or plant weld containing any discontinuities or pockets, exceeding 5 percent of the rail head area individually or 10 percent in the aggregate, oriented in or near the transverse plane, due to incomplete penetration of the weld metal between the rail ends, lack of fusion between weld and rail end metal, entrainment of slag or sand, under-bead or other shrinkage cracking, or fatigue cracking. Weld defects may originate in the rail head, web, or base, and in some cases, cracks may progress from the defect into either or both adjoining rail ends.

(15) *Head and Web Separation* means a progressive fracture, longitudinally separating the head from the web of the rail at the head fillet area.

Application

- # The remedial actions required for defective rails specify definite time limits and speeds, and allow certain discretion to the track owner for the continued operation over a defect. All rail defects should be considered dangerous by the Inspector and care should be taken to determine that proper remedial action has been undertaken by the railroad. When more than one defect is present in a rail, the defect requiring the most restrictive remedial action shall govern.

- # The remedial action table and specifications in the rule address the risks associated with rail failure. These risks are primarily dependent upon defect type and size and should not be dependent upon the manner or mechanism that reveals the existence of the defect. Failure of the track owner to comply with the operational (speed) restrictions, maintenance procedures and the prescribed inspection intervals specified in §213.337 and §213.339 (defective rails and inspection of rail, respectively), may constitute a violation of the TSS.

- # Note "A2" addresses mid-range transverse defect sizes. This remedial action allows for train operations to continue at a maximum of 10 m.p.h. up to 24 hours, following a visual inspection by a person designated under §213.305. If the rail is not replaced, another 24-hour cycle begins.

- # Note "B" limits speed to 30 m.p.h. as authorized by a §213.305 designated person. Notes "C," "D," and "H" limit the operating speed, following the application of joint bars, to 50 m.p.h.

- # The remedial action table for defects failing in the transverse plane (transverse and compound fissures, detail and engine burn fractures, and defective welds) specifies a lower limit range base of five percent of the railhead cross sectional area. If a transverse defect is reported to be less than five percent, the track owner is not legally bound to correct and no remedial action would be required under the TSS. Defects reported less than five percent are not consistently found during rail breaking routines and therefore, defect determination within this range is not always reliable.

- # Transverse and compound fissure defects, weakened between five and 70 percent of cross-sectional head area, require remedial action (note B), as indicated by the prescribed notes. Defects in the range between 70 and less than 100 percent of cross-sectional head area, require remedial action (note A2), as prescribed. Defects that affect 100 percent of the cross-sectional head area, require remedial action (note A) as prescribed, the most restrictive. Inspectors should be aware that transverse and compound fissures are defects that fail in the transverse plane and are characteristic of rail which has not been control-cooled (normally rolled prior to 1936).

Defects identified and grouped as detail fracture, engine burn fracture, and defective welds, will weaken and also fail in the transverse plane. Detail fractures also fail in the transverse plane and are characteristic of control-cooled rail (usually indicated by the letters CC or CH on the rail brand, i.e., 1360 RE CC CF&I 1982 1111). Their prescribed remedial action relates to a low range between five and 25 percent and a mid-range between 25 and 80 percent, for note (C) and note (D), respectively. Those defects require joint bar applications and operational speed restrictions within certain time frames. Defects extending less than 100 and between 80 percent require a visual inspection, an elective to restrict operation to a maximum of 10 m.p.h. for up to 24 hours, then another visual inspection, if the rail is not replaced, effectively repaired or the track removed from service.

The second paragraph in remedial action note (C) addresses defects which are discovered in Classes 3 through 5 track during an internal rail inspection required under §213.339, and whose size is determined not to be in excess of 25 percent of the rail head cross-sectional area. For these specific defects, a track owner may operate for a period not to exceed four days, at a speed limited to 50 m.p.h. If the defective rail is not removed or a permanent repair made within four days of discovery, the speed is limited to 30 m.p.h., until joint bars are applied or the rail is replaced.

The requirements specified in this second paragraph are intended to promote better utilization of rail inspection equipment and therefore maximize the opportunity to discover rail defects that are approaching service failure size. The result of the FRA's research indicates that defects of this type and size range have a predictable slow growth life. Research further indicates that even on the most heavily utilized trackage in use today, defects of this type and size are unlikely to grow to service failure size in four days.

In the remedial action table, all longitudinal defects are combined within one group subject to identical remedial actions based on their reported size. These types of longitudinal defects all share similar growth rates and the same remedial actions are appropriate to each type.

Defective rails categorized as Horizontal split head, Vertical split head, Split web, Piped rail, and Head-web separation, are longitudinal in nature. When any of this group of defects is more than 1 inch, but not more than 2 inches, the remedial action initiated, under note (H), is to limit train speed to 50 m.p.h., and note (F) require reinspecting the rail in 90 days, if deciding operations will continue. Defects in the range of more than two inches, but not more than four

inches, require complying with notes (I) and (G), speed is limited to 30 m.p.h. and the rail reinspected in 30 days, if they decide operations will continue in service. When any of the five defects exceed a length of four inches, a person designated under §213.305(a) must limit the operating speed to 30 m.p.h., under note (B).

Another form of head-web separation, often referred to as a "fillet cracked rail," is the longitudinal growth of a crack in the fillet area, usually on the gage side of the outer rail of a curve. The crack may not extend the full width between the head and the web, but it is potentially dangerous. Evidence of fillet cracking is a hairline crack running beneath the head of rail with "bleeding" or rust discoloration. Fillet cracks often result from improper superelevation or from stress reversal as a result of transposing rail. The use of a mirror is an effective aid in examining rail and the determination of head-web cracks or separation in the body of the rail, extending beyond the joint bar.

A "bolt hole crack" is a progressive fracture originating at a bolt hole and extending away from the hole, usually at an angle. They develop from high-stress risers, usually initiating as a result of both dynamic and thermal responses of the joint bolt and points along the edge of the hole, under load. A major cause of this high stress is improper field drilling of the hole. Excessive longitudinal rail movement can also cause high stress along the edge of the hole. When evaluating a rail end which has multiple bolt hole cracks, Inspectors will determine the required remedial action based on the length of the longest individual bolt hole crack.

Under note (H), the remedial action for a bolt hole crack, more than 1/2-inch but not more than 1-inch, if the rail is not replaced, is to limit speed to 50 m.p.h. then reinspect the rail in 90 days, if operations will continue in service. Cracks discovered greater than 1-inch, but not exceeding 1-1/2 inches, should be reinspected within 30 days and the speed limited to 50 m.p.h. For a bolt hole crack exceeding 1-1/2 inches, a person qualified under §213.305(a) may elect to designate a speed restriction, but cannot exceed 30 m.p.h.

Where corrective action requires rail to be reinspected within a specific number of days after discovery, the track owner may exercise several options for compliance. One option would be to perform another inspection with rail flaw detection equipment, either rail-mounted or hand-held. Another option would be to perform a visual inspection where the defect is visible and measurable. In the latter case, for certain defects enclosed within the joint bar area such as bolt hole breaks, removal of the joint bars will be necessary to comply with the reinspection requirement. If defects remain in track beyond the reinspection interval, the railroad must continue to monitor the defect and take the appropriate action as required in the remedial action table.

- A broken base can result from improper bearing of the base on a track spike or tie plate shoulder, from over-crimped anchors, or it may originate in a manufactured seam. With today's higher axle loads, Inspectors can anticipate broken base defects in 75-pound and smaller rail sections with an irregular track surface, especially on the field side. For any broken base discovered that is more than one inch but less than six inches in length, the remedial action (note D) is to apply joint bars bolted through the outermost holes to defect within 10 days, if operations will continue. The operating speed must be reduced to 30 m.p.h. or less, as authorized by a person under §213.305(a), until joint bars are applied. After that, operating speed is limited to 50 m.p.h.

  A broken base in excess of six inches requires the assignment of a person designated under §213.305 to visually supervise each train operation over the defective rail. The railroad may apply joint bars to the defect and bolt them in accordance with §213.351(d) and (e) and thereafter must limit train operations to 30 m.p.h. As reference, the dimensions between the outermost holes of a 24-inch joint bar vary between approximately 15 and 18 inches and a 36-inch joint bar approaches 30 inches.

  Inspectors should point out to the track owner that broken bases nearing these dimensions and originating in track, may negate the purpose for which the joint bars are applied. A broken base rail may be caused by damage from external sources, such as rail anchors being driven through the base by a derailed wheel. It is improper to consider them "damaged rail," as this defect is addressed by more stringent provisions applicable to broken base rail, under note (A) or (E) and (I).

- Damaged rail can result from flat or broken wheels, incidental hammer blows, or derailed or dragging equipment. Reducing the operational speed to 30 m.p.h. until joint bars are applied, lessens the impact force imparted to the weaken area. Applying joint bars under note (D) insures a proper horizontal and vertical rail-end alinement in the event the rail fails.

- Flattened rails (localized collapsed head rail) are also caused by mechanical interaction from repetitive wheel loadings. FRA and industry research indicate that these occurrences are more accurately categorized as rail surface conditions, not rail defects, as they do not, in themselves, cause service failure of the rail. Although it is not a condition shown to affect the structural integrity of the rail section, it can result in less-than-desirable dynamic vehicle responses in the higher speed ranges. The flattened rail condition is identified in the table, as well as in the definition portion of §213.337(b), as being 3/8-inch or more in depth below the rest of the railhead and eight inches or more in length. As the defect becomes more severe by reducing railhead depth and width size, wheel forces increase. If located either on the outside or inside rail, the limited cross-sectional area of the rail may increase the lateral-to-vertical ratio and cause a wheel-lift condition. The rule addresses the issue of "flattened rail" in terms of a specified remedial action for those of a certain depth and length. Those locations meeting the depth and length criteria shall be limited to an operating speed of 50 m.p.h. or the maximum allowable under §213.307 for the class of track concerned, whichever is lower.

A "break out in rail head" is defined as a piece which has physically separated from the parent rail. Rail defects meeting this definition are required to have each operation over that rail visually supervised by a person designated under §213.305(a). Inspectors need to be aware that this definition has applicability across a wide range of rail defects, as indicated in the remedial action table. Where rail defects which have not progressed to the point where they meet this strict definition, but due to the type, length and location of the defect present a hazard to continued train operation, Inspectors should determine what remedial actions, if any, are to be instituted by the track owner

The issue of "excessive rail wear" continues to be evaluated by the FRA's rail integrity research program. The FRA believes that insufficient data exists at this time to indicate that parameters for this condition should be proposed as a minimum standard.

The Sperry Rail Service prints an excellent reference manual on rail defects. Inspectors are expected to be conversant with rail defect types, appearance, growth, hazards, and methods of detection.

Defect Codes	
337.01	Transverse Fissure
337.02	Compound Fissure
337.03	Horizontal Split Head
337.04	Vertical Split Head
337.05	Split Web
337.06	Piped Rail
337.07	Bolt hole Crack
337.08	Head Web Separation
337.09	Broken Base
337.10	Detail Fracture
337.11	Engine Burn Fracture
337.12	Ordinary Break
337.13	Broken or Defective Weld
337.14	Damaged Rail
337.15	Flattened Rail

§213.339 Inspection of rail in service

(a) A continuous search for internal defects shall be made of all rail in track at least twice annually with not less than 120 days between inspections

(b) Inspection equipment shall be capable of detecting defects between joint bars, in the area enclosed by joint bars.

(c) Each defective rail shall be marked with a highly visible marking on both sides of the web and base.

(d) If the person assigned to operate the rail defect detection equipment being used determines that, due to rail surface conditions, a valid search for internal defects could not be made over a particular length of track, the test on that particular length of track cannot be considered as a search for internal defects under paragraph (a) of this section.

(e) If a valid search for internal defects cannot be conducted for reasons described in paragraph (d) of this section, the track owner shall, before the expiration of time limits --

(1) Conduct a valid search for internal defects;

(2) Reduce operating speed to a maximum of 25 m.p.h. until such time as a valid search for internal defects can be made; or

(3) Remove the rail from service.

Application

A continuous search for internal rail defects must be made of all rail in track Classes 6, 7, 8, and 9 at a frequency of twice annually with a minimum of 120 days interval between inspections.

If a valid search for internal defects cannot be conducted because of surface conditions such as shells, head checks, etc. or lubrication or similar conditions, the inspection is not considered an inspection for the purposes of this section. The railroad must reduce operating speed to 25 m.p.h. until the valid search is made or the rail is removed from service.

Defect Codes	
339.01	Failure to inspect rail for internal defects at required frequency.
339.02	Failure of equipment to inspect rail at joints.
339.03	Defective rail not marked properly.
339.04	Failure to reduce operating speed until valid rail inspection is performed.

§213.341 Initial Inspection of new rail and welds

The track owner shall provide for the initial inspection of newly manufactured rail, and for initial inspection of new welds made in either new or used rail. A track owner may demonstrate compliance with this section by providing for:

(a) In-service inspection -- A scheduled periodic inspection of rail and welds that have been placed in service, if conducted in accordance with the provisions of §213.339, and if conducted not later than 90 days after installation, shall constitute compliance with paragraphs (b) and (c) of this section;

(b) Mill inspection -- A continuous inspection at the rail manufacturer's mill shall constitute compliance with the requirement for initial inspection of new rail, provided that the inspection equipment meets the applicable requirements specified in §213.339. The track owner shall obtain a copy of the manufacturer's report of inspection and retain it as a record until the rail receives its first scheduled inspection under §213.339;

(c) Welding plant inspection – A continuous inspection at a welding plant, if conducted in accordance with the provisions of paragraph (b) of this section, and accompanied by a plant operator's report of inspection which is retained as a record by the track owner, shall constitute compliance with the requirements for initial inspection of new rail and plant welds, or of new plant welds made in used rail; and

(d) Inspection of field welds -- An initial inspection of field welds, either those joining the ends of CWR strings or those made for isolated repairs, shall be conducted not less than one day and not more than 30 days after the welds have been made. The initial inspection may be conducted by means of portable test equipment. The track owner shall retain a record of such inspections until the welds receive their first scheduled inspection under §213.339.

(e) Each defective rail found during inspections conducted under paragraph (a) or (d) of this section shall be marked with highly visible markings on both sides of the web and base and the remedial action as appropriate under §213.337 will apply.

Application

The railroad must provide initial inspections of newly manufactured rail and initial inspections of new welds made in either new or used rail.

To comply with the requirement to inspect newly manufactured rail, the railroad may conduct an in-service inspection, if conducted in accordance with §213.339, within 90 days after installation; or

To comply with the requirement to inspect newly manufactured rail, the railroad may elect to conduct a continuous inspection at the rail manufacturer's mill provided that the inspection equipment meets the requirements of §213.339.

If the mill inspection option is selected, the railroad shall maintain a record of the inspection as specified in this section.

Similarly, the railroad is required to inspect new welds made in new or used rail, either at the plant or in the track.

Each defective rail found under this section must be clearly marked and the proper remedial action taken. Inspector should cite the appropriate defect code in §213.339 for the type of rail defect found.

Defect Codes	
341.01	Failure to conduct initial inspection of new rail.
341.02	Failure to inspect new welds made in new or used rail.
341.03	Failure to clearly mark rail defect found during initial inspection of new rail and welds.

§213.343 Continuous welded rail (CWR)

Each track owner with track constructed of CWR shall have in effect written procedures which address the installation, adjustment, maintenance and inspection of CWR, and a training program for the application of those procedures, which shall be submitted to the Federal Railroad Administration within six months following the effective date of this rule. FRA reviews each plan for compliance with the following --

(a) Procedures for the installation and adjustment of CWR which include --

  (1) Designation of a desired rail installation temperature range for the geographic area in which the CWR is located; and

  (2) De-stressing procedures/methods which address proper attainment of the desired rail installation temperature range when adjusting CWR.

(b) Rail anchoring or fastening requirements that will provide sufficient restraint to limit longitudinal rail and crosstie movement to the extent practical, and specifically addressing CWR rail anchoring or fastening patterns on bridges, bridge approaches, and at other locations where possible longitudinal rail and crosstie movement associated with normally expected train-induced forces, is restricted.

(c) Procedures which specifically address maintaining a desired rail installation temperature range when cutting CWR including rail repairs, in-track welding, and in conjunction with adjustments made in the area of tight track, a track buckle, or a pull-apart. Rail repair practices shall take into consideration existing rail temperature so that --

  (1) When rail is removed, the length installed shall be determined by taking into consideration the existing rail temperature and the desired rail installation temperature range; and

  (2) Under no circumstances should rail be added when the rail temperature is below that designated by paragraph (a)(1) of this section, without provisions for later adjustment.

(d) Procedures which address the monitoring of CWR in curved track for inward shifts of alinement toward the center of the curve as a result of disturbed track.

(e) Procedures which control train speed on CWR track when --

(1) Maintenance work, track rehabilitation, track construction, or any other event occurs which disturbs the roadbed or ballast section and reduces the lateral and/or longitudinal resistance of the track; and

(2) In formulating the procedures under this paragraph (e), the track owner shall--

(i) Determine the speed required, and the duration and subsequent removal of any speed restriction based on the restoration of the ballast, along with sufficient ballast re-consolidation to stabilize the track to a level that can accommodate expected train-induced forces. Ballast re-consolidation can be achieved through either the passage of train tonnage or mechanical stabilization procedures, or both; and

(ii) Take into consideration the type of crossties used.

(f) Procedures which prescribe when physical track inspections are to be performed to detect buckling prone conditions in CWR track. At a minimum, these procedures shall address inspecting track to identify --

(1) Locations where tight or kinky rail conditions are likely to occur;

(2) Locations where track work of the nature described in paragraph (e)(1) of this section have recently been performed; and

(3) In formulating the procedures under this paragraph (f), the track owner shall --

(i) Specify the timing of the inspection; and

(ii) Specify the appropriate remedial actions to be taken when buckling prone conditions are found.

(g) The track owner shall have in effect a comprehensive training program for the application of these written CWR procedures, with provisions for periodic re-training, for those individuals designated under §213.305(c) of this part as qualified to supervise the installation, adjustment, and maintenance of CWR track and to perform inspections of CWR track.

(h) The track owner shall prescribe recordkeeping requirements necessary to provide an adequate history of track constructed with CWR. At a minimum, these records shall include:

(1) Rail temperature, location and date of CWR installations. This record shall be retained for at least one year; and

(2) A record of any CWR installation or maintenance work that does not conform with the written procedures. Such record shall include the location of the rail and be maintained until the CWR is brought into conformance with such procedures.

(i) As used in this section –

(1) “Adjusting/De-stressing” means the procedure by which a rail’s temperature is re-adjusted to the desired value. It typically consists of cutting the rail and removing rail anchoring devices, which provides for the necessary expansion and contraction, and then re-assembling the track.

(2) “Buckling Incident” means the formation of a lateral mis-alinement sufficient in magnitude to constitute a deviation of 5 inches measured with a 62-foot chord. These normally occur when rail temperatures are relatively high and are caused by high longitudinal compressive forces.

(3) “Continuous Welded Rail (CWR)” means rail that has been welded together into lengths exceeding 400 feet.

(4) “Desired Rail Installation Temperature Range” means the rail temperature range, within a specific geographical area, at which forces in CWR should not cause a buckling incident in extreme heat, or a pull-apart during extreme cold weather.

(5) “Disturbed Track” means the disturbance of the roadbed or ballast section, as a result of track maintenance or any other event, which reduces the lateral or longitudinal resistance of the track, or both.

(6) “Mechanical Stabilization” means a type of procedure used to restore track resistance to disturbed track following certain maintenance operations. This procedure may incorporate dynamic track stabilizers or ballast consolidators, which are units of work equipment that are used as a substitute for the stabilization action provided by the passage of tonnage trains.

(7) “Rail Anchors” means those devices which are attached to the rail and bear against the side of the crosstie to control longitudinal rail movement. Certain types of rail fasteners also act as rail anchors and

control longitudinal rail movement by exerting a downward clamping force on the upper surface of the rail base.

(8) "Rail Temperature" means the temperature of the rail, measured with a rail thermometer.

(9) "Tight/Kinky Rail" means CWR which exhibits minute alinement irregularities which indicate that the rail is in a considerable amount of compression.

(10) "Train-induced Forces" means the vertical, longitudinal, and lateral dynamic forces which are generated during train movement and which can contribute to the buckling potential.

(11) "Track Lateral Resistance" means the resistance provided to the rail/crosstie structure against lateral displacement.

(12) "Track Longitudinal Resistance" means the resistance provided by the rail anchors/rail fasteners and the ballast section to the rail/crosstie structure against longitudinal displacement

Application

The definition "buckling incident" is provided to explain the industry-accepted threshold for such an event. However, the rule recognizes the importance of conditions that are precursors to buckles.

Paragraph (a) requires the railroad to have in effect and comply with their own written procedures that address the installation, adjustment, maintenance and inspection of CWR.

The written procedures should be reasonable and consistent with current research results. The FRA will review each plan for compliance with paragraphs (a) through (f). The FRA Headquarters track specialists and Regional track specialists shall have primary responsibility for reviewing each set of railroad CWR procedures. Inspectors may be requested to provide recommendations concerning the comprehensiveness of those procedures.

In addition to safety critical procedures listed in this section, the railroad may decide to include procedures based on administrative or economic considerations. For example, a railroad may choose to include instructions that limit the use of worn secondhand replacement rail because of an economic concern about the length of time that it might take to perform a satisfactory weld. The railroad may also include specific actions in their procedures that are to be

taken when installation or maintenance work does not comply with its overall procedures.

The railroad must record the location of any installation or maintenance work in CWR that does not conform to its procedures in accordance with Section 213.343(h)(2). The record shall be maintained until the CWR is brought into conformance with the railroad's written procedures. The railroad may also wish to include a narrative explanation of the special circumstances involved. Inspectors should periodically review the information recorded in accordance with §213.343(h)(2) to determine if any work performed on CWR, which does not comply with the railroad procedures, is being properly recorded.

Inspectors must be aware of the procedures in effect before inspecting each railroad. When conducting inspections, the Inspector must make observations to determine if the railroad is following its basic safety procedures. If the railroad fails to follow its procedures and the failure may lead to a serious safety problem, the Inspector should consider citing the railroad for failure to comply with their CWR procedures. A violation memorandum must document the circumstances involved, including whether or not the railroad recorded the conditions as required under §213.343(h)(2). However, the Inspector should exercise judgment in the reporting of circumstances that do not fully comply with the written procedures. Minor deviations from written CWR procedures should not be considered for enforcement action unless, together with other violations, they are part of a larger safety problem.

Merely recording an activity which does not conform to the railroad's CWR procedures does not provide the railroad with indefinite relief from responsibility for compliance when its procedures are not followed and continued noncompliance may lead to an unsafe condition. The recordkeeping procedure is intended to provide a safety net by flagging those activities of noncompliance, which if not brought into compliance in a timely manner, could lead to an unsafe condition. For example, CWR track installed in the winter months without adequate rail anchors as prescribed by the written procedures and discovered in late summer would clearly be a deficient condition, whether it was recorded or not. When in doubt as to what activities are considered safety-related, the Inspector should consult with the Regional Track Specialist.

Under guidance from the Regional Track Specialist, Inspectors must determine the adequacy of the railroad's formal training program under §213.343(g) and (h). Those training procedures are required to be consistent and current with research results, clear, concise, and easy to understand by maintenance-of-way employees.

Railroads typically establish a desired rail installation temperature range for the geographical area that is higher than the annual mean temperature. This higher installation temperature will account for the expected reduction of the force-free temperature caused by track maintenance, train traffic and other factors. A railroad's failure to establish a designated installation temperature range for a specific territory is addressed under §213.343(a).

The two failure modes associated with track constructed with CWR are track buckles and a pull-aparts. A track buckle is considered the more serious of the two and is characterized by the formation of a large lateral mis-alinement caused by:

- high compressive forces in the rail (thermal and mechanical loads);
- weakened track conditions (weak track resistance, alinement deviations); and
- vehicle loads (a dynamic "wave" uplift and lateral vs. vertical ratios).

Thermal and mechanical loads are opposed by three parameters: lateral, longitudinal, and torsional resistance of the track. Track buckles almost always occur in the lateral direction. Lateral resistance is the most important and is dependent upon weight and size of crosstie material, ballast material type, shoulder width, crib content and the level of consolidation, and vertical loads.

A crosstie's base, side (crib) friction and ballast shoulder resistance contribute to the overall lateral resistance sustained. In general, each contributes (base 50%, side 20-30%, and shoulder 20-30%) to this resistance but the ratios can vary dependant upon ballast condition. Lateral resistance varies in location depending on the ballast shoulder geometry, crosstie size and type, and state of ballast consolidation.

Thermal loads by themselves can cause a buckle and are often called "static buckling." Most buckling however, occurs under a combination of thermal and vehicle loads, termed "dynamic buckling." Inspectors should place emphasis on vehicle (dynamic) effects on track lateral stability, where high rail temperatures and vehicle loading could progressively weaken the track due to dynamic uplift (flexural waves) and a buckle mechanism response induced by misalignment "growth."

Because the majority of buckles occur under dynamic train movements, loading is an important element in the buckling mechanism. Elements of track lateral instability include:

- formation of initial track misalinements caused by reduced local resistance;

- high impact loads, initial rail surface (weld) imperfections and 'soft' spots in ballast, and curve (radial breathing) shifting; and

- misalinement growth caused by high lateral loads, increased longitudinal forces, track uplifts due to vertical loads, and train induced vibration.

Inspectors may consider the above elements combined with related evidence of actual or incipient geometry defects or other defective structural conditions when evaluating the adequacy of a railroad's CWR stability procedures (or lack thereof) under §213.343(b), (c), and (d). Locations where imminent track buckling is more likely to occur include: horizontal and vertical curves, bottom of grades, bridge approaches, highway-rail grade crossings, recently disturbed track, and areas of heavy train starting or braking.

The signs or precursors of buckles include:

- newly formed alinement deviations; wavy, kinky, snaky, *etc.*,
- minute rail alinement;
- rails rotating or lifting out of the tie plates and intermittent loose tie plates;
- excessive "running" rail causing ties to plow or churn the ballast;
- insufficient and moving anchors;
- insufficient ballast section in the crib and shoulder areas;
- gaps at crosstie ends, especially on the low (inner) rail; and
- previous buckles improperly repaired.

Curves are more prone to buckling because of the curvature effect, alinement imperfection sensitivity, and train loads. It is important for Inspectors to consider when and where a buckle may occur, e.g., on track segments where the CWR was laid "cold" below the desired rail installation temperature range and there was inadequate control of the laying temperature or inadequate adjustment of the rail afterwards. Also, Inspectors should observe areas of recent maintenance involving either ballast or rail, where there was inadequate reconsolidating time for disturbed ballast or inadequate temperature adjustment when replacing a defective rail. As curvature increases, the buckling resistance decreases. Under some conditions, high degree curvature can undergo gradual lateral shift (progressive buckling). Lateral alinement deviations reduce the track buckling strength and can initiate growth to critical levels. Vertical alinement deviations can also influence buckling.

Lateral mis-alinement is an important consideration and it influences buckling strength significantly. An alinement offset or mid-ordinate within allowable limits may "grow" under the imposed loads, the ballast, subgrade movement and settlement. This is called "track shift." A longitudinal force in curved track will cause CWR rail to move radially. Compressive loads in the rail during the summer tend to move the track outwards and tensile loads in the winter will pull the track inward, a term known as "radial breathing." Inspectors should review the allowable limits, under §213.327, and evaluate the relevant alinement and track strength (§213.311, movement under load) due to repeated thermal and vehicle loadings.

Generally speaking, a decrease in the force-free temperature of 30 to 40 degrees from the installation temperature can be critical and lead directly to buckling. Inspectors should monitor the following factors which may influence shifts in the force-free temperature: improper rail installation, inadequate rail anchors or fastenings, lateral movements in curves through lining operations, "skeletonized" track segments, and inadequate ballast section. Lateral and longitudinal restraint is influenced by the factors mentioned above and, if improperly executed or allowed to exist in a defective state, may produce a potential track buckle.

Tangent track buckling incidents are less frequent than in curves. However, buckling in tangent track will generally occur suddenly and with more severe consequences.

The second of the two failure modes can be associated with track constructed with CWR is a pull-apart. A rail's decrease in temperature in the winter will create tensile forces. The maximum tensile load in the rail is determined by the difference in the installation or force-free temperature and the lowest rail temperatures. Enough tensile force can cause direct fracture at rail cross-sections with prior cracks, weak welds or shear joint bolts at CWR string end locations.

A track owner may update or modify CWR procedures as necessary, upon notification to the FRA of those changes.

Defect Codes	
343.01	Failure of track owner to develop and implement written CWR procedures.
343.02	Failure to comply with written CWR procedures.
343.03	Failure of track owner to develop a training program for the implementation of their written CWR procedures.
343.04	Failure to keep CWR records as required.

§213.345 Vehicle qualification testing

(a) All rolling stock types which operate at Class 6 speeds and above shall be qualified for operation for their intended track classes in order to demonstrate that the vehicle dynamic response to track alinement and geometry variations are within acceptable limits to assure safe operation. Rolling stock operating in Class 6 within one year prior to the promulgation of this Subpart shall be considered as being successfully qualified for Class 6 track and vehicles presently operating at Class 7 speeds by reason of conditional waivers shall be considered as qualified for Class 7.

(b) The qualification testing shall ensure that, at any speed less than 10 m.p.h. above the proposed maximum operating speed, the equipment will not exceed the wheel/rail force safety limits and the truck lateral accelerations specified in §213.333, and the testing shall demonstrate the following:

(1) The vertical acceleration, as measured by a vertical accelerometer mounted on the car floor, shall be limited to no greater than 0.55g single event, peak-to-peak.

(2) The lateral acceleration, as measured by a lateral accelerometer mounted on the car floor, shall be limited to no greater than 0.3g single event, peak-to-peak; and

(3) The combination of the lateral acceleration (L) and the vertical acceleration (V) within any period of 2 consecutive seconds as expressed by the square root of (V2 +L2) shall be limited to no greater than 0.604, where L may not exceed 0.3g and V may not exceed 0.55g.

(c) To obtain the test data necessary to support the analysis required in paragraphs (a) and (b) of this section, the track owner shall have a test plan which shall consider the operating practices and conditions, signal system, road crossings and trains on adjacent tracks during testing. The track owner shall establish a target maximum testing speed (at least 10 m.p.h. above the maximum proposed operating speed) and target test and operating conditions and conduct a test program sufficient to evaluate the operating limits of the track and equipment. The test program shall demonstrate vehicle dynamic response as speeds are incrementally increased from acceptable Class 6 limits to the target maximum test speeds. The test shall be suspended at that speed where any of the safety limits specified in paragraph (b) are exceeded.

(d) At the end of the test, when maximum safe operating speed is known along with permissible levels of cant deficiency, an additional run shall be made with the subject equipment over the entire route proposed for revenue service at the speeds the railroad will request FRA to approve for such service and a second run again at 10 m.p.h. above this speed. A report of the test procedures and results shall be submitted to FRA upon the completions of the tests. The test report shall include the design flange angle of the equipment which shall be used for the determination of the lateral to vertical wheel load safety limit for the track/vehicle interaction safety measurements required per §213.333(l).

(e) As part of the submittal required in paragraph (d) of the section, the operator shall include an analysis and description of the signal system and operating practices to govern operations in Classes 7 and 8. This statement shall include a statement of sufficiency in these areas for the class of operation. Operation at speeds in excess of 150 m.p.h. is authorized only in conjunction with a rule of particular applicability addressing other safety issues presented by the system.

(f) Based on test results and submissions, FRA will approve a maximum train speed and value of cant deficiency for revenue service.

Application

This section refers to the qualification of the Vehicle/track system. High speed vehicles and the track on which they operate are an integral system. It is of utmost importance that the vehicle/track system meets minimum qualification criteria.

Rolling stock operating in Class 6 within one year prior to the promulgation of this Subpart shall be considered as qualified for Class 6 track and vehicles presently operating at Class 7 speeds by reason of conditional waivers shall be considered as qualified for Class 7. For this "grandfathered" equipment, it is not necessary that the railroad conduct qualification testing as described below. If the railroad has operated the specified equipment at Class 6 or Class 7 speeds and a particular level of cant deficiency by reason of conditional waivers, the railroad is not required to obtain FRA approval prior to operation at those speeds and cant deficiencies.

Unless the operation is grandfathered in accordance with paragraph (a), the qualification testing must ensure that when each rolling stock type is operated at any speed less then 10 m.p.h. above the proposed maximum speed, the vehicle/track system will not exceed the wheel/rail force safety limits and the truck lateral safety limits listed in §213.333 and the carbody lateral and vertical acceleration safety limits included in paragraph (b) of this section. The railroad must comply with the limitations on carbody accelerations listed in this section during the qualification phase and must comply with the carbody acceleration

limits shown in the VTI table in §213.333 during the day-to-day operation of the system.

For non-grandfathered operations, the high speed railroad must have a test plan that considers operating practices and conditions, signal system, road crossings and trains on adjacent tracks during testing. The test program shall comply with the requirements in this section.

For operations that have not been grandfathered, a report of the test procedures and results must be submitted to the FRA. The report shall also include the design flange angle that will be used in the VTI table in §213.333. On Classes 7 and 8 track, the railroad must submit an analysis and description of the signal system and operating practices to govern operation. A high speed railroad cannot operate at speeds above 150 m.p.h. without a Rule of Particular Applicability, except that it is permitted to conduct testing at 10 m.p.h. above its intended operating speed in accordance with this section.

Unless the proposed operation has been grandfathered, the Associate Administrator for Safety will review the test results and submissions and approve a specific maximum speed and value of cant deficiency based on those submissions. The Inspector may be requested to provide a memorandum containing recommendations concerning the advisability of FRA's approval of the proposed high speed operation.

During testing, the railroad Test Engineer will evaluate the data and, if safe to do so, will decide to make another run at an incremental speed, typically 5 or 10 m.p.h. higher than the last run. The FRA Headquarters staff will typically provide a Test Monitor to observe the testing. However, in some cases, the Regional Staff may be called upon to monitor testing or a decision will be reached that a Test Monitor is not necessary for a particular test. As appropriate, other FRA technical personnel may also be involved in the monitoring of the testing.

The Passenger Equipment Safety Standards' requirement for a pre-revenue service acceptance testing plan sets forth the information that must be included in the test plan for qualification and the procedures for notification and FRA approval of the plan (See §238.111). Specifically, §238.427, Suspension systems, and Appendix C to Part 238 state that passenger equipment <u>shall be designed</u> to limit the lateral and vertical forces and accelerations to the limits indicated. §213.345 of the Track Safety Standards, establishes the testing procedures and the safety criteria which must be met during vehicle qualification on the high speed route, as well as the materials which must be submitted for FRA's consideration of approval.

After a vehicle is qualified in accordance with §213.345, other provisions of the Track Safety Standards require the monitoring of the vehicle/track interaction (VTI) parameters. For Track Classes 7, 8 and 9, Section 213.333(k) requires that an instrumented car having dynamic response characteristics that are representative of the equipment (or a portable device that monitors on board instrumentation) shall be operated at a frequency of at least twice within 60 days. The representative car (or portable device) shall monitor vertically and laterally oriented accelerometers placed near the end of the car at the floor level. In addition, accelerometers shall be mounted to the truck frame. If the carbody lateral, carbody vertical, or truck frame lateral acceleration measurements exceed those in the VTI table in §213.333, train speeds will be reduced until these safety limits are not exceeded.

§213.333(l) states that, for Track Classes 8 and 9, an instrumented car that is representative of other equipment assigned to service shall be operated over the track at the revenue speed profile annually with not less than 180 days between inspections. The instrumented car must be equipped with functioning instrumented wheelsets to measure wheel/rail forces. If the wheel/rail forces exceed the limits in the table, speeds will be reduced until these safety limits are not exceeded.

The carbody acceleration limits in §213.345 are set at more stringent levels than those in §213.333. A new vehicle/track system is expected to demonstrate compliance with the 0.3g peak to peak lateral acceleration and 0.55g peak to peak vertical acceleration limits. As the system wears and changes over time, the railroad must comply with §213.333 which sets limits of 0.5g peak to peak lateral and 0.6g peak to peak vertical. These carbody acceleration limits are established primarily to prevent safety hazards to occupants of the high speed equipment who may lose balance or fall, but are also indicators of track quality.

An event's magnitude, as well as its duration, is important to take into consideration when examining occupant safety and track quality. After qualification, exceptions to the safety limits in §213.333, regardless of duration, must result in appropriate remedial action. A sustained, oscillatory carbody acceleration is more of concern than a single impact-related event. The following types of events are considered as exceptions to §213.345(b), regardless of the event's duration, if the events exceeded the instrumentation accuracy of the accelerometers (0.315g peak to peak lateral and 0.565g peak to peak vertical):

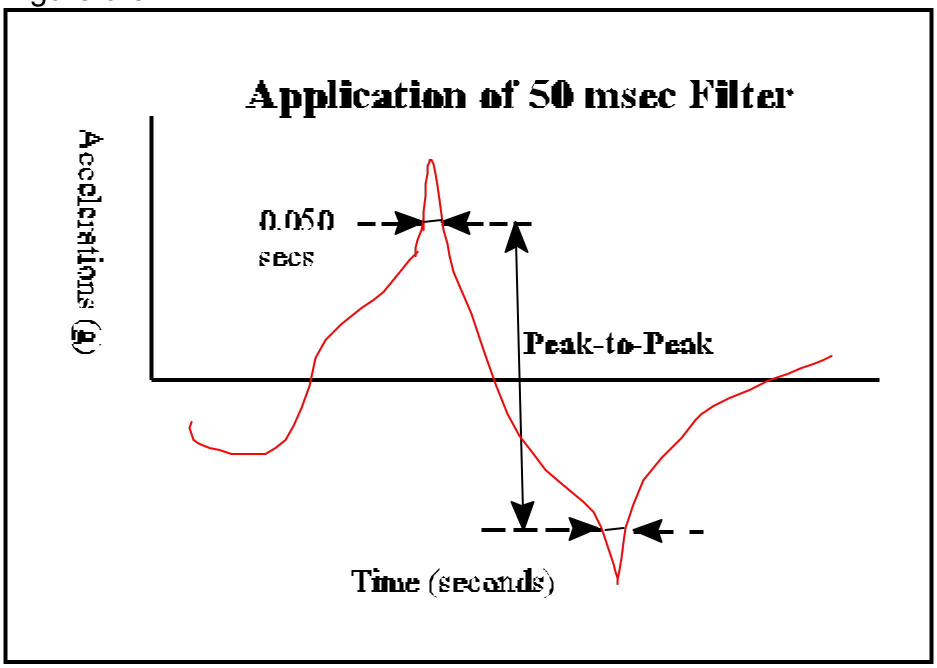
> An event with a corresponding wheel/rail force or truck frame acceleration exceeding 90% of the prescribed limit (or, in the case of vertical wheel loads, less than 20% of the static load);

A sustained, oscillatory event which exhibits four or more consecutive peak to peak occurrences where each occurrence exceeds the limits within a four-second period.

For coach cars, a lateral or vertical carbody event above 0.6g peak to peak vertical or 0.5 g peak to peak lateral, and for power cars/locomotives any exceedence of 0.75g peak to peak vertical or 0.5g peak to peak lateral (with a 10 Hz filter).

Each event must then be examined for its duration (see following Figure) using a 50-msec filter. (Note: the above thresholds are applied using the measured data signature and magnitude). The 50 msec criterion has the effect of removing short duration spikes which do not affect ride safety.

Figure 6-8



Defect Codes	
345.01	Failure to conduct qualification testing as required.
345.02	Operation at Class 6 and above speeds without approval of the FRA Associate Administrator for Safety.

§213.347 Automotive or railroad crossings at grade

(a) There shall be no at-grade (level) highway crossings, public or private, or rail-to-rail crossings at-grade on Class 8 and 9 track.

(b) If train operation is projected at Class 7 speed for a track segment that will include rail-highway grade crossings, the track owner shall submit for FRA's approval a complete description of the proposed warning/barrier system to address the protection of highway traffic and high speed trains. Trains shall not operate at Class 7 speeds over any track segment having highway-rail grade crossings unless:

(1) An FRA-approved warning/barrier system exists on that track segment and;

(2) All elements of that warning/barrier system are functioning.

Application

Highway/rail crossings, public or private, or rail-to-rail crossings at-grade are prohibited on Classes 8 and 9 track.

The railroad must submit for the approval of the FRA Associate Administrator for Safety a complete description of the proposed warning/barrier system to address the protection of highway traffic and high speed trains before operation at Class 7 speeds is permitted at the crossings unless an FRA-approved warning/barrier system exists and all elements of that system are functioning.

Railroads are encouraged to install and maintain the optimal warning/barrier systems on crossings in Class 6 track.

Defect Codes	
347.01	Highway/rail crossings or rail-to-rail crossings at-grade are present on Class 8 and 9 track.
347.02	Unapproved warning/barrier systems on class 7 track.

§213.349 Rail-end mismatch

Any mismatch of rails at joints may not be more than that prescribed by the following table --

Class of track	Any mismatch of rails at joints may not be more than the following	
	On the tread of the rail ends (inch)	On the gage side of the rail ends (inch)
Class 6, 7, 8, & 9	1/8	1/8

Application

Measure when bolts are tight. If bolts are not tight report the condition as a bolt defect. A deviation from the tolerance, as prescribed in the §213.349 Table, constitutes a reportable exception.

Particular attention should be given to a mismatch on the gage side. A sharp flange, skewed truck, or combination of both may cause wheel climb at a gage mismatch, particularly on the outer rail of a curve. A mismatch, vertical or lateral, is extremely critical on high speed railroads and may contribute to adverse dynamics in addition to traditional hazards.

Defect Codes	
349.01	Rail-end mismatch on tread of rail exceeds allowable.
349.02	Rail-end mismatch on gage side of rail exceeds allowable.

§213.351 Rail joints

(a) Each rail joint, insulated joint, and compromise joint shall be of a structurally sound design and dimensions for the rail on which it is applied.

(b) If a joint bar is cracked, broken, or because of wear allows excessive vertical movement of either rail when all bolts are tight, it shall be replaced.

(c) If a joint bar is cracked or broken between the middle two bolt holes it shall be replaced.

(d) Each rail shall be bolted with at least two bolts at each joint.

(e) Each joint bar shall be held in position by track bolts tightened to allow the joint bar to firmly support the abutting rail ends and to allow longitudinal movement of the rail in the joint to accommodate expansion and contraction due to temperature variations. When no-slip, joint-to-rail contact exists by design, the requirements of this section do not apply. Those locations, when over 400 feet long, are considered to be continuous welded rail track and shall meet all the requirements for continuous welded rail track prescribed in this subpart.

(f) No rail shall have a bolt hole which is torch cut or burned.

(g) No joint bar shall be reconfigured by torch cutting.

Application

Rail joints are considered to be a necessary discontinuity and require special attention by railroad maintenance personnel and safety Inspectors.

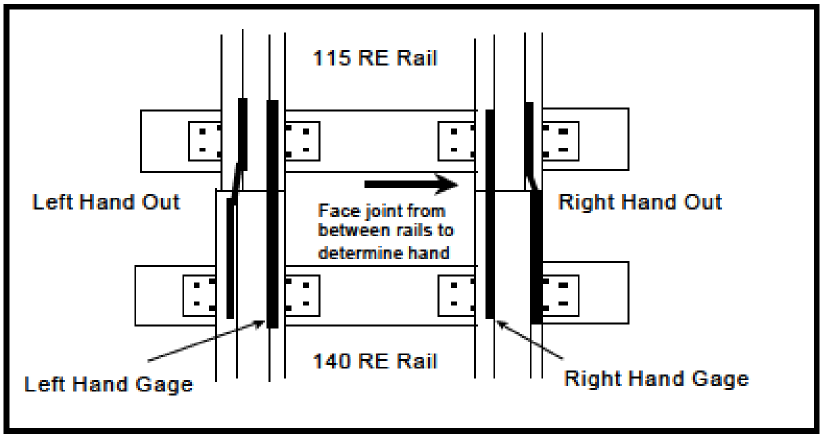
As far as possible, a rail joint should provide the same strength, stiffness, flexibility, and uniformity as the rail itself.

The TSS recognize these important aspects of rail joints and begin this section with a requirement that rail joints be of a structurally sound design and dimension for the rail on which they are applied (FRA and AREMA/AAR is to convene a working group which will issue guidelines on which joint bars meet the definition of "structurally sound" for the purpose of interchangeability with different rail sections).

For proper rail-load transfer to occur, rail joints must contact the head and base of rail when the bolts are tight. Many rail-joint designs have been used with varying degrees of success, and the TSS do not attempt to single out any particular design as the only acceptable joint. This would inhibit innovation in modern track design.

The TSS only requires structural soundness and bolt condition based on authorized operating train speed. Inspectors are reminded to be alert to locations where different rail sections are jointed by rail joints not designed as compromise joints and not identified as fitting both rail sections. Figure 6-9 illustrates the proper application of compromise joint bars.

Figure 6-9



Failure of the owner to change out a center-cracked or other than center-cracked joint bar constitutes a reportable condition. Excessive vertical rail movement within a joint constitutes an exception to the TSS.

Track owners are required to maintain the prescribed number of bolts in rail joints.

Track bolts must be of sufficient tightness to allow the joint bars to support the joint firmly, but will not be so tight as to freeze the joint.

An Inspector must be aware that a mechanical bolt tightener has the capability to torque the bolt beyond what is required, and thereby freeze the joint.

Paragraph (f) of this section prohibits the use of a rail containing a bolt hole that has been torch-cut or burned.

Paragraph (g) of this section prohibits the reconfiguration of joint bars by torch cutting.

Rail that has been welded together, either in the field or at a central facility, into lengths exceeding 400 feet are considered continuous welded rail for purposes of applying the requirements of this section.

Defect Codes	
351.01	Rail joint not of structurally sound design and dimension.
351.02	Cracked or broken joint bar (other than center-break).
351.03	Center cracked or broken joint bar.
351.04	Worn joint bar allows vertical movement of rail in joint.
351.05	Less than 2 bolts per rail at each joint for conventional jointed rail.
351.06	Reserved
351.07	Less than 2 bolts per rail at any joint in continuous welded rail.
351.08	Loose joint bars.
351.09	Torch-cut or burned-bolt hole.
351.10	Joint bar reconfigured by torch cutting.

§213.352 Torch cut rail

(a) Except as a temporary repair in emergency situations no rail having a torch cut end shall be used. When a rail end with a torch cut is used in emergency situations, train speed over that rail shall not exceed the maximum allowable for Class 2 track. All torch cut rail ends in Class 6 shall be removed be within six months of September 21, 1998.

(b) Following the expiration of the time limits specified in paragraph (a) of this section, any torch cut rail end not removed shall be removed within 30 days of discovery. Train speed over that rail shall not exceed the maximum allowable for Class 2 track until removed.

Application

No torch cutting of rail is permitted except in an emergency such as when the track needs to be quickly returned to service following a derailment or washout.

No torch cut rails are considered to exist in Class 6 and above track prior to the effective date of this rule. Torch cut rails in Class 6, if they exist, must be removed before April 21, 1999. If found, the track speed over the torch cut rail must be reduced to Class 2 and the rail must be removed within 30 days of discovery.

Defect Codes	
352.01	Torch cut rail applied for other than emergency.
352.02	Failure to remove torch cut rails within specified time frame.
352.03	Failure to remove non-inventoried torch cut rail within 30 days of discovery.
352.04	Reserved
352.05	Train speed exceeds allowable over torch cut rail.

§213.353 Turnouts, track crossings and lift rail assemblies or other transition devices on moveable bridges

(a) In turnouts and track crossings, the fastenings must be intact and maintained so as to keep the components securely in place. Also, each switch, frog, and guard rail shall be kept free of obstructions that may interfere with the passage of wheels. Use of rigid rail crossings at grade is limited per §213.347.

(b) Track shall be equipped with rail anchoring through and on each side of track crossings and turnouts, to restrain rail movement affecting the position of switch points and frogs. Elastic fasteners designed to restrict longitudinal rail movement are considered rail anchoring.

(c) Each flangeway at turnouts and track crossings shall be at least 1-1/2 inches wide.

(d) For all turnouts and crossovers, and lift rail assemblies or other transition devices on moveable bridges, the track owner shall prepare an inspection and maintenance Guidebook for use by railroad employees which shall be submitted to the Federal Railroad Administration. The Guidebook shall contain at a minimum –

(1) Inspection frequency and methodology including limiting measurement values for all components subject to wear or requiring adjustment.

(2) Maintenance techniques.

(e) Each hand operated switch shall be equipped with a redundant operating mechanism for maintaining the security of switch point position.

Application

A turnout is a track arrangement consisting of a switch and frog with connecting and operating parts extending from the point of switch to the heel of frog that allows engines and cars to pass from one track to another. Because of the

operating or movable parts and lateral thrust, it is essential that fastenings be in place, tight, and in sound condition.

A crossing is a device used where two tracks intersect at grade permitting traffic on either track to cross the rails of the other. It may consist of four frogs, connected by short rails, or a plant-manufactured diamond. Because of the impact a crossing is subjected to, it is essential that fastenings be in place, tight, and in sound condition. <u>Use of rigid rail crossings at grade is not permitted in Class 8 or 9 track.</u>

Each switch, frog, and guard rail must be kept free of obstruction.

Anchors on each side of a turnout or crossing and through a turnout are mandatory on Class 6 and above. Elastic fasteners designed to restrict longitudinal rail movement are considered rail anchoring. Rail anchoring ensures the:

- Restraint of rail;
- Proper fit of the switch points; and
- Prevention of line irregularities.

Ties and timbers at switches and crossings must be of sound condition and well-tamped, and the roadbed must be adequately drained.

Flangeways at turnouts and track crossings must be at least 1-1/2 inches wide.

For all turnouts and crossovers, and lift rail assemblies or other transition devices on moveable bridges, the railroad must prepare an inspection and maintenance Guidebook for use by railroad employees which shall be submitted to the FRA and which shall contain at a minimum:

- Inspection frequency and methodology, including limiting measurement values, for all components subject to wear or requiring adjustment.
- Maintenance techniques.

Inspectors must review the railroad's inspection Guidebook and conduct inspections based on the safety criteria contained therein. In addition, Inspectors must ascertain if the Guidebook contains the required information listed above. Inspectors shall use judgment when citing the railroad for its failure to adhere to its Guidebook.

The Guidebook must contain provisions addressing traditional types of high speed turnouts along with those components which may be developed in the future. Therefore, the Inspector has available those defect codes that have been used for several years on lower speed turnouts and switches.

Turnouts must be walked and measurements made before they can be included on the Inspection Report as a unit inspected.

The Inspector must do the following when inspecting switches:

- Confirm compliance with railroad Guidebook.
- Check alignment, gage, and surface.
- Examine condition as to wear of switch points and stock rails.
- See that all bolts, nuts, cotter pins, and other fastenings are in place, in good condition, and are properly tightened.
- See that switch points fit snugly against the rail when the switch is thrown in either position.
- Test, in the presence of the owner's representative, the operation of switches for lost motion and loose connections.
- Examine, if applicable, the rod and fastenings that connect the switch point to the switch circuit controller to ensure they are in place and in good condition.
- Examine the condition and support of spring and power switch machines and hand-thrown switch stands, including automatic or safety switch stands. Stand and machine fastenings to the head block ties must be tight to avoid any movement or play.
- Examine switch-lock, keeper (latch), and foot-lock apparatus.
- Examine condition of switch position indicator and note any unnecessary obstruction to its visibility.
- Examine the heel block, its fastenings, and bars; or, in the absence of a heel block, examine the heel of the switch point.

- Examine the seating of stock rails in the switch plates to ensure that the outer tread of a wheel cannot engage the gage side of these rails and that chairs or braces do not cant these rails in.

- Examine the insulation in the gage plates and switch rods in signal territory.

When inspecting frogs, Inspectors should do the following:

- Confirm compliance with railroad Guidebook.

- Determine if frogs may be classified as bolted rigid, solid manganese, moveable, rail-bound manganese, or spring rail.

- Ensure that a frog is supported throughout on sound ties and is well-tamped.

- Closely examine every spring rail frog encountered during an inspection. While spring rail frogs have been successfully used for many years, their unique design requires special maintenance attention to avoid derailment hazards to trailing-point train movements on the main track.

- Examine the toe of each spring rail frog. It must be solidly supported and proper hold-down housing clearance maintained to avoid excessive vertical movement of the wing rail. The first sign that this is occurring will be gouging on the gage corner of the wing rail behind the point of frog. Wheel gouging must not be confused with channeling in the spring wing rail that is machined, at the time of manufacture, to accommodate wheel tread transition.

- Determine if the toe is solidly tamped. If it is not, and excessive horn and housing clearance exists, the wing rail may have vertical motion operating on the point rail in a trailing-point movement and the forces on the wing rail will cause the wing rail to move laterally, allowing the wheel to drop in at the throat of the frog.

Defect Codes	
353.01	Loose, worn, or missing switch clips.
353.02	Loose, worn, or missing clip bolts (transit, side jaw, eccentric, vertical).
353.03	Loose, worn, or defective connecting rod.
353.04	Loose, worn, or defective connecting rod fastening.
353.05	Loose, worn, or defective switch rod.
353.06	Loose, worn, or missing switch rod bolts.
353.07	Worn or missing cotter pins.
353.08	Loose or missing rigid rail braces.
353.09	Loose or missing adjustable rail braces.
353.10	Missing switch, frog, or guard rail plates.
353.11	Loose or missing switch point stops.
353.12	Loose, worn, or missing frog bolts.
353.13	Loose, worn, or missing guard rail bolts.
353.14	Loose, worn or missing guard rail clamps, wedge, separator block, or end block.
353.15	Obstruction between switch point and stock rail.
353.16	Obstruction in flangeway of frog.
353.17	Obstruction in flangeway of guard rail.
353.18	Insufficient anchorage to restrain rail movement.
353.19	Flangeway less than 1-1/2 inches wide.
353.20	Stock rail not securely seated in switch plates.
353.21	Stock rail canted by overtightening rail braces.
353.22	Improper fit between switch point and stock rail.
353.23	Outer edge of wheel contacting gage side of stock rail.
353.24	Excessive lateral or vertical movement of switch point.
353.25	Heel of switch insecure.
353.26	Insecure switch stand or switch machine.
353.27	Insecure connecting rod.
353.28	Throw lever operable with switch lock or keeper in place.
353.29	Switch position indicator not clearly visible.
353.30	Unusually chipped or worn switch point.
353.32	Insufficient flangeway depth.
353.33	Frog point chipped, broken, or worn in excess of allowable.
353.34	Tread portion of frog worn in excess of allowable.
353.99	Severe frog condition not otherwise provided
353.35	Outer edge of wheel contacting side of spring wing rail.
353.36	Toe of wing rail not fully bolted and tight.
353.37	Ties under or wing rail not solidly tamped.
353.38	Bolt hole defect in frog.
353.39	Head and web separation in frog.
353.40	Insufficient tension in spring to hold wing rail against point rail.
353.41	Excessive clearance between hold-down housing and horn.

353.42	Turnout or crossover not being maintained in accordance with Guidebook.
353.43	Lift rail assembly or other transition device on moveable bridge not being maintained in accordance with Guidebook.
353.99	Severe frog condition not otherwise provided.

§213.355 Frog guard rails and guard faces; gage

The guard check and guard face gages in frogs shall be within the limits prescribed in the following table --

Class of track	Guard check gage The distance between the gage line of a frog to the guard line[1] of its guard rail or guarding face, measured across the track at right angles to the gage line[2], may not be less than	Guard face gage The distance between guard lines[1], measured across the track at right angles to the gage line[2], may not be more than
Class 6 track	4' 6-1/2"	4' 5"
Class 7 track	4' 6-1/2"	4' 5"
Class 8 track	4' 6-1/2"	4' 5"
Class 9 track	4' 6-1/2"	4' 5"

[1] *A line along that side of the flangeway which is nearer to the center of the track and at the same elevation as the gage line.*
[2] *A line 5/8 inch below the top of the center line of the head of the running rail, or corresponding location of the tread portion of the track structure.*

Application

In some high speed turnout designs, guard rails are not installed.

A guard rail is laid parallel to the running rail opposite a frog to form a flangeway with the rail and thereby to hold wheels of equipment to the proper alignment when passing through the frog.

A guard rail must be maintained in the proper relative position to the frog in order to accomplish its important intended safety function. Inspectors should examine guard rails carefully to see that they are adequately fastened, and when measuring guard rail gage, fully consider any movement of guard rail or frog under traffic conditions.

Section 213.355 clearly specifies allowable tolerances for guard check and guard face gage for Classes 6 through 9 track.

Defect Codes	
355.01	Guard check gage less than allowable.
355.02	Guard face gage exceeds allowable.
355.03	Cracked or broken guard rail.

§213.357 Derails

(a) Each track, other than a main track, which connects with a Class 7, 8 or 9 main track shall be equipped with a functioning derail of the correct size and type, unless railroad equipment on the track, because of grade characteristics cannot move to foul the main track.

(b) For the purposes of this section, a derail is a device which will physically stop or divert movement of railroad rolling stock or other railroad on-track equipment past the location of the device.

(c) Each derail shall be clearly visible. When in a locked position, a derail shall be free of any lost motion which would prevent it from performing its intended function.

(d) Each derail shall be maintained to function as intended.

(e) Each derail shall be properly installed for the rail to which it is applied.

(f) If a track protected by a derail is occupied by standing railroad rolling stock, the derail shall be in derailing position.

(g) Each derail on a track which is connected to a Class 7, 8 or 9 main track shall be interconnected with the signal system.

Application

Each track, other than a main track, which connects with a Class 7 and above main track must be equipped with a functioning derail of the correct size and type. For purposes of this section, main track is a track, other than an auxiliary track, extending through yards and between stations, upon which trains are operated by timetable or train orders, or both, or the use of which is governed by block signals. Thus, a controlled siding is considered a main track.

For purposes of §213.357, a derail is a device which will physically stop or divert movement of railroad rolling stock or other railroad on-track equipment past the location of the device.

Inspectors must use judgment in evaluating whether or not a particular situation should constitute an exception to the requirement for derails. If there is any doubt that the railroad equipment, "because of grade characteristics, cannot move to foul the main track," the Inspector should promptly contact the Regional Track Specialist for guidance. The Inspector should note that §213.361 requires the railroad to submit a "right-of-way plan" for FRA approval. This plan must contain provisions for the intrusion of vehicles from adjacent tracks. Inspectors must be constantly vigilant to identify circumstance where intrusion protection is needed.

Derails are of various designs and may be of the following types: switch point, spring switch point, sliding, hinged, and portable.

Derails can be operated by various means: electrical, hand throw, lever, and mechanical rod from a point other than at the derail. They must be installed to derail rolling stock in a direction away from the track or facility to be protected.

If track protected by a derail is occupied by standing railroad rolling stock, the derail must be in derailing position. Of course, the derail would have to be placed in a non-derailing position to prepare for an intentional train movement.

It is absolutely critical that derails on track connected to Class 7 and above main track shall be interconnected with a signal system. Inspectors shall periodically make joint inspection with Signal and Train Control Inspectors to determine compliance with this requirement.

Defect Codes	
357.01	Derail not clearly visible.
357.02	Derail operable when locked.
357.04	Improper size derail.
357.05	Improperly installed derail.
357.06	Loose, worn, or defective parts of derail.
357.07	Derail not present when required.
357.08	Derailing device not of proper design physically stop or divert movement
357.09	Derail not interconnected to the signal system when required.

§213.359 Track stiffness

(a) Track shall have a sufficient vertical strength to withstand the maximum vehicle loads generated at maximum permissible train speeds, cant deficiencies and surface defects. For purposes of this section, vertical track strength is defined as the track capacity to constrain vertical deformations so that the track shall return following maximum load to a configuration in compliance with the vehicle/track interaction safety limits and geometry requirements of this subpart.

(b) Track shall have sufficient lateral strength to withstand the maximum thermal and vehicle loads generated at maximum permissible train speeds, cant deficiencies and lateral alinement defects. For purposes of this section lateral track strength is defined as the track capacity to constrain lateral deformations so that track shall return following maximum load to a configuration in compliance with the vehicle/track interaction safety limits and geometry requirements of this subpart.

Application

Compliance with this section is demonstrated by compliance with track geometry, vehicle/track interaction and CWR requirements in this subpart. Since direct measurements of vertical and lateral track strength are currently difficult to obtain, Inspectors must monitor track strength using the tools contained in the track geometry, automated inspection and CWR sections.

Track must have sufficient vertical strength and lateral strength to withstand the maximum loads generated at maximum permissible train speeds, cant deficiency and lateral or vertical defects so that the track will return to a configuration in compliance with the track performance and geometry requirements of this subpart.

It is imperative that the track structure is structurally qualified to accept the loads without unacceptable deformation. The limit of 0.5 for the Net Axle L/V Ratio in the table of vehicle/track interaction safety limits in §213.333 is based on an extrapolation of the Prud'homme limit and experimental data.

Lateral loads generated by vehicles operating under maximum speed, cant deficiency, thermal loads, and initial line defect conditions should not cause the exception of an allowable deflection limit. Key influencing parameters are the track lateral resistance characteristics, tie/ballast friction coefficients, vehicle vertical axle loads, track curvature, thermal loads, and constant versus variable lateral axle loads.

§213.361 Right-of-Way

The track owner in Class 8 and 9 shall submit a barrier plan, termed a “right-of-way plan,” to the Federal Railroad Administration for approval. At a minimum, the plan will contain provisions in areas of demonstrated need for the prevention of --

(a) Vandalism;

(b) Launching of objects from overhead bridges or structures into the path of trains; and

(c) Intrusion of vehicles from adjacent rights-of-way.

Application

The railroad is required to submit a barrier plan to the FRA Associate Administrator for Safety for approval. The plan shall address vandalism, launching of objects from overhead bridges or structures, and intrusion.

Inspectors must obtain a copy of the railroad’s “right-of-way” plan either from the railroad or the Regional Track Specialist. Inspectors will be asked to evaluate the railroad’s right-of-way plan for comprehensiveness and may be directed to prepare a memorandum of recommendations concerning the plan. After the plan becomes effective, Inspectors must monitor the safety of the high speed railroad and advise the Regional Track Specialist of any concerns.

Defect Codes	
361.01	Failure to provide “Right-of-way” plan.
361.02	Failure of “Right-of-way” plan to contain required information.

§213.365 Visual inspections

(a) All track shall be visually inspected in accordance with the schedule prescribed in paragraph (c) of this section by a person designated under §213.305.

(b) Each inspection shall be made on foot or by riding over the track in a vehicle at a speed that allows the person making the inspection to visually inspect the track structure for compliance with this part. However, mechanical, electrical, and other track inspection devices may be used to supplement visual inspection. If a vehicle is used for visual inspection, the speed of the vehicle may not be more than 5 m.p.h. when passing over track crossings and turnouts, otherwise, the inspection vehicle speed shall be at the sole discretion of the Inspector, based on track conditions and inspection requirements. When riding over the track in a vehicle, the inspection will be subject to the following conditions --

(1) One Inspector in a vehicle may inspect up to two tracks at one time provided that the Inspector's visibility remains unobstructed by any cause and that the second track is not centered more than 30 feet from the track upon which the Inspector is riding;

(2) Two Inspectors in one vehicle may inspect up to four tracks at a time provided that the Inspector's visibility remains unobstructed by any cause and that each track being inspected is centered within 39 feet from the track upon which the Inspectors are riding;

(3) Each main track is actually traversed by the vehicle or inspected on foot at least once every two weeks, and each siding is actually traversed by the vehicle or inspected on foot at least once every month. On high density commuter railroad lines where track time does not permit an on track vehicle inspection, and where track centers are 15-foot or less, the requirements of this paragraph (b)(3) will not apply; and

(4) Track inspection records shall indicate which track(s) are traversed by the vehicle or inspected on foot as outlined in paragraph (b)(3) of this section.

(c) Each track inspection shall be made in accordance with the following schedule --

Class of track	Required frequency
6, 7, & 8	**Twice weekly** with at least 2 calendar-day's interval between inspections.
9	**Three times per week**.

(d) If the person making the inspection finds a deviation from the requirements of this part, the person shall immediately initiate remedial action.

(e) Each switch, turnout, crossover, and lift rail assemblies on moveable bridges shall be inspected on foot at least weekly. The inspection shall be accomplished in accordance with the Guidebook required under § 213.353.

(f) In track Classes 8 and 9, if no train traffic operates for a period of eight hours, a train shall be operated at a speed not to exceed 100 m.p.h. over the track before the resumption of operations at the maximum authorized speed.

Application

The success of the track safety program depends on the adequacy of the railroad's inspection and compliance program.

To assure that railroads are providing proper inspection coverage, Federal and State Inspectors must periodically examine the railroad's inspection records.

As specified in this section of the TSS, the owner must see that all track is inspected in accordance with the prescribed schedule. Failure of the owner to comply with this schedule may constitute a violation.

If an owner's designated inspector or supervisor finds a deviation from the TSS, failure to initiate remedial action immediately may constitute a violation.

The FRA or State Inspector will not make the owner's prescribed inspections, but will monitor them for adherence to the TSS.

For purposes of this section, "main track" is defined as a track, other than an auxiliary track, extending through yards and between stations.

Paragraph (b) does not require five m.p.h. over highway crossings. However, this section still requires an operator to perform an adequate inspection regardless of the need to permit safe operation of inspection vehicles through highway crossings.

Paragraph (b) contains language specifying the number of additional tracks that can be inspected, depending on whether one or two qualified individuals are in the vehicle, and depending on the distance between adjacent tracks measured between track center lines. Inspectors may inspect multiple tracks from hi-rail vehicles only if their view of the tracks inspected is unobstructed by tunnels, differences in ground level, or any other circumstance that would prevent an unobstructed inspection of all the tracks they are inspecting.

This section also requires railroad to traverse each main track bi-weekly and each siding monthly, and to so note on the appropriate track inspection records.

It is recognized that many high speed turnouts (and lift assemblies on moveable bridges) and those which will probably be designed in the future may have unique properties. The railroad must thoroughly understand the nature of these

turnouts and establish maintenance and inspection procedures which shall be monitored by FRA and State Inspectors. Each turnout, crossover, and lift rail assembly on moveable bridges shall be inspected at least weekly and accomplished in accordance with the Guidebook required under §213.353. Federal and State Inspectors must be familiar with the Guidebook and conduct inspections to monitor the railroad's compliance with the safety limits and procedures established in the Guidebook. The Guidebook must also include provisions for the inspection and maintenance of traditional turnouts. The high speed railroad must inspect the condition of frogs, stock rails, switch points, etc. as the railroad would do in the lower track classes. (See the discussion in §213.353.)

In track Classes 8 and 9, if traffic is not operated for a period of eight hours, the railroad is required to operate a train not to exceed 100 m.p.h. before the resumption of operations at the maximum authorized speed. This provision addresses the possibility of objects or debris being placed on the track. It also mitigates the potential occurrences of vandalism.

This section requires that each inspection performed in accordance with the schedule must be made on foot or by riding over the track in a vehicle at a speed that allows the person making the inspections to visually inspect the track structure for compliance. Therefore, an inspection made from a vehicle driven alongside the track does not constitute an inspection performed at the required frequency. The railroad may make additional inspections using other inspection methods provided that these inspections are Reserved to comply with frequency requirements.

Inspecting after dark is in compliance with the requirements of this Subpart, as long as the railroad inspector is capable of detecting defects. As an example, inspections are routinely made in tunnels or subways with limited or no lighting, and maintenance requirements may require inspections after daylight hours. Appropriate artificial lighting often can be substituted.

When FRA and State Inspectors are conducting inspections on a hi-rail vehicle, only the track occupied will be inspected and recorded on the F 6180.96 form. When conducting a walking inspection, multiple tracks may be inspected and counted as units on the F 6180.96 form. It is recognized that walking inspections reveal more defective conditions than hi-rail inspections. Therefore FRA and State Inspectors may include multiple tracks while conducting walking inspections. Inspectors will use good judgment in ensuring a high quality inspection while conducting walking inspections. In order to insure that FRA inspections are high quality, when making hi-rail inspections, FRA Inspectors will only inspect the track they occupy.

Defect Codes	
365.01	Track inspected by other than qualified designated individual.
365.02	Track being inspected at excessive speed.
365.03	Failure to inspect at required frequency.
365.04	Failure to initiate remedial action for deviations found.
365.05	One Inspector inspecting more than two tracks.
365.06	Two Inspectors inspecting more than four tracks.
365.07	Inspection performed on track outside of maximum allowable track center distances.
365.08	Main track not traversed within the required frequency.
365.09	Siding track not traversed within the required frequency.
365.10	Failure to inspect turnouts at required frequency.
365.11	Failure to inspect track crossings at required frequency.
365.12	Failure to inspect lift rail assemblies or other transition devices on moveable bridges at required frequency
365.13	Failure to operate a train at 100 m.p.h. or less after an eight hour period with no train operation

§213.367 Special inspections

In the event of fire, flood, severe storm, temperature extremes or other occurrence which might have damaged track structure, a special inspection shall be made of the track involved as soon as possible after the occurrence and, if possible, before the operation of any train over that track.

Application

This section is necessarily general in nature because it is not practical to specify all the conditions that could trigger a special inspection, nor the manner and timing which any particular special inspection should be conducted. This section is not meant to imply that train operations must necessarily stop until the special inspection is made. However, all special inspections should be conducted for the primary purpose of determining whether the track structure is safe for the continued operation of trains. Inspectors are directed to review the significant impacts to railroad operations in regard to storms as discussed in any applicable safety advisory.

Because a number of train derailments have been caused by unexpected track damage from moving water in the past, the FRA deemed it appropriate to issue a safety advisory recommending procedures that reflect best industry practice for special track inspections. The procedures consist of: (1) prompt notification of dispatchers of expected bad weather; (2) limits on train speed on all track subject to flood damage, following the issuance of a flash flood warning, until special inspection can be performed; (3) identification of bridges carrying Class

4 or higher track which are vulnerable to flooding and over which passenger trains operate; (4) availability of information about each bridge, such as identifying marks, for those who may be called to perform a special inspection; (5) training programs and refresher training for those who perform special inspections; and (6) availability of a bridge maintenance or engineering employee to assist the track Inspectors in interpreting the Inspectors' findings.

Although the advisory contains a sample list of surprise events that routinely occur in nature, this provision is not limited to only the occurrences listed or to only natural disasters. Section 213.367 addresses the need to inspect after "other occurrences" which include such natural phenomena as temperature extremes, as well as unexpected events that are human-made, e.g., a vehicle that falls on the tracks from an overhead bridge, a water main-break that floods a track roadbed, or terrorist activity that damages track. This interpretation is not new; FRA has always viewed this section to encompass sudden "surprise" events of all kinds that affect the safety and integrity of track.

Inspectors should determine the procedures that have been established by the railroad to comply with §213.367, mindful that advisory procedures are not mandatory. Procedures should include the method employed by the railroad to receive information on severe weather, i.e., who receives the information and what is done with that information. When the railroad is notified of a track-damaging occurrence, a special inspection must be made. A track owner may designate any official to be responsible to make a determination on whether a special inspection, under §213.367, is required. The designation is not limited to any certain craft, but the official must be trained and qualified to assure a proper inspection is conducted.

Defect Codes	
367.01	Failure to conduct special inspections when required.

§213.369 Inspection records

(a) Each owner of track to which this part applies shall keep a record of each inspection required to be performed on that track under this subpart.

(b) Except as provided in paragraph (e) of this section, each record of an inspection under §213.365 shall be prepared on the day the inspection is made and signed by the person making the inspection. Records shall specify the track inspected, date of inspection, location and nature of any deviation from the requirements of this part, and the remedial action taken by the person making the inspection. The owner shall designate the location(s) where each original record shall be maintained for at least one year after the inspection covered by the record. The owner shall also designate one location, within 100 miles of each state in which they conduct operations, where copies of record which apply to those operations are either maintained or can be viewed following 10 days notice by the Federal Railroad Administration.

(c) Rail inspection records shall specify the date of inspection, the location and nature of any internal defects found, the remedial action taken and the date thereof, and the location of any intervals of track not tested per § 213.339(d). The owner shall retain a rail inspection record for at least two years after the inspection and for one year after remedial action is taken.

(d) Each owner required to keep inspection records under this section shall make those records available for inspection and copying by the Federal Railroad Administrator.

(e) For purposes of compliance with the requirements of this section, an owner of track may maintain and transfer records through electronic transmission, storage, and retrieval provided that --

(1) The electronic system be designed such that the integrity of each record maintained through appropriate levels of security such as recognition of an electronic signature, or other means, which uniquely identify the initiating person as the author of that record. No two persons shall have the same electronic identity;

(2) The electronic storage of each record shall be initiated by the person making the inspection within 24 hours following the completion of that inspection;

(3) The electronic system shall ensure that each record cannot be modified in any way, or replaced, once the record is transmitted and stored;

(4) Any amendment to a record shall be electronically stored apart from the record which it amends. Each amendment to a record shall be uniquely identified as to the person making the amendment;

(5) The electronic system shall provide for the maintenance of inspection records as originally submitted without corruption or loss of data; and

(6) Paper copies of electronic records and amendments to those records, that may be necessary to document compliance with this part, shall be made available for inspection and copying by the FRA and track Inspectors responsible under §213.305. Such paper copies shall be

made available to the track Inspectors and at the locations specified in paragraph (b) of this section.

(7) Track inspection records shall be kept available to persons who performed the inspection and to persons performing subsequent inspections.

(f) Each vehicle/track interaction safety record required under §213.333 (g), and (m) shall be made available for inspection and copying by the FRA at the locations specified in paragraph (b) of this section.

Application

Track owners are required to keep a record of each inspection according to the requirements of this subpart, prepared on the day of inspection and signed by the person making the inspection.

The regulation allows railroads to designate a location within 100 miles of each state (designated locations) where records can be viewed by Inspectors. Inspectors are required to give 10 days advance notice before conducting the record keeping inspection of designated locations. The regulation does not require the railroads to maintain the records at these designated locations, only to be able to provide viewing of them at the locations within 10 days after notification. The TSS stipulates locations within 100 miles of each state, rather than locations in each state, to accommodate those railroads whose operations may cross a state's line by only a few miles. In those cases, the railroad could designate a location in a neighboring state, provided the location is within 100 miles of that state's border. Records must be kept for at least one year after the inspection covered by the report. It is appropriate for the Inspector to expect all records will be available for inspection up to the date of notification

Paragraph (c) requires a track owner to record any locations where a proper rail inspection cannot be performed because of rail surface conditions. Section §213.339(d), specifies that if rail surface conditions prohibit the railroad from conducting a proper search for rail defects, a test of that rail does not fulfill the requirements of §213.339(a) which requires a search for internal defects at specific intervals. Subsection (c) requires a record keeping of those instances.

Section 213.369(e) contains requirements for maintaining and retrieving electronic records of track inspections. This allows each railroad to design its own electronic system as long as the system meets the specified criteria to safeguard the integrity and authenticity of each record. The provision also requires that railroads make available paper copies of electronic records, when needed, by the FRA or by railroad track Inspectors.

The track owner has the liberty to devise any form deemed sufficient to meet the required standards. If the owner requires inspections at more frequent intervals than specified by §213.365(c), then the only requirement is to prepare and maintain an inspection record to conform with the <u>minimum</u> inspection frequency. This section is explicit concerning the required information contained in the inspection records. They must specify the track inspected [including the provisions under §213.365(b)(3)], date of inspection, location and nature of any defect, and the remedial action taken by the person making the inspection. If train operations were conducted over the defect, the <u>nature</u> of the defect would require a measurement to include the specific parameters or limits. When defects are discovered, the track owner's inspectors must determine the risk imposed and immediately initiate remedial action, in accordance with §213.303. If a speed restriction is used as remedial action, the reduced speed should be shown in the inspection records.

Railroad track inspectors are required to list all deviations from the TSS on their inspection record. FRA and State Inspectors should review a railroad inspection record to determine if the reported data accurately indicates the track conditions as they exist in the field. Railroad inspectors are not limited to recording deviations from the TSS (e.g., railroad maintenance items). Inspectors should compare the defects they find with the railroad inspectors reports to determine the level of compliance with the railroad's inspection program. If multiple tracks are being inspected, the records must designate the track traversed, and any tracks not inspected due to visibility obstruction or excessive distance as required under §213.365.

When two qualified persons inspect multiple tracks in accordance with §213.365(b), one report or two reports may be optionally prepared. If one report is used, the report must include a notation such as signature, initials or printed name of the second inspector.

Rail inspection records must be maintained by the track owner for at least two years after the inspection and for one year after remedial action is taken. The record must specify the location and nature of any rail defects found through internal inspection and the remedial action taken and the date thereof. This record may consist of log sheets combined with a standard rail defect and change-out report, computer records, or other data kept by the track owner and containing all the required information.

The rail inspection records must specify the locations of any rail that, due to rail surface conditions, prohibit the railroad from conducting a valid search for internal defects at the required frequency. If a valid search cannot be conducted

before the time or tonnage frequency expires, the remedial action and date of remedial action must be recorded on the inspection records.

Inspection records must be made available to the FRA or State Inspector for inspection and copying. A track owner may elect to maintain and transfer records through electronic transmission, storage, and retrieval procedures. Each record must have sufficient security to maintain the integrity of the record. Levels of security must identify the person making the inspection as the author of the record. No two individuals will have or share the same electronic signature or identity. If individuals use an electronic signature or identity other than their own, violations or personal liability action should be considered for all parties involved. The integrity of electronic inspection record systems is an extremely sensitive issue. Should the system integrity be compromised, an Inspector will contact the appropriate Track Specialist immediately. Should the Track Specialist be unavailable the Inspector will notify the appropriate Regional Administrator. Headquarters Track Division will also be notified.

The system must assure that no record can be replaced, deleted, or modified in any way, once the record has been transmitted and stored. Each amendment to a record shall be stored separately from the record it amends. Each amendment must identify the person making the amendment and have sufficient security to maintain the integrity of the amendment.

For electronic records, inspection records must be completed the day of the inspection either on computer or temporarily on paper. The electronic record must then be uploaded to the permanent electronic storage system where the record will be maintained for one year. The uploading of each inspection record must be completed within 24 hours following the completion of the inspection.

An advantage of an electronic system is the associated reduction in paperwork. Inspectors, therefore, must rely on viewing the record on the terminal or monitor screen whenever it is made available for viewing by the railroad. Although printouts of records must be made available to Federal and State Inspectors, Inspectors are discouraged from requesting paper copies of electronic records unless necessary to document non-compliance. A paper copy of an electronic record may be marked “original” and included in the documentation necessary for a violation report when recommending civil penalties.

Paper copies of electronic records and amendments will be made available for inspection and copying to the FRA or State Inspector. These records will be furnished upon request at the location specified by the railroad as required in paragraph (b) of this section. A paper copy of any electronic inspection record or amendment will be made available to the railroad inspector or any subsequent railroad inspectors performing inspections of the same territory upon request.

Defect Codes	
369.01	Failure to keep records as required.
369.02	Failure of Inspector to complete report at time of inspection.
369.03	Failure of Inspector to sign report.
369.04	Failure of Inspector to provide required information.
369.05	Failure of rail inspection record to provide required information.
369.06	Failure to make records available for copying and inspection.
369.07	Electronic system does not maintain the integrity of each record.
369.08	Electronic system allows record or amendments to be modified.
369.09	Electronic amendments not stored separately from record.
369.10	Person making electronic amendment not identified.
369.11	Electronic system corrupts or losses data.
369.12	Paper copies of records not made available for inspection and copying.
369.13	Inspection reports not available to Inspector or subsequent Inspectors.
369.14	Electronic storage not initiated within 24 hours.

End of Chapter Six

CHAPTER 7

Railroad Bridge Safety Assurance

Introduction The integrity of railroad track and its supporting structures is vital to the safety of our Nation's railroads. Their tracks are carried by more than 100,000 bridges, with an average of one bridge in every 1.4 miles of track. Those bridges must be capable of supporting themselves and the trains that move over them without risking the lives of people on the trains or nearby.

The safety of railroad bridges is addressed, not by a regulation, but by a Statement of Agency Policy published as Appendix C of the Track Safety Standards. This FRA Bridge Safety Assurance Program implements that policy in fulfillment of FRA's obligation to protect the public from unnecessary risk that could arise from deficiencies in railroad bridges.

Objective The objective of the Program is to assure that railroad bridges retain their structural integrity, and do not suffer catastrophic failures - that is, fail so as to cause human casualties, train accidents or environmental damage.

Methods FRA addresses railroad bridge issues at several levels. First, FRA maintains current information on the bridge management practices of the Nation's railroads. Most of this information is obtained by FRA field personnel through regular contacts with the railroad personnel who manage, inspect, and maintain the bridges.

Secondly, FRA Track Inspectors have regular opportunities to observe railroad bridges during the course of their regular track inspections. A track irregularity on a bridge often indicates a developing structural problem with the bridge that should be addressed by the bridge owner. Other bridge conditions might be found that call for corrective action.

Thirdly, FRA Track Inspectors encounter bridges in the course of investigation of complaints and accidents. In these cases, inspectors are sometimes required to make a quick assessment of the seriousness of the conditions alleged in a complaint, or the possible involvement of a bridge condition in an accident cause.

These three topics are addressed in further detail in these instructions.

<u>Responsibilities</u> The primary responsibility for the FRA Bridge Safety Assurance Program rests with the Bridge Engineer in the Office of Safety Assurance and Compliance. The Track Specialist in each region will administer the program in that region. Field work will be conducted primarily by the Federal and State Track Safety Inspectors in each region who have received training in the fundamentals of railroad bridge inspection. Signal and Train Control personnel will assist with signal issues related to moveable bridges.

See "<u>Procedures for Class I railroads and major regional and passenger railroads</u>" for FRA regional responsibilities and assignments in regard to these railroads. Smaller railroads will be evaluated by the regions in which their assigned principal regional inspectors are located. Each regional track specialist should request the principal regional inspectors to nominate small railroads for bridge evaluations each year, and advise the Office of Safety Assurance and Compliance through the Regional Administrator of the nominees. Each region should nominate at least four small railroads each year for evaluation.

Factors in nominations should include any particular concern that has developed around a railroad's bridge management practices. The nominees should otherwise represent a cross-section of the small railroad population in the region, and should be commensurate with the anticipated workload of the principal regional inspectors and the track inspectors who will be conducting the bridge observations.

<u>Essential Elements of Information</u> The public, as employees, customers, passengers and neighbors of railroads, have a legitimate interest in the safety of railroad bridges. FRA represents that public interest, and has the duty to see that the railroad industry fulfills its safety obligations while at the same time assuring that public perceptions do not cause impractical or unwise policy or actions related to railroad bridges. By maintaining a public record of the manner in which railroad bridges are managed and maintained, FRA can serve both the public and the railroad industry in promoting effective, sensible bridge management practices.

The particular elements of information to be obtained and kept current for each railroad's bridge management program are:

Description of the railroad's structural inspection policy, including:
  - The prescribed frequency of inspection of various classes of structures.
  - The assignment and qualification of inspectors.
  - The manner in which an inventory of structures (bridge list) is compiled, with level of detail and policy on updates.
  - The types of reports prepared for various levels of inspection.
  - The utilization of Automatic Data Processing for inspection and inventory information.
  - The process of distribution, review and evaluation of inspection reports.

- The manner in which responsibility is assigned for decisions affecting the integrity of structures: inspection, evaluation, rating, repairs and modifications.

In most instances, that policy will be in writing, and the railroad will be able to furnish a copy. If not, it should be described in the inspector's own words.

The implementation of the policy, to address at least the following critical elements of information:
- The timeliness of inspections and reporting:
  > Are inspections made and reported at the prescribed frequency?
  > Does a system exist to assure that all bridges on the inventory are inspected?
  > Are reports available at the prescribed level of review within a reasonable time after the inspection?
- The content of the inspection reports:
  > Are the reports comprehensible?
  > Is sufficient detail included to support adequate review and evaluation at higher levels?
  > Are reporting procedures consistent over the entire railroad?
  > Are reports from preceding years maintained, and do successive reports show normal progression of conditions?
- The process of evaluation of inspection reports:
  > Are exceptions that are noted given the priority and attention merited by their description?
  > Is a record maintained of the disposition or follow-up of exceptions?
- The procedures by which bridges are protected from overstress:
  > The criteria and procedures by which bridges are selected for re-rating.
  > The rating procedures and criteria: AREMA recommended practice or an alternate?
  > Is rating conducted by staff engineers or consultants?
  > How many bridges have been rerated recently (five years more or less)?
  > How are load and operating restrictions placed?

<u>Evaluation Procedures - General</u> The procedures for bridge evaluation will vary according to the size of a railroad. Work on a class I railroad or major passenger carrier will be performed on a generally continuing basis, with activities conducted at times and locations as appropriate. FRA should maintain current information on the bridge management practices of each large railroad. Track specialists and inspectors should be familiar with the practices of each large railroad in their territories to permit efficient and prompt resolution of any questions or problems that might arise. This information should be updated when changes occur, or at least annually.

Bridge management evaluations on smaller railroads will be conducted on a periodic basis, consistent with availability of FRA resources, indications of possible problems, or opportunities to assist a railroad with bridge-related safety issues. Evaluation activity on a regional railroad should be consistent with the relative size of the railroad, ranging between the level of activity on a Class I and a larger short line.

Because this program is essentially continuous, exit interviews with the railroad and final reports of investigations will not be required. However, after an office evaluation, a memo report should be submitted through channels to the Track Division showing the findings, particularly to the issues listed above. The memo should be offered to the railroad for review before it is sent forward. If the inspector finds extraordinary conditions that would not be appropriately shared with the railroad officials at that time, they should be immediately reported in a separate document through the Regional Administrator to the Track Division.

Inspectors working on subsequent field investigations should also have copies of the current system report for that railroad, so they can evaluate the level to which the railroad's program is implemented in the field.

It is extremely important that any questionable aspects of a railroad's bridge program, or any structural deficiencies, be reported to the railroad immediately. FRA should not retain information about a questionable condition of which the railroad is unaware. Because this is not an enforcement program, FRA may share all information about a railroad's bridges and bridge program with the railroad, even to providing draft copies of memo reports to the railroad for review before submission. If there appear any potential problems that might not be resolved with cooperative efforts, the specialist should notify the Bridge Engineer immediately so that any information that might be necessary for legal action can be obtained and safeguarded.

<u>Planning and Preparation for Program Evaluations</u> Preparations for field investigations should be made during the headquarters work. Depending upon the size of the railroad and the location of the final repository of most inspection records, it might be necessary to visit several division headquarters to review the detailed records kept there, if they are not all forwarded to the system headquarters. This should be determined early in the investigation.

On railroads on which much field work will be conducted by other inspectors, a good informal periodic report will be necessary in order to pass guidance to the others. During the headquarters phase, the inspector will prepare a recommendation of the divisions that should be visited by himself and the other inspectors involved in the investigation. The railroad headquarters personnel should be asked for the contact people on each division.

While working at the system and division headquarters, all inspectors should be looking for bridges that should be selected as objects for the field portion of the investigation. This information can be obtained from the inspection reports, and by asking the railroad officials.

In requesting this information, the inspector should explain that the purpose of the investigation is not to determine if problem bridges exist; there is no question that they do, but they are not inherently unsafe. The purpose is to document just how the railroad handles the problem bridges to ensure safety, such as through increased inspections, derating, or temporary reinforcement.

<u>Observation of Bridges</u> The term “observation” is used here instead of "inspection" because FRA is not planning to actually inspect bridges during this investigation. Any bridge inspection carries with it an implied responsibility for the accuracy and adequacy of the findings of the inspection. That responsibility remains with the bridge owner, and the level of detail required to fulfill that responsibility is beyond the scope of this investigation. The FRA inspectors will observe the railroad inspectors and engineers while they perform full or partial inspections according to the requirements of the railroad.

In conducting bridge observations, the inspector must always keep in mind the difference between potential hazards and conditions that are merely cosmetic or indicate a need for maintenance. As far as an individual bridge is concerned, FRA is primarily concerned with the ability of today’s bridge to carry today’s loads without risk. A lack of paint, for instance, is not serious to FRA, even if it might lead to loss of section of critical members a few years hence. Whether the railroad chooses to deal with the problem now with paint or later with more costly repairs is an economic issue and not a safety problem. On a program level, however, Inspectors should report evidence that a railroad is permitting overall deterioration of its bridges to the point that critical conditions could shortly overwhelm its ability to inspect, protect and correct them.

<u>Levels of Observation</u> Bridge observation will be conducted at essentially three levels: routine, special, and incidental. Routine observation will consist of accompanying a railroad bridge inspector or supervisor during routine, scheduled inspections over the railroad. Special observations will include observation of structures selected by the FRA inspector or the observation of special inspections conducted by the railroad, such as steel rating or damage assessments. Incidental observations will occur during the normal course of a track inspector's regular work, including track inspections and complaint and accident investigations.

Routine Bridge Observations On most railroads, bridges are inspected at regular intervals by either designated inspectors or by local supervisors of bridges or structures. The FRA Inspector should take opportunities to accompany those inspectors on occasional routine inspections to determine the types of information obtained by the railroad from the inspection, whether or not the inspections are being performed in accordance with the railroad's stated policy, and whether or not the inspections reflect the true condition of the structures.

The local inspectors typically cover the smaller bridges on a fairly long line of railroad in one day. They might return to spend more time, possibly with some assistance, on the larger or more demanding structures. Therefore, the number of bridges covered in one day is an indication of neither quality nor quantity of work accomplished, either for the railroad personnel or for the FRA Inspector. This fact should be considered by all concerned during the course of this investigation.

Special Bridge Observations Special inspections are typically made by railroads as required by circumstances.

- When a bridge is damaged.
- When the routine inspection reveals a potential critical exception or a requirement for rerating.
- When a bridge is programmed for major repairs.

The FRA inspector should arrange with the railroad officials to observe special inspections if the opportunity exists. Of particular interest will be rating or steel inspections, which are typically performed by a specialist on the larger railroads, and which often go into great detail. Also of interest will be major bridge repair or upgrading projects, which might afford unusual opportunities to observe structural details that are otherwise obscured. Even painting or redecking will allow observation of bare steel, or top flanges of girders, or stringers that are normally covered by the deck ties.

Incidental Bridge Observations Track Inspectors have many opportunities to observe railroad bridges during the course of their work. During regular track inspections, they normally pass over at least one bridge in one or two miles of track. If the track on or near a bridge shows any indication of a problem, even if within compliance with the Track Safety Standards, it might be an indication of a problem with the bridge or of a problem that could affect the bridge. These issues are addressed in the FRA training course on the Fundamentals of Bridges and are too detailed to be included here.

The inspector should not hesitate to check out tight gage, slewed ties, low approaches, alinement, cross level or profile conditions on a bridge, and to check for bridge conditions that either cause the condition or could be aggravated by it. Several instances have already occurred in which an FRA or State Inspector has prevented a serious bridge problem by first detecting a deviation in the track on a bridge.

Inspectors will occasionally investigate accidents or complaints involving bridges. In these cases, photographs are invaluable, especially if taken immediately following any accident involving a bridge. Whether or not the bridge failed, information concerning the bridge should be provided to the FRA Bridge Engineer and with the accident report. Railroads will generally assist in providing this information, including inspection reports, drawings and descriptions of the bridge.

Procedures for Class I railroads and major regional and passenger railroads The Regional Track Specialist should contact the principal bridge engineer of each major railroad at least once each year and arrange for a review of that railroad's current bridge management policy. The initial contact will usually be at the railroad's operating headquarters, followed by telephone, mail and personal contacts as necessary from year to year. The initial contacts for most large railroads were part of the bridge safety survey of 1992-1993. When a railroad undergoes a significant change in its configuration, as through mergers or a major acquisition, this information should be updated.

The purpose of the contacts with these railroads is to maintain current information as to whether the railroad is following the FRA guidelines for railroad bridge safety, whether the guidelines are adequate and proper to accomplish their objectives, and to assist the railroad with an unbiased outside observation of its bridge management practices. During the course of these contacts, the inspectors and specialists will have opportunities to observe work and inspections on various types of bridges, as well as reviewing documents in many different formats. These experiences will enhance each individual's knowledge of railroad bridge management practices.

Office work - large railroads The objective of the office portion of the investigation is to determine how the railroad assures, through a clear assignment of responsibility to competent persons, that the bridges it owns are safe to carry the loads that are operated over them. Inspectors should evaluate all of their findings in the light of this particular question. This objective is central to the program, and should be explained to the railroad personnel at every opportunity. It places all of the details of the program in the proper context.

Field Investigation - Large Railroads The objective of the field investigation is to support and verify or refute the information gathered in the office investigation. The field investigation should provide examples and physical evidence that the railroad's structure management program either does or does not provide the necessary assurances of safety. Findings of the field investigation should be prepared so as to relate as closely as possible to issues raised or addressed in the interim report of the office investigation.

The field investigation on the large railroads will often involve several inspectors, and on some, several regions. In these cases, a high level of planning and coordination among FRA personnel will be required for effective accomplishment of the work. Significant findings during the field investigation should be reported immediately to the Regional Specialist coordinating activities on that railroad so that they may be relayed to other inspectors on the same railroad, and to the FRA Bridge Engineer.

Conduct of the Investigation - Smaller Railroads The same principles apply to smaller railroads and are outlined above. The level of coordination among Inspectors and different regions will normally be less, according to the relative size of the railroad. The initial contact should normally be made jointly by the Principal Regional Inspector assigned to the railroad and either the Regional Specialist or the assigned Inspector. The instructions applying to larger railroads must be reduced in scale to apply to the smaller railroads.

The primary objectives of the investigation remain to determine whether or not the structural integrity of railroad bridges constitutes a safety problem that should be addressed by FRA, and to determine how the railroad assures, through a clear assignment of responsibility to competent persons, that the bridges it owns are safe to carry the loads that are operated over them, and to verify the policy through field observation.

If a small railroad has a consultant engaged to inspect and rate their bridges, the Inspector must be careful that the railroad incurs no consulting expenses to support FRA's requests for information. It must be recognized that a bridge management program on a smaller railroad could be much less formal than on a larger railroad, but still be effective.

The Inspector should expect that some smaller railroads might have bridge programs that are very rudimentary, if any at all. These situations will require a high degree of judgement by the Inspector in order to set priorities, and provide good advice to those railroads. The nature of the bridges involved and the density and weights of the traffic handled should be considered. The purpose of the FRA program is to prevent human casualties and societal damage due to bridge failures, and that objective should always be considered in dealing with these situations. They should be called to the attention of the Bridge Engineer as soon as possible, so that an appropriate level of evaluation can be performed to substantiate any necessary action by FRA to bring about resolution of these problem areas.

Reporting of Observations Reporting of structures observed must include the information called for on the attached reporting form, as applicable to each structure and type of inspection being performed. Additional remarks and photographs should be added to convey a true picture of the condition of the structure or at least to the extent that it can be determined from the level of observation made. Any concerns of the Inspector over the condition of the structure or any detail should be discussed with the railroad representative. The concern and the response should be recorded with the report for that structure.

A copy of the railroad inspector's report, if furnished, should be attached. A copy should be requested, but is not required.

Photographs Several photographs should be made when a bridge inspection is observed. Particular attention should be paid to captions that indicate the detail shown, its precise location on the structure, and the information that is conveyed in the photograph. Captions of photographs showing the entire structure or large portions should indicate the location of the photographer and the direction in which the camera is pointing.

The camera should be held either level or plumb about the axis of the lens. For photographs taken straight up or down, the top of the camera should be either perpendicular or parallel to the centerline of the structure.

Reporting Format: Bridge observations should be reported on the regular FRA safety inspection form using type code MSB. Each bridge included on that report should have its own line number and brief description. In addition, a standard format has been prepared for reporting bridge-specific information to the Track Division at FRA headquarters. This format is adaptable to several computer applications. A hard copy is attached to these instructions, reflecting its state of development at this time. Changes might be made in the future, so the inspector should look for the latest version to be sent via electronic means.

It is preferred that the format be completed in a computer, and then transmitted electronically to the Bridge Engineer at headquarters.

Potentially Hazardous Bridge Conditions If an FRA inspector detects a potentially hazardous condition on a bridge it is vital that a responsible railroad employee be notified immediately. If the inspector is accompanied by a railroad representative in any capacity, that person should be advised to of the necessity to protect railroad traffic or other affected persons or operations from the consequences of the hazard. If the inspector is unaccompanied, then every attempt should be made to contact the railroad by telephone. If unable to accomplish that notification, then the Inspector should contact the Regional Track Specialist or the Track Division at Headquarters and relay the message. Regardless of the time of day in which a bridge hazard is detected, the Inspector and the Regional Track Specialist should notify the Bridge Engineer or the Bridge Specialist in the Track Division of the circumstances. THE FIRST PRIORITY IS TO NOTIFY THE RAILROAD TO ENABLE THEM TO PROTECT TRAIN OPERATIONS.

Once the initial notifications are completed, the inspector should record the nature of the problem with photographs and a written record of the observations. A digital camera should be used, if available, so the photographs can be transmitted directly to the Track Division and to the railroad as necessary. The Inspector should document the response by the railroad and report to the Track Specialist or the Bridge Engineer as soon as it becomes known.

If the railroad response is inadequate, as determined by the Bridge Engineer or an authorized person in the Track Division, the Federal Railroad Administrator is authorized to issue an emergency order to either remove the bridge from service, or to place appropriate restrictions on train operations. Issuance of an emergency order requires a determination that continued operation presents a real danger to persons, property or the environment. FRA can also enter into a Compliance Agreement with the railroad, which generally carries the terms of an emergency order but stops short of removing a facility from service. A compliance agreement as issued for a bridge condition can be converted into an Emergency Order by FRA unilaterally if the railroad should substantially violate its terms.

In the instances in which FRA has issued emergency orders on bridges, the Bridge Engineer first determined through measurement and calculations that the bridge was in imminent danger of failure under load. The emergency orders were then issued by the Administrator, requiring that trains not operate over the subject bridges until they had been repaired, and then evaluated by a competent engineer and found safe for operation. The orders required the bridge owner to provide the engineer’s calculations to FRA for review before the order was lifted. It was required that engineer be competent in the field of railroad bridge engineering, be appropriately licensed to practice engineering in the subject state, and that the calculations submitted to FRA bear the engineers embossed seal.

Every emergency order situation is different, and it is not possible to issue detailed instructions that will fit every case. Whenever a bridge condition arises, close coordination among regional staff and the FRA bridge personnel in headquarters is essential to bringing about prompt resolution.

The two emergency orders and the one compliance agreement issued by FRA to address bridge safety issues are included as examples. Note that relief was granted to the Oregon Pacific Railroad once the bridge had been repaired, but the Tonawanda Island Railroad never resumed operations.

Examples of Emergency Orders and Compliance Agreements Related to Bridges

[Federal Register: February 16, 1996 (Volume 61, Number 33)]
[Page 6284-6286]

DEPARTMENT OF TRANSPORTATION
Federal Railroad Administration
[FRA Emergency Order No. 19, Notice No. 1]

Tonawanda Island Railroad; Emergency Order To Prevent Operation of Trains on Bridge 7708810

The Federal Railroad Administration (FRA) of the United States Department of Transportation (DOT) has determined that public safety compels issuance of this Emergency Order requiring the Tonawanda Island Railroad (TIRL) of North Tonawanda, New York, to discontinue operation of trains or any railroad on-track equipment on a railroad bridge numbered 7708810 which spans the Little River between North Tonawanda and Tonawanda Island, New York, until necessary repairs have been made to the bridge.

Authority

Authority to enforce Federal railroad safety laws has been delegated by the Secretary of Transportation to the Federal Railroad Administrator. 49 CFR Sec. 1.49. Railroads are subject to FRA's safety jurisdiction under the Federal railroad safety laws, 49 U.S.C. Secs. 20101, 20103. FRA is authorized to issue emergency orders where an unsafe condition or practice ``causes an emergency situation involving a hazard of death or personal injury.'' 49 U.S.C. Sec. 20104. These orders may impose such ``restrictions and prohibitions * * * that may be necessary to abate the situation.'' (Ibid.)

Background

The Tonawanda Island Railroad (TIRL), a common carrier, is a part of the general system of railroads. Its owner is Mr. Corigan Sanoian, P.E., of Niagara Falls, New York.

The TIRL operates over about a 1.5 miles of track, extending from a junction with the Conrail Niagara Branch in North Tonawanda, New York, to Tonawanda Island. The single main track route includes two highway rail grade crossings. One crossing, at River Road in North Tonawanda, is equipped with automated warning devices. The other highway rail grade crossing is located at Main Street in North Tonawanda and is equipped with traffic control signals on each side of the crossing.

In addition to the main track, several auxiliary tracks are in service, both at the junction and on Tonawanda Island. To access Tonawanda Island, the TIRL crosses the Little River via a wood and metal bridge identified by a number affixed to its westernmost bent, 7708810. For the purposes of this Emergency Order, the bridge is hereinafter designated as ``Bridge 7708810.'' The bridge consists of two timber trestle approaches, one on each side of a steel through truss swing span. The swing span has been inoperative for many years.

The Little River is a navigable waterway formed by a channel of the Niagara River, Ellicott Creek and Tonawanda Creek. It flows into the Niagara River approximately 10 miles above Niagara Falls. The Little River is the site of a significant concentration of pleasure boating during the summer. A marina is located adjacent to and downstream from the bridge. A highway bridge is located about 300 feet downstream.

The sole piece of rolling stock regularly used by the TIRL is a 50-ton industrial switcher type locomotive. The railroad's current customer base includes a consignee on Tonawanda Island which receives wood fibre in box cars. There are no consignors. Until approximately one year ago, the TIRL delivered building materials to another consignee on Tonawanda Island. However, that consignee discontinued service from the TIRL after Mr. Sanoian expressed an intent to shut down the railroad. Total traffic for TIRL in 1995 was about 51 cars.

FRA's history of inspecting the TIRL under Mr. Sanoian's ownership dates back to 1990. The following chronology highlights FRA activity with respect to the TIRL:

October 11, 1990: FRA Chief Inspector John Conklin conducted an operating practices inspection and issued inspection report No. 72, informing Mr. Sanoian that the TIRL was not in compliance with 49 CFR Part 225 (Accident/Incident Reporting), as well as 49 CFR Part 228 (Hours of Service Recordkeeping).

December 17, 1990: FRA Railroad Safety Inspector Daniel Feneziani inspected the TIRL locomotive and issued inspection report No. 171, informing Mr. Sanoian of 17 items not in compliance with the Federal railroad safety standards.

February 28, 1991: Chief Inspector Conklin conducted an operating practices inspection and issued inspection report No. 30, informing Mr. Sanoian that the TIRL still was not in compliance with 49 CFR Part 225.

December 10, 1992: Chief Inspector Conklin conducted an inspection of operating practices and issued inspection report No. 50, informing Mr. Sanoian that the TIRL was not in compliance with 49 CFR Parts 225, 228 and 240 (Qualification and Certification of Locomotive Engineers).

October 21, 1993: FRA Chief Inspectors Patrick Sullivan and William Robbins inspected the TIRL locomotive and issued inspection report No. 05, informing Mr. Sanoian of 22 items not in compliance with Federal railroad safety standards.

December 7, 1994: Chief Inspector Sullivan conducted an inspection of operating practices and issued inspection report No. 27, informing Mr. Sanoian that the TIRL was not in compliance with 49 CFR Parts 217 (Railroad Operating Rules), 225, 228, and 240.

August 9, 1995: FRA Principal Railroad Safety Inspector Bernard T. Lutz inspected the TIRL locomotive and issued inspection report No. 67, notifying Mr. Sanoian of 15 items of non-compliance with Federal railroad safety standards.

October 13, 1995: FRA Regional Administrator Mark McKeon mailed Mr. Sanoian a certified letter in which he enumerated the locomotive's conditions of non-compliance with the Federal railroad safety standards. The letter noted that some of the conditions have existed since December 17, 1990. The letter also acknowledged FRA's awareness that the TIRL is a small business with limited resources. Regional Administrator McKeon offered to discuss the defects with Mr. Sanoian in an effort to work with him to bring the railroad into compliance. United States Post Office records indicate that a notice of the certified letter was served on Mr. Sanoian on October 17, October 22, and November 2, before it was returned to the sender as ``unclaimed.''

January 2 and January 4, 1996: FRA Railroad Safety Inspector Ronald Anderson inspected bridge 7708810. His inspection was in response to concerns raised by a New York State Department of Transportation Railroad Safety Inspector. Inspector Anderson concluded that the bridge is unsafe. While inspecting the bridge on January 2, 1996, Inspector Anderson fell through the bridge due to the deteriorated condition of the bridge timbers.

January 12, 1996: Inspector Anderson and New York State Department of Transportation Inspector Keith McClain met with Mr. Sanoian to discuss the condition of the bridge. Mr. Sanoian disagreed with Inspector Anderson's assessment of the bridge and stated his belief that the bridge was safe for a load of 500,000 pounds.

January 15, 1996: Regional Administrator McKeon and Railroad Safety Inspector Michael Ziolkowski met with Mr. Sanoian to discuss both the locomotive and the bridge. Although he did not agree that the bridge was unsafe, Mr. Sanoian stated that he would not operate over it until it had been repaired and had been inspected by an FRA representative. He further stated that the locomotive would not be used until it was repaired.

Regional Administrator McKeon hand-delivered to Mr. Sanoian a copy of the letter of October 13, 1995, which previously had been returned to FRA unclaimed.

January 16, 1996: Regional Administrator McKeon prepared and signed a letter confirming the discussions of January 15. The letter, dated January 16, 1995, stated in part:

The TIRL bridge is unsafe for the movement of trains, locomotives and other rolling stock. The bridge must not be operated over until it is repaired.

The letter noted Mr. Sanoian's verbal assurances that he had obtained the services of a contractor to repair the bridge and that he would provide FRA with an opportunity to inspect the bridge once the repairs were made. He also agreed to repair the locomotive before using it again.

The letter further stated that unless the TIRL took immediate steps to repair the bridge, Regional Administrator McKeon would recommend issuance of an Emergency Order prohibiting its use.

January 17, 1996: Inspector Ziolkowski hand-delivered the January 16 letter to Mr. Sanoian. Mr. Sanoian stated to Inspector Ziolkowski that the bridge did not have ``a structural problem'' but that it had a ``lateral problem.''

January 18, 1996: During a telephone conference with Regional Administrator McKeon and Deputy Regional Administrator Lawrence Hasvold, Mr. Sanoian requested permission to use the locomotive to move material to repair the bridge. Regional Administrator McKeon advised Mr. Sanoian that the locomotive could not be used until it was in compliance with the applicable Federal regulations.

January 19-22, 1996: The TIRL received loaded boxcar RBOX 40945 in interchange from Conrail, moved it across the bridge, and placed it at the consignee's facility on Tonawanda Island. This move presumably was made with the railroad's only locomotive.

January 25, 1996: Principal Inspector Lutz again inspected the TIRL locomotive and issued inspection report No. 1, informing Mr. Sanoian of 14 items not in compliance with Federal railroad safety standards. As a result of the inspection, Inspector Lutz removed the TIRL locomotive from service by issuing a Special Notice for Repairs, Form FRA 6180 (``Form 8''). A copy of the form was placed in the locomotive cab.

January 26, 1996: Inspector Ziolkowski hand-delivered a copy of the Form 8 to Mr. Sanoian. Despite the fact that the boxcar was placed on the trailing end of a stub track with the locomotive ahead of it, Mr. Sanoian stated that he had not moved the locomotive and could not have done so because it ``had no air.''

January 29, 1996: FRA Inspector Ron Marx conducted a track inspection on the TIRL and identified five deficiencies, including a five-and-one-sixteenth-inch cross level deviation on Bridge 7708810. This serious track defect does not meet even the minimum track geometry standards contained in 49 CFR Part 213. In addition, the added load placed on one rail by a downward tilt of the track to the downstream side further overloads the already severely degraded bridge structural members supporting the bridge timbers to which that rail is attached. Inspector Marx also found combustible debris located against the southeast corner of the bridge.

January 29-31, 1996: Representatives of Parsons Brinckerhoff, Quade and Douglas, Inc. inspected Bridge 7708810. Parsons Brinckerhoff, an engineering consulting firm with nationally recognized expertise in bridges, including wooden structures, is under contract to DOT to inspect Bridge 7708810 and to advise FRA of the bridge's structural condition. Parsons Brinckerhoff evaluated the bridge in accordance with accepted principles of structural engineering as contained in the ``Manual for Railway Engineering'' published by the American Railway Engineering Association. Parsons Brinckerhoff determined, and reported to FRA, that the bridge is unsafe, even for the movement of TIRL's 50-ton locomotive.

Condition of the bridge

The investigation performed by Parsons Brinckerhoff on behalf of FRA disclosed that bridge 7708810 is in need of repair and should be closed to all rail traffic until adequate repairs have been made. A report of the investigation notes that severe deterioration and distress exist in the three northern stringers of the westernmost span of the bridge structure. The damage includes severe section loss caused by fungal attack, crushing of the bearing surfaces due to an inadequate bearing area, and horizontal shear cracks along most of the length of the stringers. The three stringers are so badly deteriorated that they are considered as failed. Because of the complete lack of support under one rail, the entire span is rated zero for live load capacity.

Failure of the bridge under load could have very serious consequences. In addition to killing or injuring railroad crew members, failure of the bridge also could kill or injure pleasure boaters on the river or at the marina. A catastrophic failure of the bridge causing any pollution of the Niagara River, whether from locomotive diesel fuel or from the contents of a boxcar, could have international impact. Furthermore, failure of the railroad bridge over the fast-moving current could damage the nearby highway bridge.

Finding and Order

The results of bridge engineers' inspection of Bridge 7708810 have led FRA to conclude that any future use of the bridge poses an imminent and unacceptable threat to public safety. A past pattern of failure by the TIRL to comply with Federal railroad safety laws and regulations persuades FRA that reliance upon the cooperation of the TIRL to repair the bridge to safe condition is inadequate to protect public safety. I find that the unsafe conditions discussed above create an emergency situation involving a hazard of death or injury to persons. Accordingly, pursuant to the authority of 49 U.S.C. Sec. 20104, delegated to me by the Secretary of Transportation (49 CFR Sec. 1.49) it is ordered that the Tonawanda Island Railroad shall discontinue, and shall not permit, the operation of trains or any railroad on-track equipment over Bridge 7708810 while this Emergency Order remains in effect.

Relief

The Tonawanda Island Railroad may obtain relief from this Emergency Order by providing the Federal Railroad Administrator with a report of inspection and evaluation of repairs, indicating to FRA's satisfaction that the Bridge 7708810 has been acceptably repaired. The report should be prepared by an engineer who is technically proficient and legally competent in the field of railroad bridge engineering, and it should state that the capacity of the bridge to carry safely railroad cars and locomotives has been restored. The configuration and weights of the loads for which the determination has been made should be stated in the report. Upon FRA's approval of the bridge engineer's assessment of the bridge restoration, and following an inspection by FRA if the agency deems it necessary, the Administrator will rescind this Emergency Order.

Penalties

Any violation of this order shall subject the person committing the violation to a civil penalty of up to $20,000. 49 U.S.C. Sec. 21301. FRA may, through the Attorney General, also seek injunctive relief to enforce this order. 49 U.S.C. Sec. 20112.

Effective Date and Notice to Affected Persons

This Emergency Order shall take effect at 12:01 a.m. (EST) on February 13, 1996, and apply to all operations of trains or railroad on-track equipment on Bridge 7708810 on or after that time. Notice of this Emergency Order will be provided by publishing it in the Federal Register. Copies of this Emergency Order will be sent by mail or facsimile prior to publication to Mr. Corigan Sanoian of the Tonawanda Island Railroad, the Consolidated Rail Corporation, International Filler Corporation, the City of North Tonawanda, New York Department of Transportation, and the Association of American Railroads.

Review

Opportunity for formal review of this Emergency Order will be provided in accordance with 49 U.S.C. Sec. 20104(b) and section 554 of Title 5 of the United States Code. Administrative procedures governing such review are found at 49 CFR part 211. See 49 CFR Secs. 211.47, 211.71, 211.73, 211.75, and 211.77.

Issued in Washington, D.C. on February 12, 1996.

Jolene M. Molitoris,

Administrator.
[FR Doc. 96-3592 Filed 2-15-96; 8:45 am]
BILLING CODE 4910-06-P

[Federal Register: December 22, 1999 (Volume 64, Number 245)]
[Notices]
[Page 71844-71846]
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DEPARTMENT OF TRANSPORTATION

Federal Railroad Administration
[FRA Emergency Order No. 22, Notice No. 1]

Oregon Pacific Railroad; Emergency Order To Prevent Operation of Trains on the Railroad Bridge Crossing Johnson Creek in the City of Milwaukie, Oregon

The Federal Railroad Administration (FRA) of the United States Department of Transportation (DOT) has determined that public safety compels issuance of this Emergency Order requiring the Oregon Pacific Railroad Company (OPR) to discontinue operation of trains or any railroad on-track equipment on a railroad bridge it owns spanning Johnson Creek (hereinafter designated as the ``Johnson Creek Bridge'') in the City of Milwaukie, Oregon. The bridge shall remain out of service until it has been properly repaired and its capacity determined by a registered professional engineer licensed to practice in the State of Oregon and who is technically proficient in the field of timber railroad bridge engineering.

Authority

Authority to enforce Federal railroad safety laws has been delegated by the Secretary of Transportation to the Federal Railroad Administrator. 49 CFR 1.49. Railroads are subject to FRA's safety jurisdiction under the Federal railroad safety laws, 49 U.S.C. 20101, 20103. FRA is authorized to issue emergency orders where an unsafe condition or practice ``causes an emergency situation involving a hazard of death or personal injury.'' 49 U.S.C. Sec. 20104. These orders may impose such ``restrictions and prohibitions * * * that may be necessary to abate the situation.'' (Ibid.)

Background

The Oregon Pacific Railroad Company, a common carrier, is a part of the general railroad system of transportation and operates two principal segments of track. The segment in which the Johnson Creek Bridge is located consists of 4.28 miles of main track and 2.11 miles of secondary or yard trackage, or a total trackage of 6.39 miles, extending from milepost 0.26 (at its connection with Union Pacific Railroad Company's Portland-Eugene mainline at UP MP 769) at or near East Portland, Oregon, to milepost 4.54 at Milwaukie, all of which is located in Clackamas County, Oregon. The Oregon Pacific Railroad acquired this segment from East Portland Traction Company on January 1, 1997, and commenced railroad operation on that date.

The other segment of railroad operated by the Oregon Pacific Railroad is not contiguous with the first. It extends 9.93 miles from Canby to Molalla, Oregon, and includes a total of 11.38 miles of trackage. The Oregon Pacific Railroad likewise commenced railroad operations on that segment on January 1, 1997.

The President, Chief Executive Officer and General Manager of the Oregon Pacific Railroad is Mr. Richard A. Samuels, whose office mailing address is Oregon Pacific Railroad Company, P.O. Box 22548, Portland, Oregon 97269. Mr. Samuels is also the principal stockholder of the company.

The Oregon Pacific Railroad crosses Johnson Creek in Milwaukie, Oregon, on a timber trestle bridge not identified by number and located approximately one-half mile upstream from the point where Johnson Creek empties into the Willamette River. The location is also approximately 300 feet west of S.E. McLoughlin Boulevard (Oregon State Highway 99E) between its intersections with S.E. Harrison Street and S.E. Jackson Street. Geographic coordinates are 45 deg.26'41" North latitude and 122 deg.38'38" West longitude. There is no commercial water traffic on Johnson Creek.

The Oregon Pacific Railroad crosses the bridge to serve one shipper, AmeriCold Logistics, located south of the bridge. AmeriCold Logistics transports frozen food products in mechanical refrigerator cars at a rate of about two cars per week, typically hauled in one train. Each refrigerator car has a gross weight of 220,000 pounds. The Oregon Pacific Railroad uses a small locomotive whose weight is undetermined.

Condition of the Bridge

The bridge is 127 feet long and consists of a nine-span open-deck timber trestle carrying a single track in a twelve-degree curve to the west. For reference in this emergency order and other documents relating to this emergency order, the bridge components are numbered from north to south and from east to west, with the north dump bent or abutment numbered as 0.

Intermediate bents one through seven nominally consist of four driven timber piles. Bent 8 is framed on a mud sill. Caps measure 14 inches by 14 inches by 12 feet on bents 1 through 5, and bent 8. Caps in bents 6 and 7 are 14 inches by 13 inches by 12 feet, with the large side horizontal. Each span has eight stringers, with four stringers essentially centered under each rail, 8 inches by 18 inches by 32 feet, with stringer joints alternating between bents. The clear space under the bridge is approximately six feet above the water level of the stream.

Track ties of 7 inches by 9 inches by 9 feet rest directly on top of the stringers, and support in turn tie plates and the two running rails, 75 pounds per yard, one 75-pound-per-yard guard rail connected to the west running rail, and two 55-pound-per-yard inner guard rails. The track is of conventional bolted rail construction.

Bent 5 is missing piles 1 and 2, and is supported by only piles 3 and 4, both under its west side. An outrigger beam has been placed under span 5, under the stringers and directly against the north face of the cap of bent 5. This beam consists of several timbers, 8 inches by 16 inches in cross section, placed vertically. These timbers are packed in four plies. Plies 1 and 3 each consist of two 16-foot timbers butt joined at the center of the beam. Plies 2 and 4 each consist of one 30-foot timber and one 2-foot timber, butt joined two feet from the west end of the beam, nearest the bridge. The beam is oriented with its individual plies placed on their short edges.

The outrigger beam is supported on its east end by a track tie resting on the ground on the south bank of Johnson Creek where the creek makes a sharp bend to the north on the east side of the bridge. The outrigger beam is supported on its west end by a \3/8\-inch diameter chain wrapped once around two track ties. Wooden blocks and wedges are placed between the bottoms of the stringers and the top of the outrigger beam. The east, or ``free'' end of the cap of bent 5 has settled approximately five inches from the bottoms of stringers 1 through 4.

Stringer 1 over spans 5 and 6 has essentially failed, with a deep shear crack near its neutral axis for its full length. The cap of bent 6 is demonstrating severe crushing over piles 3 and 4. The bridge shows signs of heavy vertical deflection under load on the east side.

On December 1, 1999, a track safety inspector and a bridge inspector from the Oregon Department of Transportation (ODOT), and a track safety specialist from FRA inspected the bridge. On December 2, 1999, they advised Mr. Samuels of the unsafe condition of the bridge. Mr. Samuels verbally agreed to immediately remove the bridge from service until it could be properly repaired. This discussion and agreement were memorialized in a letter dated December 6, 1999, to Mr. Samuels from FRA's regional administrator for Region 8, Dick L. Clairmont. Subsequent investigation by FRA has revealed, however, that the Oregon Pacific Railroad did not take the bridge out of service, but instead placed more blocking and wedges between the stringers and the top of the outrigger beam and continued to operate railroad rolling stock over the bridge.

The ODOT inspectors, along with an FRA inspector who has received specialized training in timber bridge inspection, then performed a more detailed measurement of the components of the bridge which are summarized in the paragraphs above. Using those measurements, FRA has determined that the Johnson Creek Bridge is in danger of imminent, catastrophic failure at any time that a railroad load passes over the bridge. The configuration of the outrigger beam arrangement overly stresses the stringers, caps, and piles of piers 4, 5 and 6 far beyond their normal capacity, and even the outrigger beam itself could fail at any time. Depending on the amount and direction of deflection of the bridge components, the 3/8-inch diameter chain which secures the west end of the outrigger beam also may become stressed far beyond its ultimate capacity. Merely replacing or reinforcing the chain would not correct the unstable condition created by the lack of piles 1 and 2 in bent 5.

Failure of the bridge under load could have very serious consequences. The bridge failure could cause the train to fall into Johnson Creek, killing or injuring any railroad crew members operating rolling stock, killing or injuring any innocent bystanders using Johnson Creek or its banks, and possibly blocking the creek resulting in widespread flooding in the immediate area. Locomotive diesel fuel and/or fuel and contents of a mechanical refrigerator car could cause severe environmental damage to Johnson Creek and the nearby Willamette River.

Finding and Order

FRA has concluded that any future railroad use of the Johnson Creek Bridge on the Oregon Pacific Railroad poses an imminent and unacceptable threat to public and employee safety. The past failure of the Oregon Pacific Railroad to voluntarily remove the bridge from service and perform proper repairs persuades FRA that the agency cannot rely upon the cooperation of the railroad to protect public safety in relation to the Johnson Creek Bridge. I find that these unsafe conditions create an emergency situation involving a hazard of death or injury to persons.

Accordingly, pursuant to the authority of 49 U.S.C. 20104 delegated to me by the Secretary of Transportation (49 CFR 1.49), it is ordered that the Oregon Pacific Railroad Company shall discontinue, and shall not permit, the operation of trains or any railroad on-track equipment over the Johnson Creek Bridge while this Emergency Order remains in effect.

Relief

The Oregon Pacific Railroad Company may obtain relief from this Emergency Order by providing the Federal Railroad Administrator with a report of inspection and evaluation of repairs, indicating to FRA's satisfaction that the Johnson Creek Bridge has been acceptably repaired. The report shall be prepared and sealed by a registered professional engineer who is licensed to practice in the State of Oregon and is technically proficient in the field of timber railroad bridge engineering. The report shall state that the capacity of the bridge to carry safely railroad cars and locomotives has been restored. The configuration and weights of the loads for which the determination has been made shall be stated in the report, together with all calculations upon which that determination is based. The original of the engineer's report, bearing the embossed imprint of the seal of the engineer, shall be provided to the regional administrator of FRA's Region 8 before the report will be considered by FRA. Upon FRA's approval of the engineer's assessment of the bridge restoration, and following an inspection by FRA in which the agency finds the bridge properly repaired to safe condition, the Administrator will rescind this Emergency Order.

Penalties

Any violation of this order shall subject the person committing the violation to a civil penalty of up to $22,000. 49 U.S.C. 21301. FRA may, through the Attorney General, also seek injunctive relief to enforce this order. 49 U.S.C. Sec. 20112.

Effective Date and Notice to Affected Persons

This Emergency Order shall take effect at 12:01 a.m. (PST) on December 17, 1999 and apply to all operations of trains or railroad on track equipment on the Johnson Creek Bridge on or after that time. Notice of this Emergency Order will be provided by publishing it in the Federal Register. Copies of this Emergency Order will be sent by mail or facsimile prior to publication to Mr. Richard A. Samuels, President, Chief Executive Officer and General Manager, Oregon Pacific Railroad Company, P.O. Box 22548, Portland, Oregon 97269; the Union Pacific Railroad Company; the City of Milwaukie, Oregon; AmeriCold Logistics; Oregon Department of Transportation; the Association of American Railroads; and the American Short Line and Regional Railroad Association.

Review

Opportunity for formal review of this Emergency Order will be provided in accordance with 49 U.S.C. 20104(b) and section 554 of Title 5 of the United States Code. Administrative procedures governing such review are found at 49 CFR part 211. See 49 CFR 211.47, 211.71, 211.73, 211.75, and 211.77.

Issued in Washington, DC on December 16, 1999.
Jolene M. Molitoris,
Administrator.
[FR Doc. 99-33209 Filed 12-21-99; 8:45 am]
BILLING CODE 4910-06-P

[Federal Register: February 2, 2000 (Volume 65, Number 22)]
[Notices]
[DOCID:fr02fe00-121]

DEPARTMENT OF TRANSPORTATION
Federal Railroad Administration
[FRA Emergency Order No. 22, Notice No. 2]
Oregon Pacific Railroad; Notice of Relief From Emergency Order No. 22

AGENCY: Federal Railroad Administration, Department of Transportation.

ACTION: Notice of Relief.

SUMMARY:

This notice provides relief for the Oregon Pacific Railroad from the limitations of Federal Railroad Administration (FRA) Emergency Order No. 22, issued December 16, 1999. The relief allows the Oregon Pacific Railroad to recommence operation of trains and other railroad on-track equipment on a railroad bridge it owns spanning Johnson Creek (hereinafter designated as the ``Johnson Creek Bridge'') in the City of Milwaukie, Oregon.

Authority

FRA is authorized to issue emergency orders where an unsafe condition or practice "causes an emergency situation involving a hazard of death or personal injury." 49 U.S.C. Sec. 20104. These orders may impose such ``restrictions and prohibitions * * * that may be necessary to abate the situation.'' (Ibid.) Likewise, FRA is authorized to grant relief from an emergency order when the agency deems that the unsafe condition or practice which gave rise to the emergency order no longer exists.

Background

The Oregon Pacific Railroad Company, a common carrier, is a part of the general railroad system of transportation and operates two principal segments of track. One of the segments crosses Johnson Creek in Milwaukie, Oregon, on a timber trestle bridge not identified by number and located approximately one-half mile upstream from the point where Johnson Creek empties into the Willamette River. In December, 1999, based on detailed inspections of the bridge, FRA determined that the Johnson Creek Bridge was in danger of imminent, catastrophic failure at any time that a railroad load passes over the bridge.

Failure of the bridge under load could have had very serious consequences. The bridge failure could have caused a train to fall into Johnson Creek, killing or injuring any railroad crew members operating rolling stock, killing or injuring any innocent bystanders using Johnson Creek or its banks, and possibly blocking the creek resulting in widespread flooding in the immediate area. Locomotive diesel fuel and/or fuel and contents of a mechanical refrigerator car could have caused severe environmental damage to Johnson Creek and the nearby Willamette River.

FRA therefore concluded that any railroad use of the Johnson Creek Bridge on the Oregon Pacific Railroad posed an imminent and unacceptable threat to public and employee safety involving a hazard of death or injury to persons. On December 16, 1999, the Federal Railroad Administrator issued Emergency Order No. 22 which prohibited all operations of trains and other railroad on-track equipment on the Johnson Creek Bridge until repairs were made and certified as sufficient by a licensed bridge engineer and approved by FRA.

Following the issuance of Emergency Order No. 22, the Oregon Pacific Railroad made repairs to the Johnson Creek Bridge under the guidance of a professional engineer licensed to practice in the State of Oregon. On January 17, 2000, FRA's professional bridge engineer inspected the Johnson Creek Bridge and found that the repairs made to the bridge since the issuance of Emergency Order No. 22 are sufficient to restore immediate safety to the bridge structure.

The termination of Emergency Order No. 22 does not indicate that FRA has made any determination regarding the capacity of the bridge in addition to the work performed by the professional engineer guiding the repairs on behalf of the Oregon Pacific Railroad. Relief from Emergency Order No. 22 simply means that FRA finds that the bridge no longer presents an imminent hazard of death or injury to persons. The Oregon Pacific Railroad continues to be fully responsible for the structural integrity and safe operation of the Johnson Creek Bridge. FRA strongly recommends that the Oregon Pacific Railroad follow a regular program of inspection and maintenance of all railroad bridges owned and operated by the railroad.

Relief

In light of the foregoing, I grant the Oregon Pacific Railroad relief from Emergency Order No. 22. The railroad may immediately recommence operation of trains and other railroad on-track equipment on the Johnson Creek Bridge in the City of Milwaukie, Oregon. The issuance of this Notice does not preclude imposition of another emergency order governing the condition of the bridge should that condition again deteriorate to the extent that I believe it poses an imminent and unacceptable threat to public safety.

Issued in Washington on January 20, 2000.
Jolene M. Molitoris,
Administrator.
[FR Doc. 00-2229 Filed 2-1-00; 8:45 am]
BILLING CODE 4910-06-P

Safety Compliance Agreement Between Columbus and Greenville Railway Company and the Federal Railroad Administration Concerning Bridge Conditions

Article I. Background

A. Columbus and Greenville Railway Company (CAGY) is an interstate carrier by rail which operates a freight railroad extending approximately 168 miles between Columbus and Greenville, Mississippi. It provides the only rail service for movement of freight in the central Mississippi Delta and the continued availability f a safely operated service is vital to the economy of CAGY's service area. CAGY operates no passenger trains on that segment of its railroad. CAGY is subject to the jurisdiction of the Federal Railroad Administration (FRA) under the federal railroad safety statutes, 49 U.S.C. Chapters 201-213.

B. FRA Track Safety Inspectors regularly monitor the compliance of CAGY with the Federal Track Safety Standards (found at 49 C.F.R. Part 213). These inspections have disclosed several deviations from the Track Safety Standards in tracks located on bridges and bridge approaches. Detailed investigations into the causes of these deviations have led FRA to evaluate bridge conditions overall on CAGY. In 1999, FRA found that, due to their configuration, bridges on CAGY line segments described in Article II, below, as Category A segments, could not continue to sustain the loads operated by CAGY over a reasonable period of time. FRA also determined that CAGY bridge maintenance work at the time was barely able to keep the bridges in service from day to day. FRA reported these findings to CAGY, and CAGY replied with a commitment to correct some of the shortcomings found by FRA. However, CAGY's response has not been sufficient to allay FRA's concerns.

C. FRA has extensive authority with which to enforce Federal railroad safety laws and regulations. FRA may impose civil penalties on railroads, officers, and employees, disqualify individuals from safety-sensitive functions, issue emergency orders and compliance orders, seek injunctive relief to compel compliance, and seek criminal penalties for the knowing and willful falsification, destruction, or failure to complete records or reports that are required to be completed. The authority vested in FRA by the federal railroad safety statutes extends to all areas of railroad operations, including the safety of railroad bridges, whether or not FRA has issued regulations in the particular area of concern. Nothing in this agreement precludes FRA from exercising any of these authorities with regard to CAGY as FRA deems necessary.

D. Under its statutory emergency order authority (49 U.S.C. 20104), FRA is authorized to act in cases involving the safety of bridges that carry railroad tracks, where the condition of the bridges presents an emergency situation involving a hazard of death or personal injury. FRA may use its emergency order authority to address bridge safety problems even though FRA does not have rules on bridge maintenance. FRA does have guidelines covering bridges published at 49 C.F.R. Part 213, Appendix C.

E. Because of the effective application of sound engineering practices by the railroads to the design and management of their bridges, accidents caused by the structural failure of railroad bridges are exceedingly rare. Train accidents from this cause have occurred at a rate of fewer than one or two per year over the past several decades across the entire nation. However, the 168-mile CAGY accounts for five of the train accidents caused by the structural failure of bridges in the ten years beginning with 1991. Considering this relatively high level of bridge-related train accidents, and the overall condition of CAGY bridges noted by FRA during the past several years, FRA has determined that CAGY must take remedial action to protect the safety of trains operating over its bridges.

F. A CAGY accident on February 5, 2001 at Indianola, Mississippi, illustrates the seriousness of the bridge deficiencies and the urgent need for corrective action. In that accident, a bridge failed under a train traveling east at 10 miles per hour and slowing to stop in downtown Indianola. As a result, three rail cars, including a car of agricultural herbicide, derailed and landed in the water below. Fortunately, no herbicide was discharged. A fourth car derailed but remained on the bridge. FRA observation of bridge conditions on the CAGY after the accident revealed another bridge in imminent danger of collapse. CAGY removed the bridge from service. FRA's knowledge of bridge conditions on the CAGY, the railroad's bridge maintenance practices, and the heavy weights of some rail cars being hauled across the railroad's bridges has led FRA to conclude that imminent hazards of death or injury may exist at many bridges on the CAGY. Accordingly, FRA is conducting further observations of CAGY bridges and is considering issuing an emergency order to address the condition of those bridges and CAGY's bridge maintenance practices.

G. FRA and CAGY have entered into this Compliance Agreement in order to improve CAGY's activities for protection of safe train operation over its bridges and to ensure that, in the absence of CAGY's strict adherence to this agreement, FRA will be able to take prompt and uncontested action to ensure compliance with its terms. FRA and CAGY agree as follows:

Article II. Scope of the Compliance Agreement

A. **Portions of railroad subject to the Agreement:** For purposes of this Agreement CAGY is divided into three categories.

1. *Category A* segments are those portions of the original Columbus and Greenville Railway acquired by CAGY in 1975 between Columbus and Greenville, Mississippi, on which trains are operated.

2. *Category B* segments acquired by CAGY from other railroads 1975, on which trains are operated.

3. *Category C* includes all segments on which trains are not operated.

B. **Classification of segments:** CAGY may reclassify a line segment into Category C at any time by removing the track from service and notifying FRA of the reclassification. CAGY may reclassify a line segment from Category C to another category only when that segment meets all the requirements in this agreement for that new category, and must notify FRA of the reclassification before train operations begin.

Article III. Action to be Undertaken by Columbus and Greenville Railway

A. Train Operation Over and In Approach to Bridges.

1. *Protection of bridges from overload:* (Applies to Categories A and B) CAGY shall, within fourteen(14) days of this agreement, submit proposed procedures to FRA to ensure that no railroad equipment heavier than that permitted now by CAGY's current maximum weight for its system, or heavier than permitted by the rating for a particular bridge (developed in accordance with Section B, below), is operated over its bridges. Such procedures shall include, but not be limited to, review of waybill weights of all loaded cars accepted from shippers or in interchange from connecting railroads, and weighing of all loaded cars passing a scale location on CAGY.

A loaded car need only be weighed once per shipment. However, a loaded car received in interchange that bears an actual scale weight on its waybill need not be re-weighed by CAGY.

2. *Placement of speed restrictions:* (Applies to Category A) As part of its procedures, CAGY shall ensure that limits of temporary and permanent train speed restrictions are placed so that no train will be required to reduce speed while any part of the train is moving over a bridge. The milepost locations of such limits may differ for eastward versus westward trains.

3. *FRA approval:* Within seven (7) days of receiving the proposed procedures, FRA will approve them or require specific amendments. CAGY will implement the approved procedures, amended as necessary, within fourteen(14) days of FRA's response to the submission of the proposed procedures.

B. Bridge Evaluation and Rating by a Competent Engineer. (Applies to Category A)

1. *Qualifications and engagement of engineer(s):* CAGY shall engage the services of one or more professional engineers who by training and experience are competent in the field of timber railroad bridge design and evaluation, and who are legally competent to practice engineering in the State of Mississippi. CAGY will notify FRA by April 30, 2001 of the identity of any engineer proposed to be so engaged, a statement of the qualifications, ability and availability of that engineer to perform the required work.

2. *Supervision of inspections by engineer:* CAGY and an engineer as described in Paragraph 1 above shall conduct an inspection, evaluation and load rating on all of its bridges, of timber and any other construction, over which trains are operated. The engineer shall develop a procedure for the conduct of the bridge inspection. CAGY shall submit the procedure to FRA for review and comment by May 31, 2001. CAGY may begin inspections under the procedure as soon as the procedure is submitted to FRA. FRA will return initial comments within seven (7) days of the submission and will continue to forward comments to CAGY as needed.

3. *Bridge inspection procedures:* The inspection procedure shall be such as will determine and record the condition and dimensions of every member of each bridge to be rated, together with the relationship between bridge components and the condition of the bridge as an entire structure. Particular attention shall be paid to the presence or absence, and effectiveness, of bracing in timber trestles. The engineer shall supervise the 2001 annual bridge inspection to ensure its accuracy and adequacy as the basis for a rating of each bridge. The inspection of all bridges on CAGY shall be completed August 31, 2001.

4. *Rating of bridges by the engineer:* As the 2001 bridge inspections are completed and recorded, the engineer shall evaluate each bridge and prescribe the limits of a loading regimen for each bridge. Allowable loadings may be prescribed for a definite time period, conditioned upon specified repairs or modifications to the subject bridge. be expressed in terms of the standard Cooper loading as prescribed by in its Manual for Railway Engineering in the appropriate chapter on Timber, Steel or Concrete Bridges. Ratings shall also be expressed in terms of cars and locomotives commonly operated by CAGY, and may include speed restrictions consistent with Article II, Section A2 for particular loading conditions.

5. *Reporting to FRA*: CAGY will submit to FRA a progress report monthly, beginning , to be received by FRA not later than seven (7) calendar days after the last day of the reporting period. The report shall identify by bridge number each bridge on which a rating inspection has been completed, the length of and number of spans in the bridge, and the date of completion of the inspection. The progress report shall also identify in like manner the bridges on which

ratings have been completed. The reporting of completion of inspections and ratings shall be cumulative. CAGY shall also forward the evaluation and rating for each bridge to FRA within 30 days after the rating is completed, and not later than September 28, 2001. The rating for each bridge shall bear the embossed seal of the engineer under whose responsible charge the rating was performed and shall include the inspection report and the calculations upon which the rating is based.

6. *Application of ratings:* CAGY will revise the procedures to protect bridges from overload prescribed in Section A.1. to incorporate the restrictions of each bridge rating as the ratings are completed and forwarded by the Engineer.

C. Bridge Design and Modification by a Competent Engineer. (Applies to all categories)

1. *Supervision by engineer:* CAGY will not attempt to construct, reconstruct, or modify existing members of, a bridge unless such construction, reconstruction or modification has been designed by a competent engineer qualified in accordance with Article II, Section B1 above. The design documents shall bear the embossed seal of the engineer, and the engineer shall supervise and inspect the work to ensure that it conforms to the design.

2. *Permitted repairs and modifications:* This provision shall not preclude the immediate replacement in kind or addition of members to timber trestles where such replacement or addition does not adversely affect the carrying capacity of existing members or the entire bridge, without the work having been designed by an engineer, provided that the work shall be inspected and approved by the engineer within thirty (30) days of its completion.

D. Long-term Provisions for Safe Operation of Trains on Bridges. (Applies to all categories)

1. *Application of FRA Bridge Safety Policy:* CAGY shall prepare and implement a program in conformance with the provisions of the Federal Railroad Administration Policy on the Safety of Railroad Bridges found at, 49 C.F.R. Part 213, Appendix C.

2. *Time period:* CAGY will notify FRA of its compliance with this provision before the termination of this compliance agreement.

Article IV. Certain Actions FRA May Take to Ensure Compliance

A. Unacceptable Conditions. (Applies to all categories)

1. *Determinations by FRA:* If, during the duration of this Agreement, FRA identifies a bridge condition that it determines, in its sole judgement, to be an imminent hazard to continued train operations, FRA will immediately notify CAGY of the condition, and CAGY will immediately remove the bridge from service. Failure by CAGY to remove the bridge from service will be considered a violation of this Agreement.

2. *Authorized FRA personnel:* FRA will notify CAGY of the identity of individual FRA employees who are authorized to make initial determination regarding the suitability of a bridge for continued service.

3. *Authorized CAGY personnel:* CAGY will notify FRA of the identity of its officers designated to receive and act upon a notice by FRA of unsuitable bridge conditions.

4. *Returning bridge to service:* In any case in which FRA identifies such a bridge condition and CAGY effects repairs or modifications to the bridge, the bridge may be returned to service, unless FRA disapproves of the repairs or modifications. A report of an evaluation of these repairs shall be prepared and sealed by the engineer and forwarded to FRA for review. Within seven (7) days of receiving the engineer's report, FRA will notify CAGY if it disapproves the repairs made. If FRA disapproves the repairs, the bridge will remain out of service or, if the bridge had been returned to service immediately following the modifications, it will be removed from service once again.

Article V. Violation of this Agreement. (Applies to all categories)

FRA is entering into this Agreement to address a systemic problem with safe operation of trains on bridges owned by CAGY which could lead to an emergency situation involving a hazard of death or injury. If, in the sole judgment of FRA, CAGY fails to comply in full with any term of this Agreement, FRA may, upon 48 hours notice to CAGY, issue an emergency order containing the terms of the Agreement and specifying penalties for violation of those terms.

Article VI. Mutual Representations

A CAGY makes the following representations:

1. It has read and is familiar with all its obligations under this Agreement and agrees to comply in full with those obligations;

2. It admits that FRA has jurisdiction over it and authority to issue an emergency order in accordance with Article V of this Agreement; and expressly consents to the issuance of such emergency order;

3. It agrees not to seek administrative or judicial review of any emergency order that is issued by FRA pursuant to Article V in response to the railroad's violation of this Agreement and that imposes on CAGY only obligations prescribed in Article III, IV, and V of this Agreement. Nevertheless, it reserves the right to contest factual allegations related to violations of any such emergency order once issued, or the imposition of any civil penalty or other form of relief.

B. FRA makes the following representation:

1. Contingent on CAGY's satisfaction of the terms of this Agreement, FRA agrees not to issue an emergency order concerning the matters addressed in this Agreement.

2. FRA will act in good faith and not in an arbitrary and capricious manner in the enforcement of this Agreement.

Article VII. Notice to Affected Employees and FRA Personnel

Within five (5) business days of the execution of this Agreement, CAGY shall distribute a copy of this Agreement to each employee who is responsible for implementation of, or who is required to observe the terms of, this Agreement, including each current Engineering Department manager and employee, and each Engineering Department manager and employee hired after the effective date of the Agreement. Within five (5) business days of the effective date of this Agreement, FRA shall distribute a copy of this Agreement to each current inspector in all regions where CAGY operates and to each Inspector hired during the term of this Agreement.

Article VIII. Effective Date and Duration of Agreement

This Agreement shall become effective upon execution and, except as provided below, remains in effect until December 31, 2002 or until CAGY has complied with the provisions of Article III, Section D (Long-term Provisions for Safe Operation of Trains on Bridges), whichever is later. FRA will assess CAGY's progress in implementing this Agreement in January 2002, and will meet with CAGY to discuss that assessment. Based on that assessment, FRA will decide by March 31, 2002, whether to terminate this Agreement and will report its determination to CAGY on or about that date. FRA's determination of whether or not to terminate the Agreement will be a matter of its sole discretion, and CAGY will not challenge that determination. In the event that FRA at any time during the term of this Agreement makes the determination that CAGY has violated this Agreement and issues an emergency order, those sections of this Agreement addressing CAGY's waiver of its right to contest the issuance of an emergency order shall remain in effect; all other provisions of this Agreement shall be rendered null and void.

____
President
Columbus and Greenville Railway Company

____
Date

____
Acting Deputy Administrator
Federal Railroad Administration

____
Date

Statement of Agency Policy on the Safety of Railroad Bridges

Following is the Federal Register Notice with the current Policy Statement.

Policy on the Safety of Railroad Bridges
From the Federal Register of August 30, 2000
Pages 52667 - 52672
Reformatted for WordPerfect on September 20, 2000

DEPARTMENT OF TRANSPORTATION
Federal Railroad Administration
49 CFR Part 213
[Docket No. RST–94–3, Notice No. 2]
Policy on the Safety of Railroad Bridges

AGENCY: Federal Railroad Administration (FRA), Department of Transportation, (DOT).

ACTION: Final Statement of Agency Policy.

SUMMARY: FRA issues a final statement of policy for the safety of railroad bridges. FRA establishes suggested criteria for railroads to use to ensure the structural integrity of bridges that carry railroad tracks. This final statement of policy reflects minor changes following public comment on the interim statement of policy published April 27, 1995, at 60 FR 20654.

DATES: *Effective Date:* The final statement of policy is effective September 29, 2000.

FOR FURTHER INFORMATION CONTACT: Gordon A. Davids, P.E., Bridge Engineer, Office of Safety Assurance and Compliance, Federal Railroad Administration, 1120 Vermont Avenue, NW., Mail Stop 25, Washington, DC 20590, (Telephone: 202–493–6320), or Nancy Lummen Lewis, Trial Attorney, Office of Chief Counsel, Federal Railroad Administration, 1120 Vermont Avenue, NW., Mail Stop 10, Washington, DC 20590, (Telephone 202–493–6047).

SUPPLEMENTARY INFORMATION: On April 27, 1995, FRA issued an interim statement of policy on the safety of railroad bridges. Published in the **Federal Register** at 60 FR 20654, the interim statement included a request for comments to be submitted to FRA during a 60-day period following publication. The interim statement detailed the reasons which prompted FRA to adopt this policy, as well as the background information behind its adoption. The notice stated that FRA intended to incorporate the policy statement as an appendix to 49 CFR part 213, reflecting any changes warranted by comments submitted during the comment period. FRA's original intent was to publish the final statement of policy at the same time it issued a final rule to revise the Federal Track Safety Standards found at 49 CFR Part 213. However, because the final statement of policy addresses certain unique issues not shared by the final rule to revise the track standards, FRA decided to publish this final statement of policy separately.

Statutory Authority
The Secretary of Transportation has authority to ‘‘prescribe regulations and issue orders for every area of railroad safety.’’ 49 U.S.C. 20101. The Secretary has delegated his authority to FRA. 49 CFR 1.49(m).

Reasons for Adoption of the Bridge Safety Policy
The severity of a train accident is usually compounded when a bridge is involved, regardless of the cause of the accident. FRA must be able to deal effectively with any safety problems involving the structural integrity of railroad bridges. At the same time, FRA must assure that private and public resources are not diverted

unnecessarily from railroad inspection and maintenance programs that are also critical to railroad safety. At one extreme, FRA could respond to bridge safety issues only when accidents occur or when someone contacts the agency about particular concerns.

However, such a reactive policy would inhibit FRA's ability to detect impending problems with railroad bridges. At the other extreme, FRA could regulate all aspects of railroad bridge management, including inspection, rating, construction and maintenance. The expense of such an action to the railroad industry and to the Federal government is not justified.

To promote bridge safety, this policy statement includes non-regulatory guidelines to inform railroad managers and all concerned about current good practices related to bridge inspection and management. The guidelines accommodate a wide variety of effective bridge inspection and management methods. Therefore, FRA does not expect that its policy will force railroads to change effective bridge management programs and thus unnecessarily divert resources needed for the functional work of bridge management. Because FRA believes that a national bridge safety policy is most effective when it is administered consistently throughout the United States, the agency will, upon request, cooperate with states to the fullest extent feasible to resolve railroad bridge safety problems. This cooperation will extend to training of inspectors of state railroad safety agencies, joint investigations and evaluations of bridge conditions, and where necessary, invocation of FRA's enforcement authority.

FRA will revise the guidelines as necessary to accomplish the objectives of the bridge safety program. To that end, FRA will continue to monitor and evaluate the railroads' bridge inspection and management programs to guarantee that those responsible for the safety of bridges continue to meet their obligations. FRA will make its findings available to the public upon request, excluding any proprietary information received and identified as such. Should FRA find through its monitoring that widespread bridge structural problems have developed, it may use the information it has gathered to commence a rulemaking proceeding to further address railroad bridge safety.

Effect of this Statement of Policy
This statement of policy containing guidelines for the proper maintenance of bridge structures is meant to be advisory in nature; it does not have the force of regulations under which FRA ordinarily issues violations and assesses civil penalties. Even without specific bridge safety regulations, FRA maintains authority to perform safety inspections of any railroad facility and to issue emergency orders under 49 U.S.C. 20104, 49 U.S.C. 20107, and 49 CFR part 209. This authority permits FRA, if necessary, to remove from service or otherwise impose conditions on any railroad operation which, in the judgment of the agency, poses an emergency situation involving a hazard of death or personal injury.

For example, on February 12, 1996, FRA issued Emergency Order No.19, which removed from service a railroad bridge on the Tonawanda Island Railroad near North Tonawanda, New York, after FRA found that the bridge posed an unacceptable risk to the safety of train operations. Likewise, FRA issued Emergency Order No. 22 on December 16, 1999, which removed from service a railroad bridge on the Oregon Pacific Railroad in Milwaukie, Oregon. The bridge in Oregon was satisfactorily repaired, and FRA lifted Emergency Order No. 22 on January 20, 2000.

This final statement of agency policy does not change FRA's statutory emergency order authority with respect to railroad bridge safety. Rather, the guidelines contained herein represent the general criteria against which FRA will evaluate each railroad's bridge inspection and management program.

Public Response to the Interim Policy
A 60-day comment period followed the publication of the Interim Statement of Policy, and FRA received comments from five parties. Those comments were considered in the development of this final policy and are addressed here.

The American Railway Engineering and Maintenance of Way Association (AREMA), in conveying its support of the policy and its associated guidelines, expressed a concern that the policy's reference to AREMA's *Manual for Railway Engineering* in Guideline 5 may lead some to believe that the specifications contained therein represent minimum safety standards. That interpretation was not intended by FRA, and Guideline 5 has been modified to reflect that concern.

The Association of American Railroads (AAR) and the Norfolk Southern Corporation expressed support for the policy, as well as support for AREMA's comments. The AAR also requested clarification of the provisions in Guideline 1 regarding the responsibility for the safety of bridges.

The Federal Track Safety Standards prescribe the track owner as the party responsible for proper maintenance of the tracks. It follows, therefore, that compliance with the track standards necessitates that the track owner also maintain any structure supporting the track, be it a bridge or an earth structure. Where a bridge owner is not the track owner, the bridge owner is responsible to the track owner for the integrity of the bridge. Likewise, the track owner is responsible to other railroads operating over its track for the integrity of both the track and the bridges which support it.

FRA does not consider it necessary that one railroad operating with trackage rights over another should duplicate the bridge management work of the track owner. An operator under trackage rights should be able to accept a general assurance that the owner is maintaining the integrity of its bridges. However, effective communication of load restrictions between the owner and other operating railroads is essential to prevent overloading bridges.

The Brotherhood of Maintenance of Way Employees (BMWE) had earlier petitioned FRA to issue regulations governing bridge safety, including a requirement for displacement and damage detectors. The BMWE cited the specifications of the American Association of State Highway and Transportation Officials (AASHTO) as examples of standards that govern the design, construction, inspection and maintenance of highway bridges. The BMWE recommended that the same type of standards should be applied to railroad bridges. AASHTO specifications generally have been adopted by highway bridge owners, as the bridge chapters in the AREMA *Manual for Railway Engineering* have been adopted by railroad bridge owners. In fact, railroads frequently use AASHTO specifications for highway bridges which they own, and highway agencies use the AREMA manual in their projects involving railroad bridges. AASHTO specifications are not regulations, unless they have been adopted as such by a government agency that actually owns and maintains highway bridges. FRA believes that this policy statement, with its reference to the AREMA manual, effectively points interested parties toward standards that are the railroad equivalent of the AASHTO specifications and, in so doing, accomplishes the objective of BMWE's recommendation.

The BMWE also commented that it agreed with FRA's plan to make this policy a part of the Federal Track Safety Standards contained in 49 CFR part 213.

Comments From NYSDOT

The Department of Transportation of the State of New York (NYSDOT) submitted several comments generally calling for more stringent regulations than the guidelines in the present policy. NYSDOT questioned the reliability of the results of the 1992–1993 FRA bridge survey because the FRA track inspectors who conducted the survey are not licensed structural engineers. FRA personnel did not themselves inspect or evaluate the bridges included in the survey. Rather, they observed the railroads' inspectors and engineers conducting the inspections and making the evaluations. They reported their findings in the manner which FRA trained them to use for this project, and an FRA professional bridge engineer, who is licensed and registered in the State of New York, analyzed the data. The FRA track inspectors did not engage in formulating any engineering decisions.

In response to FRA's statement that its bridge survey showed that there have been no fatalities caused by the structural failure of a railroad bridge, NYSDOT stated that it had information concerning a fatality that occurred when a railroad bridge failed in 1976. In a review of the accident records for 1976, FRA found one instance in which a locomotive engineer in Iowa was fatally injured when a railroad trestle was washed out in a flood. The accident was reported to FRA as having been caused by a flood or washout, and not a bridge failure. Upon review of the record, FRA finds that the accident was caused by damage to the bridge by outside sources and not by the structural failure of the bridge.

NYSDOT also responded to FRA's report that 11 of 19 train accidents on bridges occurring since 1983 were caused by external damage to the bridges from wash-outs or from collisions of marine vessels. According to NYSDOT, these accidents should be counted as accidents caused by bridge failure. FRA disagrees. FRA believes that it could perform a more precise analysis of the data by distinguishing between accidents caused by external damage to bridges and accidents resulting from failure of bridges to withstand normal service loads. The Federal Track Safety Standards already address floods and wash-outs by requiring railroads to properly maintain drainage facilities under and adjacent to roadbeds, including bridges. See 49 CFR 213.33.

The Track Safety Standards also require in 49 CFR 213.239 that railroads perform special inspections following floods, fire, severe storms, or other occurrences that might have damaged track structure. FRA considers any damage to the track or its supporting structures, including bridges, that renders the track incapable of safely carrying its traffic loads, to come under the provisions of this section of the Track Safety Standards.

NYSDOT commented that railroad bridges, many of which were designed to carry heavy steam locomotives, are now severely loaded by modern 100-ton capacity cars. FRA has found that the railroads understand the phenomenon of structural fatigue and its effect on the longevity of steel structures. Railroads have the advantage of controlling the loads they operate over their bridges, and in most cases, they can determine the loading history of a bridge with sufficient accuracy to permit a valid fatigue evaluation.

NYSDOT commented that FRA does not maintain quantitative data on the nation's railroad bridges, unlike highway agencies which keep detailed quantitative data on highway bridges. Highway agencies need to gather detailed information on those bridges because they are fully responsible for their construction, inspection, maintenance, repair, and safety. However, in the railroad industry, the railroads are responsible for the bridges they own or operate, and they maintain the information necessary for the fulfillment of that responsibility. FRA owns no bridges, and generally does not fund bridge maintenance or construction. The agency therefore does not have the need to expend resources to collect and maintain detailed quantitative data that would duplicate information held by the railroads themselves.

NYSDOT commented that FRA should issue regulations mandating certain requirements for bridge inspection programs. These requirements would include specifications for

(1) Diving inspections at set periods,
(2) levels of inspection for various types of bridges and bridge components,
(3) qualifications and training of inspection personnel, and
(4) historical information to be provided to bridge inspectors.

FRA does not believe that such regulations are warranted. Rather, these points of concern should be addressed in the guidelines, with the manner of execution left to the determination of the engineer engaged by the bridge owner. FRA believes that specific inspection criteria are best determined on a bridge-by-bridge basis. FRA further believes that it can adequately address individual bridge problems as they arise by exercising its existing safety authority.

An example is FRA Emergency Order No. 19 against the Tonawanda Island Railroad bridge in which NYSDOT assisted FRA in collecting information to address specific problems on one particular railroad bridge that was in very poor condition and under highly unusual circumstances. Another example is FRA Emergency Order No. 22 against the Oregon Pacific Railroad. Before issuing that emergency order, FRA, with the help of the Oregon Department of Transportation, gathered information about serious defects in the bridge structure and well as the inadequate repairs the railroad had already made to the bridge.

Differences Between Interim and Final Policies
In addition to the editorial modifications described under the section ''Public Participation,'' as well as other slight editorial modifications, FRA has added three references to earthquakes and seismic activity to reflect recent advances in railroad bridge engineering related to seismic design. This addition is intended to call attention to potential risks to railroad bridges posed by seismic activity in the United States. FRA also has clarified in paragraph (b) of Section 1, ''Responsibility for safety of railroad bridges,'' who is responsible for railroad bridge safety when the owner of the track on a bridge is not the owner of the bridge itself.

Regulatory Impact
Executive Order 12866 and DOT Regulatory Policies
This statement of policy has been evaluated in accordance with existing regulatory policies. It is considered to be a nonsignificant regulatory action under E.O. 12866 and is a nonsignificant rule under 5(a)(4) of DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979) because it is advisory only and does not carry with it the force of law or regulation. For nonsignificant rules, the DOT Regulatory Policies and Procedures ordinarily require an economic evaluation to be placed in the public docket. This evaluation should include an analysis of the economic consequences of the rule, including (if possible) an estimation of the cost and benefits of the rule to the private sector, consumers, and all levels of government. However, such an evaluation is not required if the expected impact of a rule is deemed minimal. Because this statement of policy offers only guidelines to be followed and does not mandate any actions or establish any record keeping requirements, the need for further cost/ benefit analysis is not indicated.

Regulatory Flexibility Act
Because this statement of policy is advisory in nature and does not carry with it the force of law or regulation, analysis of it under the Regulatory Flexibility Act (5 U.S.C. 601, *et seq.*) is not required. Nevertheless, in reviewing the economic impact of this statement of policy, FRA concluded that it will not have any measurable impact on small entities. There are no direct or indirect economic impacts for small units of government, businesses, or other organizations. Therefore, it is certified that this policy statement will not have a significant economic impact on a substantial number of small entities under the provisions of the Regulatory Flexibility Act.

Small Business Regulatory Enforcement Fairness Act of 1996
Because an analysis under the Regulatory Flexibility Act is not required for the final statement of policy, FRA is likewise not required to issue a Small Entity Compliance Guide to summarize the requirements of this rule, pursuant to section 212 of the Small Business Regulatory Enforcement Fairness Act of 1996 (Pub. L. 104–121). *Paperwork Reduction Act* There are no information collection requirements contained in this statement of policy. *Environmental Impact* FRA has evaluated this statement of policy in accordance with its procedures for ensuring full consideration of the potential environmental impacts of FRA actions, as required by the National Environmental Policy Act (42 U.S.C. 4321 *et seq.*) and related directives. This notice meets the criteria that establish this as a non-major action for environmental purposes.

Federalism Implications
FRA undertook the survey of railroad bridges because of a perception that the nation's railroad bridges are aging and may pose a significant hazard to public safety. Following the survey, FRA concluded that the vast majority of such bridges across the nation are adequately maintained and do not present a threat to safety. This conclusion is not based upon an assessment of railroad bridge safety for any particular location, nor does it imply that every railroad bridge in every state meets the minimum guidelines. Therefore, it is FRA's intent that this statement of policy should not preclude any state from addressing safety issues concerning railroad bridges within that state.

In stating its intent that this policy statement should not preempt regulatory actions by states, FRA is adhering to the principles of Executive Order 13132 issued on August 4, 1999, which directs Federal agencies to exercise great care in establishing policies that have federalism implications. See 64 FR 43,255. Section 3(a) of the Executive Order requires Federal agencies to ‘‘closely examine the constitutional and statutory authority supporting any action that would limit the policymaking discretion of States and ***carefully assess the necessity for such action.’’ In Section 3(b), the Executive Order continues, ‘‘National action limiting the policymaking discretion of the States shall be taken only where there is constitutional and statutory authority for the action and the national activity is appropriate in light of the presence of a problem of national significance.’’ Of course, FRA has the constitutional and statutory authority to issue guidelines addressing railroad bridge safety, but the agency has not found a ‘‘problem of national significance’’ of such a dimension to warrant limiting state policymaking discretion in addressing the same subject matter. In light of this conclusion, a Federalism Assessment pursuant to Executive Order 13132 is not required. Nevertheless, FRA has prepared a short Federalism analysis which resides in the docket reserved for this proceeding.

For railroad operations to be conducted safely, the structural integrity of bridges that carry railroad track must be properly maintained. FRA's research reveals that the railroad industry does not have a systemic bridge safety problem. For that reason, FRA adopts a safety policy, rather than regulations, to effect and maintain railroad bridge safety.

List of Subjects in 49 CFR Part 213
Penalties, Railroad Safety, Railroads

Amend Part 213 to read as follows:
PART 213—TRACK SAFETY STANDARDS
1. The authority citation for part 213 is revised to read as follows:
Authority: 49 U.S.C. 20102–20114 and 20142; 28 U.S.C. 2461; and 49 CFR1.49(m).

2. A new Appendix C is added to part 213 to read as follows:
Appendix C to Part 213—Statement of Agency Policy on the Safety of Railroad Bridges
1. The structural integrity of bridges that carry railroad tracks is important to the safety of railroad employees and to the public. The responsibility for the safety of railroad bridges rests with the owner of the track carried by the bridge, together with any other party to whom that responsibility has been assigned by the track owner.
2. The capacity of a bridge to safely support its traffic can be determined only by intelligent application of engineering principles and the laws of physics. Bridge owners should use, as FRA does, those principles to assess the integrity of railroad bridges.
3. The long term ability of a structure to perform its function is an economic issue beyond the intent of this policy. In assessing a bridge's structural condition, FRA focuses on the present safety of the structure, rather than its appearance or long term usefulness.
4. FRA inspectors conduct regular evaluations of railroad bridge inspection and management practices. The objective of these evaluations is to document the practices of the evaluated railroad and to disclose any program weaknesses that could affect the safety of the public or railroad employees. When the evaluation discloses problems, FRA seeks a cooperative resolution. If safety is jeopardized by a bridge owner's failure to resolve a bridge problem, FRA will use available legal means, including issuance of emergency orders, to protect the safety of railroad employees and the public.
5. This policy statement addresses the integrity of bridges that carry railroad tracks. It does not address the integrity of other types of structures on railroad property (i.e., tunnels or bridges carrying highways) or other features over railroads (i.e., highway overpasses).
6. The guidelines published in this statement are advisory, rather than regulatory, in nature. They indicate those elements FRA deems essential to successful bridge management programs. FRA uses the guidelines when evaluating bridge inspection and management practices.

Guidelines

1. Responsibility for safety of railroad bridges
(a) **Track owner.** The owner of the track on a bridge, or another person assuming responsibility for the compliance of that track with this Part under provisions of § 213.5, is responsible for ensuring that the bridge is capable of safely carrying all railroad traffic operated on that track, and for specifying the maximum loads that may be operated over the bridge.
(b) **Divided ownership.** Where the owner of the track on a bridge does not own the bridge, the track owner should ensure that the bridge owner is following a program that will maintain the integrity of the bridge. The track owner either should participate in the inspection of the bridge, or should obtain and review reports of inspections performed by the bridge owner. The track owner should maintain current information regarding loads that may be operated over the bridge, either from its own engineering evaluations or as provided by a competent engineer representing the bridge owner. Information on permissible loads may be communicated by the bridge owner either in terms of specific car and locomotive configurations and weights, or as values representing a standard railroad bridge rating reference system. The most common standard bridge rating reference system incorporated in the Manual for Railway Engineering of the American Railway Engineering and Maintenance of Way Association is the dimensional and proportional load configuration devised by Theodore Cooper. Other reference systems may be used where convenient, provided their effects can be defined in terms of shear, bending and pier reactions as necessary for a comprehensive evaluation and statement of the capacity of a bridge.
(c) **Other railroads.** The owner of the track on a bridge should advise other railroads operating on that track of the maximum loads permitted on the bridge stated in terms of car and locomotive configurations and weights. No railroad should operate a load which exceeds those limits without specific authority from, and in accordance with restrictions placed by, the track owner.

2. Capacity of Railroad Bridges
(a) **Determination.** The safe capacity of bridges should be determined by competent engineers using accepted principles of structural design and analysis.
(b) **Analysis.** Proper analysis of a bridge means knowledge of the actual dimensions, materials and properties of the structural members of the bridge, their condition, and the stresses imposed in those members by the service loads.
(c) **Rating.** The factors which were used for the design of a bridge can generally be used to determine and rate the load capacity of a bridge provided: (i) The condition of the bridge has not changed significantly, and (ii) The stresses resulting from the service loads can be correlated to the stresses for which the bridge was designed or rated.

3. Railroad Bridge Loads
(a) **Control of loads.** The operating instructions for each railroad operating over bridges should include provisions to restrict the movement of cars and locomotives whose weight or configuration exceed the nominal capacity of the bridges.
(b) **Authority for exceptions.** Equipment exceeding the nominal weight restriction on a bridge should be operated only under conditions determined by a competent engineer who has properly analyzed the stresses resulting from the proposed loads.
(c) **Operating conditions.** Operating conditions for exceptional loads may include speed restrictions, restriction of traffic from adjacent multiple tracks, and weight limitations on adjacent cars in the same train.

4. Railroad Bridge Records
(a) The organization responsible for the safety of a bridge should keep design, construction, maintenance and repair records readily accessible to permit the determination of safe loads. Having design or rating drawings and calculations that conform to the actual structure greatly simplifies the process of making accurate determinations of safe bridge loads. (b) Organizations acquiring railroad property should obtain

original or usable copies of all bridge records and drawings, and protect or maintain knowledge of the location of the original records.

5. Specifications for Design and Rating of Railroad Bridges
(a) The recommended specifications for the design and rating of bridges are those found in the *Manual for Railway Engineering* published by the American Railway Engineering and Maintenance-of-way Association. These specifications incorporate recognized principles of structural design and analysis to provide for the safe and economic utilization of railroad bridges during their expected useful lives. These specifications are continually reviewed and revised by committees of competent engineers. Other specifications for design and rating, however, have been successfully used by some railroads and may continue to be suitable.
(b) A bridge can be rated for capacity according to current specifications regardless of the specification to which it was originally designed.

6. Periodic Inspections of Railroad Bridges
(a) Periodic bridge inspections by competent inspectors are necessary to determine whether a structure conforms to its design or rating condition and, if not, the degree of nonconformity.
(b) The prevailing practice throughout the railroad industry is to inspect railroad bridges at least annually. Inspections at more frequent intervals may be indicated by the nature or condition of a structure or intensive traffic levels.

7. Underwater Inspections of Railroad Bridges
(a) Inspections of bridges should include measuring and recording the condition of substructure support at locations subject to erosion from moving water.
(b) Stream beds often are not visible to the inspector. Indirect measurements by sounding, probing, or any other appropriate means are necessary in those cases. A series of records of those readings will provide the best information in the event unexpected changes suddenly occur. Where such indirect measurements do not provide the necessary assurance of foundation integrity, diving inspections should be performed as prescribed by a competent engineer.

8. Seismic Considerations
(a) Owners of bridges should be aware of the risks posed by earthquakes in the areas in which their bridges are located. Precautions should be taken to protect the safety of trains and the public following an earthquake.
(b) Contingency plans for seismic events should be prepared in advance, taking into account the potential for seismic activity in an area.
(c) The predicted attenuation of ground motion varies considerably within the United States. Local ground motion attenuation values and the magnitude of an earthquake both influence the extent of the area affected by an earthquake. Regions with low frequency of seismic events produce less data from which to predict attenuation factors. That uncertainty should be considered when designating the area in which precautions should be taken following the first notice of an earthquake. In fact, earthquakes in such regions might propagate their effects over much wider areas than earthquakes of the same magnitude occurring in regions with frequent seismic activity.

9. Special Inspections of Railroad Bridges
(a) A special bridge inspection should be performed after an occurrence that might have reduced the capacity of the bridge, such as a flood, an earthquake, a derailment, or an unusual impact.
(b) When a railroad learns that a bridge might have suffered damage through an unusual occurrence, it should restrict train operations over the bridge until the bridge is inspected and evaluated.

10. Railroad Bridge Inspection Records
(a) Bridge inspections should be recorded. Records should identify the structure inspected, the date of the inspection, the name of the inspector, the components inspected, and their condition.

(b) Information from bridge inspection reports should be incorporated into a bridge management program to ensure that exceptions on the reports are corrected or accounted for. A series of inspection reports prepared over time should be maintained so as to provide a valuable record of trends and rates of degradation of bridge components. The reports should be structured to promote comprehensive inspections and effective communication between an inspector and an engineer who performs an analysis of a bridge.
(c) An inspection report should be comprehensible to a competent person without interpretation by the reporting inspector.

11. Railroad Bridge Inspectors and Engineers

(a) Bridge inspections should be performed by technicians whose training and experience enable them to detect and record indications of distress on a bridge. Inspectors should provide accurate measurements and other information about the condition of the bridge in enough detail so that an engineer can make a proper evaluation of the safety of the bridge.
(b) Accurate information about the condition of a bridge should be evaluated by an engineer who is competent to determine the capacity of the bridge. The inspector and the evaluator often are not the same individual. The quality of the bridge evaluation depends on the quality of the communication between them.

12. Scheduling Inspections

(a) A bridge management program should include a means to ensure that each bridge under the program is inspected at the frequency prescribed for that bridge by a competent engineer.
(b) Bridge inspections should be scheduled from an accurate bridge inventory list that includes the due date of the next inspection.

13. Special Considerations for Railroad Bridges

Railroad bridges differ from other types of bridges in the types of loads they carry, in their modes of failure and indications of distress, and in their construction details and components. Proper inspection and analysis of railroad bridges require familiarity with the loads, details and indications of distress that are unique to this class of structure. Particular care should be taken that modifications to railroad bridges, including retrofits for protection against the effects of earthquakes, are suitable for the structure to which they are to be applied. Modifications should not adversely affect the serviceability of the bridge nor its accessibility for periodic or special inspection.

Issued in Washington, DC on August 22, 2000.
Jolene M. Molitoris,
Administrator.
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Large Railroad Assignments by Region. 1998 (Subject to change in future years)

Class I **Region**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Conrail		2						
CSXT			3					
Norfolk Southern			3					
Canadian Pacific (SOO)				4				
Canadian National (GTW)				4				
Illinois Central (+ CC)				4				
Burlington Northern & Santa Fe					5			
Kansas City Southern (+GWWR)						5		
Union Pacific						5		
Passenger Railroads								
Metro North (New York)	1							
Long Island Rail Road	1							
New Jersey Transit Rail Operations	1							
Amtrak		2						
SEPTA (Philadelphia)		2						
Tri-Rail (Florida)			3					
METRA (Chicago)				4				
NICTD (Northern Indiana)				4				
SCRRD (Los Angeles)							6	
Large Regional Railroads								
Guilford Transportation Industries	1							
St. Lawrence & Hudson (CP)(D&H)	1							
Buffalo & Pittsburgh		2						
Florida East Coast			3					
Wisconsin Central				4				
RailTex Roads					5			
I&M Rail Link						6		
Iowa Interstate						6		
Montana Rail Link								8
Dakota, Minnesota & Eastern								8

FEDERAL RAILROAD ADMINISTRATION

Office of Safety

Bridge Observation Report Format

RR Code *1.a* ________ RR Name *1.b* ____________________

Division *1.c* ________ Subdivn *1.d* ____________________

Bridge No. *2.a* ________ Section *2.b* _________ of *2.c* _________ Sections.

FRA/USCG Waterway Bridge key no. *3.a* ____________________ River Mile *3.b* _____

Crossing 3.c ____________________ **O**ver/**U**nder *3.d* _ track.

Highway, stream, railroad, etc.

City *4.a* ____________________ State *4.b* _____ RR Milepost *4.c* _____________

Geographic Coordinates: Latitude *4.d* ___________ North, Longitude *4.e* ___________ West

Type: Superstructure *5.a* ____________________ Substructure *5.b* _____________ Deck *5.c* ____________

Principal materials *5.d* __________________ Walkway(s) **(R** / **L** Side(s) / **C**enter**)** *5.e* _____________

Number of spans *6.a* ___________ Total length *6.b* ________ ft. Longest span *6.c* ___________________ ft.

Dates of *7.a* ________ *7.b* ____________ No. tracks *7.c* __________ *7.d* ____

Original construction Major modifications Now Originally

Maximum authorized train speed: Freight *8.a* _____________ mph. Passenger *8.b* ___ mph.

Loads permitted by timetable or bulletin *8.c* ____________________

Other load or speed restrictions *8.d* ____________________

Inspected *9.a* ________________ times per *9.b* _________ by Owner / Others: *9.c* ____________________

Date of last previous inspection *9.d* ____________________

Comments, exceptions, notes, sketches (use additional pages as necessary) *10.* ____________________

____

Attachments *11.* ____________________

List here or enter NONE

R.R. Copy received by *12.a* ____________________ *12.b* ______

Railroad representative - signature and title Date

Associated Inspection Report *12.c* ____________________ *12.d* ___________ *12.e* ______

Inspector's ID Report number Date

FRA Inspector *12.f* ____________________ *12.g* ___________ *12.h* ______

Inspector's Signature Inspector's ID Date

Format for Electronic Reporting of Bridge Observations.

FEDERAL RAILROAD ADMINISTRATION

Office of Safety Assurance & Compliance - Bridge Observation Report Format

Instructions:

This is a WordPerfect keyboard merge file for entry of data on railroad bridge observations. It contains merge codes that will prompt you for an entry into each field in the report. When you enter a value, for a field, it not only shows up on the page you are working, but in a list of fields at the end of the document. The resulting file will have both a filled-out form that can be given to a railroad representative or read by anyone, and an attached list of field names and field values for automated entry into a data base.

To begin data entry, open this file in WordPerfect. You should have a "Merge File" toolbar at the top of the view. Click on Merge and a "Perform Merge" window appears, with the default options, which should be:

Form File -> Current document
Data source -> None
Output -> New document

Again click on Merge and the process begins, field by field.

The entry fields follow the names and order of the hard-copy Bridge Observation Report, so if you have completed that form manually, the same values should be entered here, in order. You may enter blank values in most fields, so if there is nothing to enter, press ENTER and move on to the next field.

When each field has been presented for entry the merge process is over and you have a fresh document to save in WordPerfect format. Give the document any name you want, so long as it is different from all others, and save it. You may then edit the document as any WordPerfect document, but be sure that any changes in the first form are reflected in the corresponding fields in the data base entry section. Be CAREFUL not to erase any of the arrows (>) in the data base entry section. They are used to separate field names and field values in the conversion process. DO NOT change the field names, or any of the characters to the left of the > in the data base entry section.

The names of four fields near the end of the report are marked with aterisks * . These fields are:

Inspector's ID*
Associated Inspection Report Number*
Report Year*
Report Line Number*

These key fields will make each bridge observation report unique, and key it to the Inspectors' regular inspection report. Since inspection report numbers begin over each year, we need the year of the report series. In order to permit more than one bridge observation on a regular inspection report, the line number field was added to this format, so the line number should be different for each bridge observation on one track inspection report.

To see the merge codes, click on Options in the merge feature bar, and select Display Codes. Before entering data, use Hide Codes to clear them out of the display.

FEDERAL RAILROAD ADMINISTRATION
Office of Safety - Bridge Observation Report Format

Railroad Information

RR Code	*1.a*	
RR Name	*1.b*	
RR Division	*1.c*	
RR Subdivision	*1.d*	

Bridge Identification

Bridge No.	*2.a*	
Section	*2.b*	
No. of Sections	*2.c*	

FRA/USCG Waterway Bridge Information

Bridge Key No.	*3.a*	
River Mile	*3.b*	

Crossing

Feature	*3.c*	
Over/Under	*3.d*	

Location

City	*4.a*	
State	*4.b*	
RR Milepost	*4.c*	

Geographic Coordinates

Latitude	*4.d*	
Longitude	*4.e*	

Structure Type

Superstructure	*5.a*	
Substructure	*5.b*	
Deck	*5.c*	
Materials	*5.d*	
Walkway(s)	*5.e*	
Moveable Type	*5.f*	

Dimensions of this section of bridge

Number of spans	*6.a*	
Total length	*6.b*	ft
Longest span	*6.c*	ft.

History

Construction date	*7.a*	
Modification date	*7.b*	
No. tracks now	*7.c*	
Orig. no. of tracks	*7.d*	

Operation

Maximum authorized train speed:

Freight *8.a*

Passenger *8.b*

Loads permitted by timetable or bulletin *8.c*

Other load or speed restrictions *8.d* ___

Inspection program

Inspected *9.a* ___times

per *9.b*

by Owner/Others *9.c*

Date of last previous inspection *9.d*

Comments, exceptions, notes, sketches (use additional pages as necessary)

10.

Attachments

11.

R.R. Copy received by *12.a* ______________________________

Railroad representative - signature and title

12.b ______________________

Date

Inspector's ID* *12.c*

Associated Inspection Report No.* *12.d*

Inspection Date *12.e*

FRA Inspector *12.f* ______________________________

Inspector's Signature

12.g ______________________

Inspector's ID

Report date *12.h*

Report year* *12.i*

Report line number* *12.j*

Names of Fields in Data File:

12.c. >INSP_ID>
12.i. >YEAR>
12.d. >REPORT_NR>
12.j. >LINE_NR>
1.a. >RR_CODE>
1.c. >RR_DIVN>
1.d. >RR_SUB_DIVN>
2.a. >BRIDGE_NR>
4.c. >RR_MILE>
2.b. >SECT_NR>
2.c. >NR_SECTS>
3.a. >H2O_KEY>
3.b. >RIVER_MILE>
5.f. >MOVE_TYPE>
3.c. >CROSSING>
3.d. >O/U>
4.a. >CITY>
4.b. >STATE>
4.d. >LAT_DEG>
>LAT_MIN>
>LAT_SEC>
4.e. >LON_DEG>
>LON_MIN>
>LON_SEC>
5.a. >TYPE_SUPER>
5.b. >TYPE_SUB>
5.c. >TYPE_DECK>
5.d. >MATERIAL>
5.e. >WALKWAYS>
6.a. >NR_SPANS>
6.b. >TOTAL_LEN>
6.c. >LONG_SPAN>
7.a. >DATE_ORIG>
7.b. >DATE_MODS>
7.c. >TKS_NOW>
7.d. >TKS_ORIG>
8.c. >MAX_LOADS>
8.a. >MAX_SPD_FRT>
8.b. >MAX_SPD_PSGR>
8.d. >OTHER_RESTRICTIONS>
9.a. >INSP_FREQ>
9.b. >INSP_PERIOD>
9.c. >INSP_BY>
9.d. >LAST_INSP>
11. >ATTACHMENTS>
12.e. >INSP_DATE>
12.h. >REPORT_DATE>
>ToSend>
>Forwarded>
10. >COMMENTS>

End of Chapter 7

Appendix A, Table 1 - Three-Inch Unbalance Table													
Degree of Curvature	Elevation in Inches												
	0	1/2	1	1-1/2	2	2-1/2	3	3-1/2	4	4-1/2	5	5-1/2	6
	Maximum allowable operating speed (m.p.h.)												
0°30'	93	100	107	113	120	125	131	136	141	146	151	156	160
0°40'	80	87	93	98	103	109	113	118	122	127	131	135	139
0°50'	72	78	83	88	93	97	101	106	110	113	117	121	124
1°00'	66	71	76	80	85	89	93	96	100	104	107	110	113
1°15'	59	63	68	72	76	79	83	86	89	93	96	99	101
1°30'	54	58	62	66	69	72	76	79	82	85	87	90	93
1°45'	50	54	57	61	64	67	70	73	76	78	81	83	86
2°00'	46	50	54	57	60	63	66	68	71	73	76	78	80
2°15'	44	47	50	54	56	59	62	64	67	69	71	74	76
2°30'	41	45	48	51	54	56	59	61	63	66	68	70	72
2°45'	40	43	46	48	51	54	56	58	60	62	65	66	68
3°00'	38	41	44	46	49	51	54	56	58	60	62	64	66
3°15'	36	39	42	45	47	49	51	54	56	57	59	61	63
3°30'	35	38	40	43	45	47	50	52	54	55	57	59	61
3°45'	34	37	39	41	44	46	48	50	52	54	55	57	59
4°00'	33	35	38	40	42	44	46	48	50	52	54	55	57
4°30'	31	33	36	38	40	42	44	45	47	49	50	52	54
5°00'	29	32	34	36	38	40	41	43	45	46	48	49	51
5°30'	28	30	32	34	36	38	40	41	43	44	46	47	48
6°00'	27	29	31	33	35	36	38	39	41	42	44	45	46
6°30'	26	28	30	31	33	35	36	38	39	41	42	43	45
7°00'	25	27	29	30	32	34	35	36	38	39	40	42	43
8°00'	23	25	27	28	30	31	33	34	35	37	38	39	40
9°00'	22	24	25	27	28	30	31	32	33	35	36	37	38
10°00'	21	22	24	25	27	28	29	31	32	33	34	35	36
11°00'	20	21	23	24	26	27	28	29	30	31	32	33	34
12°00'	19	20	22	23	24	26	27	28	29	30	31	32	33

Appendix A, Table 2 - Four-Inch Unbalance Table													
Degree of Curvature	Elevation in Inches												
	0	1/2	1	1-1/2	2	2-1/2	3	3-1/2	4	4-1/2	5	5-1/2	6
	Maximum allowable operating speed (m.p.h.)												
0°30'	107	113	120	125	131	136	141	146	151	156	160	165	169
0°40'	93	98	104	109	113	118	122	127	131	135	139	143	146
0°50'	83	88	93	97	101	106	110	113	117	121	124	128	131
1°00'	76	80	85	89	93	96	100	104	107	110	113	116	120
1°15'	68	72	76	79	83	86	89	93	96	99	101	104	107
1°30'	62	65	69	72	76	79	82	85	87	90	93	95	98
1°45'	57	61	64	67	70	73	76	78	81	83	86	88	90
2°00'	53	57	60	63	65	68	71	73	76	78	80	82	85
2°15'	50	53	56	59	62	64	67	69	71	73	76	78	80
2°30'	48	51	53	56	59	61	63	65	68	70	72	74	76
2°45'	46	48	51	53	56	58	60	62	64	66	68	70	72
3°00'	44	46	49	51	53	56	58	60	62	64	65	67	69
3°15'	42	44	47	49	51	53	55	57	59	61	63	65	66
3°30'	40	43	45	47	49	62	50	55	57	59	61	62	64
3°45'	39	41	44	46	48	50	52	53	55	57	59	60	62
4°00'	38	40	42	44	46	48	50	52	53	55	57	58	60
4°30'	36	38	40	42	44	45	47	49	50	52	53	55	56
5°00'	34	46	38	40	41	43	45	46	48	49	51	52	53
5°30'	32	34	36	38	39	41	43	44	46	47	48	50	51
6°00'	31	33	35	36	38	39	41	42	44	45	46	48	49
6°30'	30	31	33	35	36	38	39	41	42	43	44	46	47
7°00'	29	30	32	34	35	36	38	39	40	42	43	44	45
8°00'	27	28	30	31	33	34	35	37	38	39	40	41	42
9°00'	25	27	28	30	31	32	33	35	36	37	38	39	40
10°00'	24	25	27	28	29	30	32	33	34	35	36	37	38
11°00'	23	24	25	27	28	29	30	31	32	33	34	35	36
12°00'	22	23	24	26	27	28	29	30	31	32	33	34	35

Appendix B, Table 1 - Top 20 Track Causes of Derailments Main Tracks 1995 through 2000			
Cause	Count	Percent	Damage
Wide gage(defective/missing crossties)	207	11.1	14,580,525
Track alignment irreg(buckled/sunkink)	173	9.2	47,110,448
Transverse/compound fissure	156	8.3	44,233,342
Cross level track irreg.(not at joints)	120	6.4	15,153,594
Cross level of track irregular(joints)	114	6.1	11,008,549
Detail fracture - shelling/head check	108	5.8	41,643,178
Broken base of rail	98	5.2	28,083,420
Vertical split head	89	4.8	23,033,089
Switch point worn or broken	86	4.6	4,891,217
Roadbed settled or soft	75	4	13,289,480
Head and web sep(outside jt bar limit)	63	3.4	13,113,570
Other rail and joint bar defects	57	3	20,381,752
Trk alignmnt irreg-not buckled/sunkink	39	2.1	7,454,822
Joint bar broken (noninsulated)	34	1.8	19,216,520
Worn rail	31	1.7	5,329,433
Wide gage(spikes/other rail fasteners)	30	1.6	2,988,484
Other track geometry defects	29	1.5	2,551,601
Washout/rain/slide/etc. dmg -track	28	1.5	8,293,803
Superelevation improper, excessive,etc.	27	1.4	4,260,246
Broken weld (field)	26	1.4	16,371,956

Appendix B, Table 2 - Top 20 Track Causes of Derailments Yard Tracks 1995 through 2000			
Cause	Count	Percent	Damage
Wide gage(defective/missing crossties)	577	24	20,304,757
Switch point worn or broken	323	13.4	7,509,303
Broken base of rail	150	6.2	6,944,763
Switch damaged or out of adjustment	148	6.1	3,981,856
Transverse/compound fissure	125	5.2	5,224,571
Switch pt gap(btwn swt pt & stock rail)	106	4.4	2,927,237
Wide gage(spikes/other rail fasteners)	76	3.2	2,529,314
Head and web sep(outside jt bar limit)	76	3.2	2,773,009
T221- Vertical split head	73	3	3,031,659
T399- Oth frog, switch, trk appliance defect	56	2.3	1,477,332
T102- Cross level track irreg.(not at joints)	47	2	1,437,276
T207- Detail fracture - shelling/head check	43	1.8	1,778,465
T113- Wide gage (due to worn rails)	41	1.7	1,295,734
T299- Other rail and joint bar defects	41	1.7	933,455
T001- Roadbed settled or soft	38	1.6	1,383,367
T101- Cross level of track irregular(joints)	37	1.5	1,166,184
T199- Other track geometry defects	36	1.5	1,715,061
T205- Defective or missing crossties	33	1.4	1,083,138
T222- Worn rail	26	1.1	605,923
T305- Retarder worn, broken, malfunctioning	24	1	498,101

Appendix C - Track Class/Defect Code Matrix

Defect Codes		Track Class										
Code	Description	R	X	1	2	3	4	5	6	7	8	9
4.01	Excepted track segment not identified in appropriate record.	x										
4.02	Excepted track segment located within 30 feet of an adjacent track subject to simultaneous operation at speeds in excess of 10 mph.		x									
4.03	Excepted track not inspected in accordance with §213.233(c) and 213.235 as specified for Class 1 track.		x									
4.04	Train speed exceeds 10 mph on excepted track.		x									
4.05	Occupied passenger train operated on excepted track.		x									
4.06	Freight train operated on excepted track with more than five cars required to be placarded in accordance with 49 CFR Part 172.		x									
4.07	Train with a car required to be placarded by 49 CFR Part 172 operated over excepted track within 100 feet of a bridge or in a public street or highway.		x									
4.08	Failure to notify FRA of removal of trackage from excepted status.	x										
7.01	No written record of names of qualified persons to supervise restorations and renewals of track under traffic and/or to inspect track for defects, or to pass trains over broken rails or pull-aparts.	x										
7.02	Failure of track owner to provide written authorization to qualified designated individuals.	x										
7.03	Failure to use qualified person to pass trains over broken rails or pull aparts.		x	x	x	x	x	x				
7.04	Train speed exceeds 10 m.p.h. over broken rails or pull aparts.		x	x	x	x	x	x				
7.05	Failure to promptly notify and dispatch person fully qualified under §213.7 to the location of the broken rail or pull apart.			x	x	x	x	x				
9.01	Failure to restore other than excepted track to compliance with Class 1 stds. within 30 days after a person designated under §213.7(a) has determined that operations may safely continue over defect(s) not meeting Class 1 or excepted track stds.			x	x	x	x	x				
9.02	Failure of track owner to enforce, over Class 1 defects, the limiting conditions imposed by person designated under §213.7(a).		x									
9.03	Reserved.											
11.01	Proper qualified supervision not provided at work site during work hours when track is being restored or renewed under traffic conditions.		x	x	x	x	x	x				
33.01	Drainage or water-carrying facility not maintained.			x	x	x	x	x				
33.02	Drainage or water-carrying facility obstructed by debris.			x	x	x	x	x				
33.03	Drainage or water-carrying facility collapsed.			x	x	x	x	x				
33.04	Drainage or water-carrying facility obstructed by vegetation.			x	x	x	x	x				
33.05	Drainage or water-carrying facility obstructed by silting.			x	x	x	x	x				

Appendix C - Track Class/Defect Code Matrix

Defect Codes		Track Class										
Code	Description	R	X	1	2	3	4	5	6	7	8	9
33.06	Drainage or water-carrying facility deteriorated to allow subgrade saturation.			x	x	x	x	x				
33.07	Uncontrolled water undercutting track structure or embankment.			x	x	x	x	x				
37.01	Combustible vegetation around track-carrying structures.			x	x	x	x	x				
37.02	Vegetation obstructs visibility of railroad signs and fixed signals.			x	x	x	x	x				
37.03	Vegetation obstructs passing of day and night signals by railroad employees.			x	x	x	x	x				
37.04	Vegetation interferes with railroad employees performing normal trackside duties.			x	x	x	x	x				
37.05	Vegetation prevents proper functioning of signal and/or communication lines.			x	x	x	x	x				
37.06	Excessive vegetation at train order office, depot, interlocking plant, a carman's building, etc., prevents employees on duty from visually inspecting moving equipment when their duties so require.			x	x	x	x	x				
37.07	Excessive vegetation at train meeting points prevents proper inspection of moving equipment by railroad employees.			x	x	x	x	x				
37.08	Excessive vegetation in toepaths and around switches where employees are performing normal trackside duties.			x	x	x	x	x				
37.09	Vegetation brushing sides of rolling stock.			x	x	x	x	x				
37.10	Vegetation obstructs visibility of grade crossing warning signs and signals by the traveling public.			x	x	x	x	x				
53.01	Gage dimension exceeds allowable on tangent track.			x	x	x	x	x				
53.02	Gage dimension is less than allowable on tangent track.			x	x	x	x	x				
53.03	Gage dimension exceeds allowable on curved track.			x	x	x	x	x				
53.04	Gage dimension is less than allowable on curved track.			x	x	x	x	x				
53.05	Gage dimension exceeds allowable for excepted track.		x									
55.01	Alinement deviation of tangent track exceeds allowable.			x	x	x	x	x				
55.02	Alinement deviation of curved track exceeds allowable for a 62-foot chord.			x	x	x	x	x				
55.03	Alinement deviation of curved track exceeds allowable for a 31-foot chord.			x	x	x	x	x				
57.01	Reserved											
57.02	Operating speed exceeds allowable for 3-inches of unbalance, based on curvature and elevation.			x	x	x	x	x				
57.03	Operating speed exceeds allowable for 4-inches of unbalance, based on curvature and elevation.			x	x	x	x	x				
57.04	Operating speed exceeds allowable for a FRA approved unbalance based on curvature and elevation approved for track contiguous to high speed track.			x	x	x	x	x				
57.05	Reserved											
57.06	Maximum crosslevel on curve exceeds allowable.			x	x	x	x	x				

Appendix C - Track Class/Defect Code Matrix												
Defect Codes		Track Class										
Code	Description	R	X	1	2	3	4	5	6	7	8	9
63.01	Runoff in any 31-feet of rail at end of raise exceeds allowable.			x	x	x	x	x				
63.02	Deviation from uniform profile on either rail exceeds allowable.			x	x	x	x	x				
63.03	Reserved											
63.04	Reserved.											
63.05	Deviation from zero crosslevel at any point on tangent exceeds allowable.			x	x	x	x	x				
63.06	Reserved											
63.07	Difference in crosslevel between any two points less than 62-feet apart on tangents exceeds allowable.			x	x	x	x	x				
63.08	Difference in crosslevel between any two points less than 62-feet apart on curves between spirals exceeds allowable.			x	x	x	x	x				
63.09	Difference in crosslevel between any two points less than 62-feet apart on spirals exceeds allowable.			x	x	x	x	x				
63.10	Reverse elevation on curve exceeds allowable.			x	x	x	x	x				
63.11	Variation in crosslevel per 31-feet exceeds allowable on restricted length spiral.			x	x	x	x	x				
63.12	Difference in crosslevel within 62-feet between a point on a curve that equals or exceeds 6-inches and a point with greater elevation exceed allowable.			x	x	x	x	x				
63.13	Crosslevel differences for six or more consecutive pairs of staggered joints exceeds allowable.			x	x	x	x	x				
103.01	Insufficient Ballast			x	x	x	x	x				
103.02	Fouled Ballast			x	x	x	x	x				
109.01	Reserved											
109.02	No effective support ties within the prescribed distance from a joint.			x	x	x	x	x				
109.03	Crossties not effectively distributed to support a 39-foot segment of track.			x	x	x	x	x				
109.04	Fewer than minimum allowable number of non-defective ties per 39 feet for tangent and curved track less than 2 degrees. [used after 09/21/00]			x	x	x	x	x				
109.05	Fewer than minimum allowable number of non-defective ties per 39 feet for turnouts and curved track over 2 degrees. [used after 09/21/00]			x	x	x	x	x				
109.06	Track constructed without crossties does not effectively support track structure.			x	x	x	x	x				
110.01	Failure to notify FRA at least 30 days prior to the designation of a GRMS line segment.			x	x	x	x	x				
110.02	Failure to notify FRA at least 10 days prior to the removal of a line segment from GRMS designation.			x	x	x	x	x				
110.03	Failure to provide required information identifying a GRMS line segment.			x	x	x	x	x				
110.04	Failure to provide sufficient technical data to establish compliance with minimum GRMS design requirements.			x	x	x	x	x				
110.05	Failure to maintain and operate GRMS within minimum design requirements over designated GRMS line segments.			x	x	x	x	x				

Appendix C - Track Class/Defect Code Matrix

Defect Codes		Track Class										
Code	Description	R	X	1	2	3	4	5	6	7	8	9
110.06	Failure of GRMS to provide analog trace of specified parameters			x	x	x	x	x				
110.07	Failure of GRMS to provide exception report listing of specified parameters.			x	x	x	x	x				
110.08	Failure to provide exception report listing to § 213.7 individual prior to next inspection required under § 213.233.			x	x	x	x	x				
110.09	Failure to maintain and make available documented calibration procedures on GRMS vehicle.			x	x	x	x	x				
110.10	Failure to initiate a daily instrument verification procedure.			x	x	x	x	x				
110.11	Failure to maintain PTLF accuracy within five-percent of 4,000-pound reading.			x	x	x	x	x				
110.12	Failure to make available GRMS training program.			x	x	x	x	x				
110.13	Failure of GRMS training program to meet minimum requirements.			x	x	x	x	x				
110.14	Failure to provide GRMS training to § 213.7 individual whose territory is subject to requirements of § 213.110.			x	x	x	x	x				
110.15	Failure to initiate required remedial action for exceptions listed on GRMS record of lateral restraint.			X	x	x	x	x				
110.16	Gage widening exceeds allowable measured with PTLF.			x	x	x	x	x				
110.17	Failure to provide functional PTLF to § 213.7 individual whose territory is subject to requirements of § 213.110.			x	x	x	x	x				
110.18	Failure to restore contact between rail and lateral rail restraint components			x	x	x	x	x				
110.19	Failure to keep GRMS records as required.			x	x	x	x	x				
110.20	Failure to conduct GRMS inspections at required frequency.			x	x	x	x	x				
113.01	Transverse Fissure			x	x	x	x	x				
113.02	Compound Fissure			x	x	x	x	x				
113.03	Horizontal Split Head			x	x	x	x	x				
113.04	Vertical Split Head			x	x	x	x	x				
113.05	Split Web			x	x	x	x	x				
113.06	Piped Rail			x	x	x	x	x				
113.07	Bolt-Hole Crack			x	x	x	x	x				
113.08	Head Web Separation			x	x	x	x	x				
113.09	Broken Base			x	x	x	x	x				
113.10	Detail Fracture			x	x	x	x	x				
113.11	Engine Burn Fracture			x	x	x	x	x				
113.12	Ordinary Break			x	x	x	x	x				
113.13	Broken or Defective Weld			x	x	x	x	x				
113.14	Damaged Rail			x	x	x	x	x				
113.15	Flattened Rail			x	x	x	x	x				
115.01	Rail-end mismatch on tread of rail exceeds allowable.			x	x	x	x	x				
115.02	Rail-end mismatch on gage side of rail exceeds allowable.			x	x	x	x	x				
119.01	Failure of track owner to develop and implement written CWR procedures.			x	x	x	x	x				

Appendix C - Track Class/Defect Code Matrix													
Defect Codes		Track Class											
Code	Description	R	X	1	2	3	4	5	6	7	8	9
119.02	Failure to comply with written CWR procedures.			x	x	x	x	x				
119.03	Failure of track owner to develop a training program for the implementation of their written CWR procedures.			x	x	x	x	x				
119.04	Failure to keep CWR records as required.			x	x	x	x	x				
121.01	Rail joint not of structurally sound design and dimension.			x	x	x	x	x				
121.02	Cracked or broken joint bar in Classes 3 through 5 track (other than center-break).			x	x	x	x	x				
121.03	Center cracked or broken joint bar.			x	x	x	x	x				
121.04	Worn joint bar allows excessive vertical movement of rail in joint in Classes 3 through 5 track.			x	x	x	x	x				
121.05	Less than 2 bolts per rail at each joint for conventional jointed rail in Classes 2 through 5 track.			x	x	x	x	x				
121.06	Less than 1 bolt per rail at each joint for conventional jointed rail in Class 1 track.			x	x	x	x	x				
121.07	Less than 2 bolts per rail at any joint in continuous welded rail.			x	x	x	x	x				
121.08	Loose joint bars.			x	x	x	x	x				
121.09	Torch-cut or burned-bolt hole in rail in Classes 2 through 5 track.			x	x	x	x	x				
121.10	Joint bar reconfigured by torch cutting in Classes 3 through 5 track.			x	x	x	x	x				
122.01	Torch cut rail applied in Class 3 through 5 track for other than emergency.			x	x	x	x	x				
122.02	Failure to remove torch cut rails within specified time frame.			x	x	x	x	x				
122.03	Failure to remove non-inventoried torch cut rail within 30 days of discovery.			x	x	x	x	x				
122.04	Train speed exceeds allowable over non-inventoried torch cut rail.			x	x	x	x	x				
123.01	Insufficient tie plates in Class 3 through 5 track.			x	x	x	x	x				
123.02	Object between base of rail and the bearing surface of the tie plate causing concentrated load.			x	x	x	x	x				
127.01	Insufficient fasteners in a 39-foot track segment.			x	x	x	x	x				
133.01	Loose, worn, or missing switch clips.			x	x	x	x	x				
133.02	Loose, worn, or missing clip bolts (transit, side jaw, eccentric, vertical).			x	x	x	x	x				
133.03	Loose, worn, or defective connecting rod.			x	x	x	x	x				
133.04	Loose, worn, or defective connecting rod fastening.			x	x	x	x	x				
133.05	Loose, worn, or defective switch rod.			x	x	x	x	x				
133.06	Loose, worn, or missing switch rod bolts.			x	x	x	x	x				
133.07	Worn or missing cotter pins.			x	x	x	x	x				
133.08	Loose or missing rigid rail braces.			x	x	x	x	x				
133.09	Loose or missing adjustable rail braces.			x	x	x	x	x				
133.10	Missing switch, frog, or guard rail plates.			x	x	x	x	x				
133.11	Loose or missing switch point stops.			x	x	x	x	x				
133.12	Loose, worn, or missing frog bolts.			x	x	x	x	x				
133.13	Loose, worn, or missing guard rail bolts.			x	x	x	x	x				
133.14	Loose, worn or missing guard rail clamps, wedge, separator block, or end block.			x	x	x	x	x				

Appendix C - Track Class/Defect Code Matrix													
Defect Codes		Track Class											
		R	X	1	2	3	4	5	6	7	8	9
Code	Description												
133.15	Obstruction between switch point and stock rail.			x	x	x	x	x				
133.16	Obstruction in flangeway of frog.			x	x	x	x	x				
133.17	Obstruction in flangeway of guard rail.			x	x	x	x	x				
133.18	Insufficient anchorage to restrain rail movement.			x	x	x	x	x				
133.19	Flangeway less than 1 1/2 inches wide.			x	x	x	x	x				
135.01	Stock rail not securely seated in switch plates.			x	x	x	x	x				
135.02	Stock rail canted by overtightening rail braces.			x	x	x	x	x				
135.03	Improper fit between switch point and stock rail.			x	x	x	x	x				
135.04	Outer edge of wheel contacting gage side of stock rail.			x	x	x	x	x				
135.05	Excessive lateral or vertical movement of switch point.			x	x	x	x	x				
135.06	Heel of switch insecure.			x	x	x	x	x				
135.07	Insecure switch stand or switch machine.			x	x	x	x	x				
135.08	Insecure connecting rod.			x	x	x	x	x				
135.09	Throw lever operable with switch lock or keeper in place.			x	x	x	x	x				
135.10	Switch position indicator not clearly visible.			x	x	x	x	x				
135.11	Unusually chipped or worn switch point.			x	x	x	x	x				
135.12	Improper switch closure due to metal flow.			x	x	x	x	x				
135.13	Use of tongue and plane mate where speeds exceed class one			x	x	x	x	x				
137.01	Insufficient flangeway depth.			x	x	x	x	x				
137.02	Frog point chipped, broken, or worn in excess of allowable.			x	x	x	x	x				
137.03	Tread portion of frog worn in excess of allowable.			x	x	x	x	x				
137.04	Use of flange bearing frog where speed exceeds that permitted by Class 1.			x	x	x	x	x				
137.99	Severe frog condition not otherwise provided.			x	x	x	x	x				
139.01	Outer edge of wheel contacting side of spring wing rail.			x	x	x	x	x				
139.02	Toe of wing rail not fully bolted and tight.			x	x	x	x	x				
139.03	Ties under or wing rail not solidly tamped.			x	x	x	x	x				
139.04	Bolt-hole defect in frog.			x	x	x	x	x				
139.05	Head and web separation in frog.			x	x	x	x	x				
139.06	Insufficient tension in spring to hold wing rail against point rail.			x	x	x	x	x				
139.07	Excessive clearance between hold-down housing and horn.			x	x	x	x	x				
141.01	Raised guard worn excessively.			x	x	x	x	x				
141.02	Frog point rebuilt before restoring guarding face.			x	x	x	x	x				
143.01	Guard check gage less than allowable.			x	x	x	x	x				
143.02	Guard face gage exceeds allowable.			x	x	x	x	x				
143.03	Cracked or broken guard rail.			x	x	x	x	x				
205.01	Derail not clearly visible.			x	x	x	x	x				
205.02	Derail operable when locked.			x	x	x	x	x				
205.03	Reserved			x	x	x	x	x				
205.04	Improper size derail.			x	x	x	x	x				
205.05	Improperly installed derail.			x	x	x	x	x				
205.06	Loose, worn, or defective parts of derail.			x	x	x	x	x				

Appendix C - Track Class/Defect Code Matrix

Defect Codes		Track Class										
Code	Description	R	X	1	2	3	4	5	6	7	8	9
233.01	Track inspected by other than qualified designated individual.			x	x	x	x	x				
233.02	Track being inspected at excessive speed.		x	x	x	x	x	x				
233.03	Failure to inspect at required frequency.	x										
233.04	Failure to initiate remedial action for deviations found.	x	x	x	x	x	x	x				
233.05	One Inspector inspecting more than two tracks.	x	x	x	x	x	x	x				
233.06	Two Inspectors inspecting more than four tracks.	x	x	x	x	x	x	x				
233.07	Inspection performed on track outside of maximum allowable track center distances.	x	x	x	x	x	x	x				
233.08	Main track not traversed within the required frequency.	x										
233.09	Siding track not traversed within the required frequency.	x										
235.01	Failure to inspect turnouts at required frequency.	x										
235.02	Failure to inspect track crossings at required frequency.	x										
235.03	Failure to inspect lift rail assemblies or other transition devices on moveable bridges at required frequency	x										
235.04	Failure to operate specified switches in Classes 3 through 5.	x										
237.01	Failure to inspect rail for internal defects at required frequency.	x										
237.02	Failure of equipment to inspect rail at joints.			x	x	x	x	x				
237.03	Defective rail not marked properly.			x	x	x	x	x				
237.04	Failure to reduce operating speed until valid rail inspection is performed.			x	x	x	x	x				
239.01	Failure to conduct special inspections when required.			x	x	x	x	x				
241.01	Failure to keep records as required.	x										
241.02	Failure of Inspector to complete report at time of inspection.	x										
241.03	Failure of inspector to sign report.	x										
241.04	Failure of Inspector to provide required information.	x										
241.05	Failure of rail inspection record to provide required information.	x										
241.06	Failure to make records available for copying and inspection.	x										
241.07	Electronic system does not maintain the integrity of each record.	x										
241.08	Electronic system allows record or amendments to be modified.	x										
241.09	Electronic amendments not stored separately from record.	x										
241.10	Person making electronic amendment not identified.	x										
241.11	Electronic system corrupts or losses data.											
241.12	Paper copies of records not made available for inspection and copying.	x										
241.13	Inspection reports not available to Inspector or subsequent Inspectors.	x										
241.14	Electronic storage not initiated within 24 hours.	x										

Appendix C - Track Class/Defect Code Matrix

Defect Codes		Track Class										
Code	Description	R	X	1	2	3	4	5	6	7	8	9
305.01	No written record of names of qualified persons to supervise restorations and renewals of track under traffic and/or to inspect track for defects, or to pass trains over broken rails or pull-aparts, or to maintain or inspect CWR.	x										
305.02	Failure of track owner to provide written authorization to qualified designated individuals.	x										
305.03	Failure to use qualified person to pass trains over broken rails or pull aparts.			x	x	x	x	x	x	x	x	x
305.04	Train speed exceeds 10 m.p.h. over broken rails or pull aparts.			X	x	x	x	x	x	x	x	x
305.05	Failure to promptly notify and dispatch person fully qualified under §213.305 to the location of the broken rail or pull apart.			x	x	x	x	x	x	x	x	x
307.01	Train speed exceeds 200 mph without FRA approval.								x	x	x	x
307.02	Freight transported at passenger train speeds in unqualified vehicles.								x	x	x	x
307.03	Load distribution & securement in the freight vehicle adversely affects the dynamic performance of the vehicle or the axle loading pattern is not uniform & exceeds the passenger locomotive axle loadings in passenger trains at the same maximum speed.								x	x	x	x
307.04	Carrier accepted or transported a hazardous material defined in 49 CFR Part 171.8 which is not acceptable for movement.								x	x	x	x
307.05	Trains operated in excess of 150 mph not in conjunction with a Rule of Particular Applicability addressing other safety issues presented by the system.								x	x	x	x
309.01	Reserved											
309.02	Work performed during a period of restoration and renewal under traffic conditions which interrupts rail continuity.								x	x	x	x
309.03	Work performed during a period of restoration and renewal under traffic conditions which adversely affects track stability.								x	x	x	x
309.04	Removal and replacement of the rail fastenings on more than one tie at a time within 15 feet during a period of restoration and renewal under traffic conditions.								x	x	x	x
319.01	Drainage or water-carrying facility not maintained.								x	x	x	x
319.02	Drainage or water-carrying facility obstructed by debris.								x	x	x	x
319.03	Drainage or water-carrying facility collapsed.								x	x	x	x
319.04	Drainage or water-carrying facility obstructed by vegetation.								x	x	x	x
319.05	Drainage or water-carrying facility obstructed by silting.								x	x	x	x
319.06	Drainage or water-carrying facility deteriorated to allow subgrade saturation.								x	x	x	x
319.07	Uncontrolled water undercutting track structure or embankment.								x	x	x	x

Appendix C - Track Class/Defect Code Matrix

Defect Codes		Track Class										
Code	Description	R	X	1	2	3	4	5	6	7	8	9
321.01	Combustible vegetation around track-carrying structures.								x	x	x	x
321.02	Vegetation obstructs visibility of railroad signs and fixed signals.								x	x	x	x
321.03	Vegetation obstructs passing of day and night signals by railroad employees.								x	x	x	x
321.04	Vegetation interferes with railroad employees performing normal trackside duties.								x	x	x	x
321.05	Vegetation prevents proper functioning of signal and/or communication lines.								x	x	x	x
321.06	Excessive vegetation at train order office, depot, interlocking plant, a carman's building, etc., prevents employees on duty from visually inspecting moving equipment when their duties so require.								x	x	x	x
321.07	Excessive vegetation at train meeting points prevents proper inspection of moving equipment by railroad employees.								x	x	x	x
321.08	Excessive vegetation in toepaths and around switches where employees are performing normal trackside duties.								x	x	x	x
321.09	Vegetation brushing sides of rolling stock.								x	x	x	x
321.10	Vegetation obstructs visibility of grade crossing warning signs and signals by the traveling public.								x	x	x	x
323.01	Gage dimension exceeds allowable on tangent track.								x	x	x	x
323.02	Gage dimension is less than allowable on tangent track.								x	x	x	x
323.03	Gage dimension exceeds allowable on curved track.								x	x	x	x
323.04	Gage dimension is less than allowable on curved track.								x	x	x	x
323.05	Reserved								x	x	x	x
323.06	Gage variation within 31 feet exceeds allowable.								x	x	x	x
327.01	Reserved											
327.02	Reserved											
327.03	Reserved											
327.04	The alinement of track exceeds the allowable deviation for a 31-foot chord for a single deviation.								x	x	x	x
327.05	The alinement of track exceeds the allowable deviation for a 62-foot chord for a single deviation.								x	x	x	x
327.06	The alinement of track exceeds the allowable deviation for a 124-foot chord for a single deviation.								x	x	x	x
327.07	The alinement of track exceeds the allowable deviation for a 31-foot chord for three or more deviations.								x	x	x	x
327.08	The alinement of track exceeds the allowable deviation for a 62-foot chord for three or more deviations.								x	x	x	x
327.09	The alinement of track exceeds the allowable deviation for a 124-foot chord for three or more deviations.								x	x	x	x
329.01	Reserved											
329.02	Operating speed exceeds allowable for 3-inches of unbalance, based on curvature and elevation.								x	x	x	x

Appendix C - Track Class/Defect Code Matrix

Defect Codes		Track Class										
Code	Description	R	X	1	2	3	4	5	6	7	8	9
329.03	Reserved											
329.04	Reserved											
329.05	Operating speed exceeds allowable for a FRA approved unbalance based on curvature and elevation.								x	x	x	x
329.06	Maximum crosslevel on curve exceeds allowable.								x	x	x	x
331.01	Reserved											
331.02	Reserved											
331.03	Reserved											
331.04	Reserved											
331.05	Reserved											
331.06	Reserved											
331.07	Difference in crosslevel between any two points less than 62-feet apart on tangents exceeds allowable.								x	x	x	x
331.08	Difference in crosslevel between any two points less than 62-feet apart on curves between spirals exceeds allowable.								x	x	x	x
331.09	Difference in crosslevel between any two points less than 62-feet apart on spirals exceeds allowable.								x	x	x	x
331.10	Reserved											
331.11	Reserved											
331.12	Reserved											
331.13	Crosslevel differences for six or more consecutive pairs of staggered joints exceeds allowable								x	x	x	x
331.14	The profile of track exceeds the allowable deviation for a 31-foot chord for a single deviation.								x	x	x	x
331.15	The profile of track exceeds the allowable deviation for a 62-foot chord for a single deviation.								x	x	x	x
331.16	The profile of track exceeds the allowable deviation for a 124-foot chord for a single deviation.								x	x	x	x
331.17	The profile of track exceeds the allowable deviation for a 31-foot chord for three or more deviations.								x	x	x	x
331.18	The profile of track exceeds the allowable deviation for a 62-foot chord for three or more deviations.								x	x	x	x
331.19	The profile of track exceeds the allowable deviation for a 124-foot chord for three or more deviations.								x	x	x	x
333.01	Failure to inspect using TGMS at required frequency.	x										
333.02	Failure to operate qualified TGMS as required.	x										
333.03	Failure to keep TGMS records as required.	x										
333.04	Failure of TGMS report to provide required information.	x										
333.05	Failure to field verify a TGMS exception within two days.	x										
333.06	Failure to initiate remedial action for TGMS exception within two days.	x										
333.07	Failure to make TGMS records available for inspection.	x										
333.08	Failure to operate GRMS at required frequency.	x										
333.09	Lateral track capacity of track structure permits a gage widening ratio greater than allowed.										x	x
333.10	Failure to equip at least one vehicle per day with										x	x

Appendix C - Track Class/Defect Code Matrix												
Defect Codes		Track Class										
		R	X	1	2	3	4	5	6	7	8	9
Code	Description											
	required accelerometers.											
333.11	Failure to have written procedures for notification of track personnel when daily accelerometer measurements indicate a possible track-related condition.										x	x
333.12	Failure to follow written procedures for notification of track personnel when daily accelerometer measurements indicate a possible track-related condition.										x	x
333.13	Failure to operate an instrumented car or portable device to measure carbody and truck frame accelerations at required frequency.										x	x
333.14	Failure to reduce train speeds when carbody and truck frame accelerations exceed allowable.										x	x
333.15	Failure to keep records of acceleration measurements as required.										x	x
333.16	Failure to operate an inspection vehicle with instrumented wheelsets to measure wheel/rail forces at required frequency.										x	x
333.17	Failure to reduce train speed when wheel/rail forces exceed allowable.										x	x
333.18	Failure to keep record of wheel/rail force measurements as required.	x										
334.01	Insufficient Ballast								x	x	x	x
334.02	Fouled Ballast								x	x	x	x
335.01	Fewer than minimum allowable number of non-defective ties per 39 feet.								x	x	x	x
335.02	No effective support ties within the prescribed distance from a joint.								x	x	x	x
335.03	Crossties not effectively distributed to support a 39-foot segment of track.								x	x	x	x
335.04	Reserved								x	x	x	x
335.05	Reserved								x	x	x	x
335.06	Track constructed without crossties does not effectively support track structure.								x	x	x	x
335.07	Fewer than three non-defective ties each side of an effective tie.								x	x	x	x
335.08	Less than nine out of 10 consecutive ties with tie plates.								x	x	x	x
335.09	Metal object causing concentrated load between base of rail and bearing surface of tie plate.								x	x	x	x
335.10	Insufficient tie plates.								x	x	x	x
337.01	Transverse Fissure								x	x	x	x
337.02	Compound Fissure								x	x	x	x
337.03	Horizontal Split Head								x	x	x	x
337.04	Vertical Split Head								x	x	x	x
337.05	Split Web								x	x	x	x
337.06	Piped Rail								x	x	x	x
337.07	Bolt-Hole Crack								x	x	x	x
337.08	Head Web Separation								x	x	x	x
337.09	Broken Base								x	x	x	x

Appendix C - Track Class/Defect Code Matrix

Defect Codes		Track Class										
Code	Description	R	X	1	2	3	4	5	6	7	8	9
337.10	Detail Fracture								x	x	x	x
337.11	Engine Burn Fracture								x	x	x	x
337.12	Ordinary Break								x	x	x	x
337.13	Broken or Defective Weld								x	x	x	x
337.14	Damaged Rail								x	x	x	x
337.15	Flattened Rail								x	x	x	x
339.01	Failure to inspect rail for internal defects at required frequency.								x	x	x	x
339.02	Failure of equipment to inspect rail at joints.								x	x	x	x
339.03	Defective rail not marked properly.								x	x	x	x
339.04	Failure to reduce operating speed until valid rail inspection is performed.								x	x	x	x
341.01	Failure to conduct initial inspection of new rail.								x	x	x	x
341.02	Failure to inspect new welds made in new or used rail.								x	x	x	x
341.03	Failure to clearly mark rail defect found during initial inspection of new rail and welds.								x	x	x	x
343.01	Failure of track owner to develop and implement written CWR procedures.								x	x	x	x
343.02	Failure to comply with written CWR procedures.								x	x	x	x
343.03	Failure of track owner to develop a training program for the implementation of their written CWR procedures.								x	x	x	x
343.04	Failure to keep CWR records as required.								x	x	x	x
345.01	Failure to conduct qualification testing as required.								x	x	x	x
345.02	Operation at Class 6 and above speeds without approval of the FRA Associate Administrator for Safety.								x	x	x	x
347.01	Highway/rail crossings or rail-to-rail crossings at-grade are present on Class 8 and 9 track.								x	x	x	x
347.02	Unapproved warning/barrier systems on class 7 track.								x	x	x	x
349.01	Rail-end mismatch on tread of rail exceeds allowable.								x	x	x	x
349.02	Rail-end mismatch on gage side of rail exceeds allowable.								x	x	x	x
351.01	Rail joint not of structurally sound design and dimension.								x	x	x	x
351.02	Cracked or broken joint bar (other than center-break).								x	x	x	x
351.03	Center cracked or broken joint bar.								x	x	x	x
351.04	Worn joint bar allows vertical movement of rail in joint.								x	x	x	x
351.05	Less than 2 bolts per rail at each joint for conventional jointed rail.								x	x	x	x
351.06	Reserved								x	x	x	x
351.07	Less than 2 bolts per rail at any joint in continuous welded rail.								x	x	x	x
351.08	Loose joint bars.								x	x	x	x
351.09	Torch-cut or burned-bolt hole.								x	x	x	x
351.10	Joint bar reconfigured by torch cutting.								x	x	x	x
352.01	Torch cut rail applied for other than emergency.								x	x	x	x
352.02	Failure to remove torch cut rails within specified time								x	x	x	x

Appendix C - Track Class/Defect Code Matrix												
Defect Codes		Track Class										
Code	Description	R	X	1	2	3	4	5	6	7	8	9
	frame.											
352.03	Failure to remove non-inventoried torch cut rail within 30 days of discovery.								x	x	x	x
352.04	Reserved											
352.05	Train speed exceeds allowable over torch cut rail.								x	x	x	x
353.01	Loose, worn, or missing switch clips.								x	x	x	x
353.02	Loose, worn, or missing clip bolts (transit, side jaw, eccentric, vertical).								x	x	x	x
353.03	Loose, worn, or defective connecting rod.								x	x	x	x
353.04	Loose, worn, or defective connecting rod fastening.								x	x	x	x
353.05	Loose, worn, or defective switch rod.								x	x	x	x
353.06	Loose, worn, or missing switch rod bolts.								x	x	x	x
353.07	Worn or missing cotter pins.								x	x	x	x
353.08	Loose or missing rigid rail braces.								x	x	x	x
353.09	Loose or missing adjustable rail braces.								x	x	x	x
353.10	Missing switch, frog, or guard rail plates.								x	x	x	x
353.11	Loose or missing switch point stops.								x	x	x	x
353.12	Loose, worn, or missing frog bolts.								x	x	x	x
353.13	Loose, worn, or missing guard rail bolts.								x	x	x	x
353.14	Loose, worn or missing guard rail clamps, wedge, separator block, or end block.								x	x	x	x
353.15	Obstruction between switch point and stock rail.								x	x	x	x
353.16	Obstruction in flangeway of frog.								x	x	x	x
353.17	Obstruction in flangeway of guard rail.								x	x	x	x
353.18	Insufficient anchorage to restrain rail movement.								x	x	x	x
353.19	Flangeway less than 1-1/2 inches wide.								x	x	x	x
353.20	Stock rail not securely seated in switch plates.								x	x	x	x
353.21	Stock rail canted by overtightening rail braces.								x	x	x	x
353.22	Improper fit between switch point and stock rail.								x	x	x	x
353.23	Outer edge of wheel contacting gage side of stock rail.								x	x	x	x
353.24	Excessive lateral or vertical movement of switch point.								x	x	x	x
353.25	Heel of switch insecure.								x	x	x	x
353.26	Insecure switch stand or switch machine.								x	x	x	x
353.27	Insecure connecting rod.								x	x	x	x
353.28	Throw lever operable with switch lock or keeper in place.								x	x	x	x
353.29	Switch position indicator not clearly visible.								x	x	x	x
353.30	Unusually chipped or worn switch point.								x	x	x	x
353.31	Improper switch closure due to metal flow.								x	x	x	x
353.32	Insufficient flangeway depth.								x	x	x	x
353.33	Frog point chipped, broken, or worn in excess of allowable.								x	x	x	x
353.34	Tread portion of frog worn in excess of allowable.								x	x	x	x
353.99	Severe frog condition not otherwise provided								x	x	x	x
353.35	Outer edge of wheel contacting side of spring wing rail.								x	x	x	x
353.36	Toe of wing rail not fully bolted and tight.								x	x	x	x
353.37	Ties under or wing rail not solidly tamped.								x	x	x	x

Appendix C - Track Class/Defect Code Matrix

Defect Codes		Track Class										
Code	Description	R	X	1	2	3	4	5	6	7	8	9
353.38	Bolt-hole defect in frog.								x	x	x	x
353.39	Head and web separation in frog.								x	x	x	x
353.40	Insufficient tension in spring to hold wing rail against point rail.								x	x	x	x
353.41	Excessive clearance between hold-down housing and horn								x	x	x	x
353.42	Turnout or crossover not being maintained in accordance with Guidebook.								x	x	x	x
353.43	Lift rail assembly or other transition device on moveable bridge not being maintained in accordance with Guidebook.								x	x	x	x
355.01	Guard check gage less than allowable.								x	x	x	x
355.02	Guard face gage exceeds allowable.								x	x	x	x
355.03	Cracked or broken guard rail.								x	x	x	x
357.01	Derail not clearly visible.								x	x	x	x
357.02	Derail operable when locked.								x	x	x	x
357.04	Improper size derail.								x	x	x	x
357.05	Improperly installed derail.								x	x	x	x
357.06	Loose, worn, or defective parts of derail.								x	x	x	x
357.07	Derail not present when required								x	x	x	x
357.08	Derailing device not of proper design to physically stop or divert movement								x	x	x	x
357.09	Derail not interconnected to the signal system when required								x	x	x	x
361.01	Failure to provide Right of Way plan								x	x	x	x
361.02	Failure of Right of Way plan to contain required information								x	x	x	x
365.01	Track inspected by other than qualified designated individual.								x	x	x	x
365.02	Track being inspected at excessive speed.								x	x	x	x
365.03	Failure to inspect at required frequency.	x										
365.04	Failure to initiate remedial action for deviations found.	x							x	x	x	x
365.05	One Inspector inspecting more than two tracks.	x							x	x	x	x
365.06	Two Inspectors inspecting more than four tracks.	x							x	x	x	x
365.07	Inspection performed on track outside of maximum allowable track center distances.	x							x	x	x	x
365.08	Main track not traversed within the required frequency.	x										
365.09	Siding track not traversed within the required frequency.	x										
365.10	Failure to inspect turnouts at required frequency.	x										
365.11	Failure to inspect track crossings at required frequency.	x										
365.12	Failure to inspect lift rail assemblies or other transition devices on moveable bridges at required frequency	x										
365.13	Failure to operate a train at 100 m.p.h. or less after an eight hour period with no train operation	x										
367.01	Failure to conduct special inspections when required.	x										
369.01	Failure to keep records as required.	x										

Appendix C - Track Class/Defect Code Matrix												
Defect Codes		Track Class										
Code	Description	R	X	1	2	3	4	5	6	7	8	9
369.02	Failure of Inspector to complete report at time of inspection.	x										
369.03	Failure of Inspector to sign report.	x										
369.04	Failure of Inspector to provide required information.	x										
369.05	Failure of rail inspection record to provide required information.	x										
369.06	Failure to make records available for copying and inspection.	x										
369.07	Electronic system does not maintain the integrity of each record.	x										
369.08	Electronic system allows record or amendments to be modified.	x										
369.09	Electronic amendments not stored separately from record.	x										
369.10	Person making electronic amendment not identified.	x										
369.11	Electronic system corrupts or losses data.	x										
369.12	Paper copies of records not made available for inspection and copying.	x										
369.13	Inspection reports not available to Inspector or subsequent Inspectors.	x										
369.14	Electronic storage not initiated within 24 hours.	x										

Notes:

(1) No defects permitted from a vehicle (separate report with appropriate source code for field verified defects).
(R) Records inspections.

Appendix D - Source/Activity Code Matrix

Activity Codes		Source Codes																
		Reg Insp	Complaint	Accident	Special Assessment	Waiver	Asist Other Fed Agencey	Other	Nuclear Route	ATIP	ATIP Follow Up	Inspect from Train	Regular STRACNET	Special STRACNET	ATIP STRACNET	Reinspect	Manut. Facility	Focused Inspection
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	R	V	W
Remedial Action	209							x										
Camp Car	218C	x	x	x	x	x	x	x	x				x	x		x		x
FRA Geometry	ATIP									x	x				x			
Barrier Plan	BAP	x	x	x	x	x	x	x	x				x	x		x		x
Bridge Worker	BWK	x	x	x	x	x	x	x	x		x		x	x		x		x
CWR Plans	CWRP	x	x	x	x	x	x	x	x				x	x		x		x
Derail	DER	x	x	x	x	x	x	x	x				x	x		x		x
GRMS - Govt	GRMG		x		x		x	x	x									x
GRMS - Railroad	GRMS	x	x	x	x	x	x	x					x	x		x		
Highway Rail Vegetation	HGCT	x	x	x	x	x	x	x	x				x	x		x		x
Lift Rail	LRA	x	x	x	x	x	x	x	x				x	x		x		x
Bride Inspection	MSB	x	x	x	x		x	x	x				x	x		x		x
Main Track Hi Rail	MTH	x	x	x	x	x	x	x	x				x	x		x		x
Main Track Walk	MTW	x	x	x	x	x	x	x	x				x	x		x		x
Noise	NOIS	x	x	x	x	x	x	x					x	x		x		x
Qualification Test Plan	QTP	x	x	x	x	x	x	x	x				x	x		x		x
Vehicle Qualification Test	QVT	x	x	x	x	x	x	x	x				x	x		x		x
Rail Mill Facility	RMI				x	x	x	x	x							x	x	x
Right of Way Plan	RWOP	x	x	x	x	x	x	x	x				x	x		x		x
Roadway Worker	RWP	x	x	x	x	x	x	x	x		x	x	x	x	x	x		x

Appendix D - Source/Activity Code Matrix

Activity Codes		Source Codes: Reg Insp	Complaint	Accident	Special Assessment	Waiver	Asist Other Fed Agencey	Other	Nuclear Route	ATIP	ATIP Follow Up	Inspect from Train	Regular STRACNET	Special STRACNET	ATIP STRACNET	Reinspect	Manut. Facility	Focused Inspection
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	R	V	W
Rail Crossing Main	RXM	x	x	x	x	x	x	x	x				x	x		x		x
Rail Crossing Yard	RXY	x	x	x	x	x	x	x	x				x	x		x		x
Speed (Radar)	SPCL	x	x	x	x		x	x	x				x	x		x		x
Railroad Geometry Car	TGMS	x	x	x	x	x	x	x	x				x	x		x		
Turnout Main	TOM	x	x	x	x	x	x	x	x				x	x		x		x
Turnout Yard	TOY	x	x	x	x	x	x	x	x				x	x		x		x
Track Inspection Records	TREC	x	x	x	x	x	x	x	x				x	x		x		x
Inspect From Train	TRM	x	x	x	x	x	x	x	x			x	x	x		x		x
Yard Track Hi Rail	YTH	x	x	x	x	x	x	x	x				x	x		x		x
Yard Track Walk	YTW	x	x	x	x	x	x	x	x				x	x		x		x
Vehicle/Track Interaction	VTI	x	x		x	x	x	x	x				x	x		x		x
Welding Plant	WPI		x	x	x	x	x	x								x	x	x

Appendix E - Activity/Defect Code Matrix

Defect Codes		Activity Codes																							
Code	Description	ATIP (1)	DER	MTH MTW	RXM	RXY	SPCL	TOM	TOY	TREC	TRM	YTH YTW	HGCT	QVT	LRA	TGMS	GRMS	GRMG (1)	VTI (1)	RMI	WPI	CWRP	QTP	ROWP	BAP
4.01	Excepted track segment not identified in appropriate record.									x															
4.02	Excepted track segment located within 30 feet of an adjacent track subject to simultaneous operation at speeds in excess of 10 mph.			x	x	x		x	x			x													
4.03	Excepted track not inspected in accordance with §213.233(c) and 213.235 as specified for Class 1 track.			x	x	x		x	x			x													
4.04	Train speed exceeds 10 mph on excepted track.						x																		
4.05	Occupied passenger train operated on excepted track.			x								x													
4.06	Freight train operated on excepted track with more than five cars required to be placarded in accordance with 49 CFR Part 172.			x								x													
4.07	Train with a car required to be placarded by 49 CFR Part 172 operated over excepted track within 100 feet of a bridge or in a public street or highway.			x								x													
4.08	Failure to notify FRA of removal of trackage from excepted status.									x															
7.01	No written record of names of qualified persons to supervise restorations and renewals of track under traffic and/or to inspect track for defects, or to pass trains over broken rails or pull-aparts.									x															
7.02	Failure of track owner to provide written authorization to qualified designated individuals.									x															
7.03	Failure to use qualified person to pass trains over broken rails or pull aparts.			x	x	x		x	x			x													
7.04	Train speed exceeds 10 m.p.h. over broken rails or pull aparts.			x	x	x	x	x	x			x													
7.05	Failure to promptly notify and dispatch person fully qualified under §213.7 to the location of the broken rail or pull apart.			x	x	x		x	x			x													
9.01	Failure to restore other than excepted track to compliance with Class 1 stds. within 30 days after a person designated under §213.7(a) has determined that operations may safely continue over defect(s) not meeting Class 1 or excepted track stds.			x	x	x		x	x			x													
9.02	Failure of track owner to enforce, over Class 1 defects, the limiting conditions imposed by person designated under §213.7(a).			x	x	x		x	x			x													

Appendix E - Activity/Defect Code Matrix																									
Defect Codes		Activity Codes																							
Code	Description	ATIP (1)	DER	MTH MTW	RXM	RXY	SPCL	TOM	TOY	TREC	TRM	YTH YTW	HGCT	QVT	LRA	TGMS	GRMS	GRMG (1)	VTI (1)	RMI	WPI	CWRP	QTP	ROWP	BAP
9.03	Reserved.																								
11.01	Proper qualified supervision not provided at work site during work hours when track is being restored or renewed under traffic conditions.			x	x	x		x	x			x													
33.01	Drainage or water-carrying facility not maintained.			x								x													
33.02	Drainage or water-carrying facility obstructed by debris.			x								x													
33.03	Drainage or water-carrying facility collapsed.			x								x													
33.04	Drainage or water-carrying facility obstructed by vegetation.			x								x													
33.05	Drainage or water-carrying facility obstructed by silting.			x								x													
33.06	Drainage or water-carrying facility deteriorated to allow subgrade saturation.			x								x													
33.07	Uncontrolled water undercutting track structure or embankment.			x								x													
37.01	Combustible vegetation around track-carrying structures.			x								x													
37.02	Vegetation obstructs visibility of railroad signs and fixed signals.			x								x													
37.03	Vegetation obstructs passing of day and night signals by railroad employees.			x								x													
37.04	Vegetation interferes with railroad employees performing normal trackside duties.			x	x	x		x	x			x													
37.05	Vegetation prevents proper functioning of signal and/or communication lines.			x								x													
37.06	Excessive vegetation at train order office, depot, interlocking plant, a carman's building, etc., prevents employees on duty from visually inspecting moving equipment when their duties so require.			x	x	x		x	x			x													
37.07	Excessive vegetation at train meeting points prevents proper inspection of moving equipment by railroad employees.			x								x													
37.08	Excessive vegetation in toepaths and around switches where employees are performing normal trackside duties.			x				x	x			x													
37.09	Vegetation brushing sides of rolling stock.			x								x													
37.10	Vegetation obstructs visibility of grade crossing warning signs and signals by the traveling public.			x								x	x												

Appendix E - Activity/Defect Code Matrix

Defect Codes		Activity Codes																							
Code	Description	ATIP (1)	DER	MTH MTW	RXM	RXY	SPCL	TOM	TOY	TREC	TRM	YTH YTW	HGCT	QVT	LRA	TGMS	GRMS	GRMG (1)	VTI (1)	RMI	WPI	CWRP	QTP	ROWP	BAP
53.01	Gage dimension exceeds allowable on tangent track.			x	x	x		x	x			x													
53.02	Gage dimension is less than allowable on tangent track.			x	x	x		x	x			x													
53.03	Gage dimension exceeds allowable on curved track.			x	x	x		x	x			x													
53.04	Gage dimension is less than allowable on curved track.			x	x	x		x	x			x													
53.05	Gage dimension exceeds allowable for excepted track.			x	x	x		x	x			x													
55.01	Alinement deviation of tangent track exceeds allowable.			x	x	x		x	x			x													
55.02	Alinement deviation of curved track exceeds allowable for a 62-foot chord.			x	x	x		x	x			x													
55.03	Alinement deviation of curved track exceeds allowable for a 31-foot chord.			x	x	x		x	x			x													
57.01	Reserved																								
57.02	Operating speed exceeds allowable for 3-inches of unbalance, based on curvature and elevation.			x	x	x		x	x			x													
57.03	Operating speed exceeds allowable for 4-inches of unbalance, based on curvature and elevation.			x	x	x		x	x			x													
57.04	Operating speed exceeds allowable for a FRA approved unbalance based on curvature and elevation approved for track contiguous to high speed track.			x	x	x		x	x			x													
57.05	Reserved																								
57.06	Maximum crosslevel on curve exceeds allowable.			x	x	x		x	x			x													
63.01	Runoff in any 31-feet of rail at end of raise exceeds allowable.			x	x	x		x	x			x													
63.02	Deviation from uniform profile on either rail exceeds allowable.			x	x	x		x	x			x													
63.03	Reserved																								
63.04	Reserved.																								
63.05	Deviation from zero crosslevel at any point on tangent exceeds allowable.			x	x	x		x	x			x													
63.06	Reserved																								
63.07	Difference in crosslevel between any two points less than 62-feet apart on tangents exceeds allowable.			x	x	x		x	x			x													
63.08	Difference in crosslevel between any two points less than 62-feet apart on curves between spirals exceeds allowable.			x	x	x		x	x			x													

Appendix E - Activity/Defect Code Matrix

Code	Description	ATIP (1)	DER	MTH MTW	RXM	RXY	SPCL	TOM	TOY	TREC	TRM	YTH YTW	HGCT	QVT	LRA	TGMS	GRMS	GRMG (1)	VTI (1)	RMI	WPI	CWRP	QTP	ROWP	BAP
63.09	Difference in crosslevel between any two points less than 62-feet apart on spirals exceeds allowable.			x	x	x		x	x			x													
63.10	Reverse elevation on curve exceeds allowable.			x	x	x		x	x			x													
63.11	Variation in crosslevel per 31-feet exceeds allowable on restricted length spiral.			x	x	x		x	x			x													
63.12	Difference in crosslevel within 62-feet between a point on a curve that equals or exceeds 6-inches and a point with greater elevation exceed allowable.			x	x	x		x	x			x													
63.13	Crosslevel differences for six or more consecutive pairs of staggered joints exceeds allowable.			x								x													
103.01	Insufficient Ballast			x	x	x		x	x			x													
103.02	Fouled Ballast			x	x	x		x	x			x													
109.01	Reserved			x				x	x			x													
109.02	No effective support ties within the prescribed distance from a joint.			x	x	x		x	x			x													
109.03	Crossties not effectively distributed to support a 39-foot segment of track.			x	x	x		x	x			x													
109.04	Fewer than minimum allowable number of non-defective ties per 39 feet for tangent and curved track less than 2 degrees. [used after 09/21/00]			x				x	x			x													
109.05	Fewer than minimum allowable number of non-defective ties per 39 feet for turnouts and curved track over 2 degrees. [used after 09/21/00]			x				x	x			x													
109.06	Track constructed without crossties does not effectively support track structure.			x	x	x		x	x			x													
110.01	Failure to notify FRA at least 30 days prior to the designation of a GRMS line segment.																x								
110.02	Failure to notify FRA at least 10 days prior to the removal of a line segment from GRMS designation.																x								
110.03	Failure to provide required information identifying a GRMS line segment.																x								
110.04	Failure to provide sufficient technical data to establish compliance with minimum GRMS design requirements.																x								
110.05	Failure to maintain and operate GRMS within minimum design requirements over designated GRMS line segments.																x								
110.06	Failure of GRMS to provide analog trace of specified parameters																x								

Appendix E - Activity/Defect Code Matrix

Defect Codes		Activity Codes																							
Code	Description	ATIP (1)	DER	MTH MTW	RXM	RXY	SPCL	TOM	TOY	TREC	TRM	YTH YTW	HGCT	QVT	LRA	TGMS	GRMS	GRMG (1)	VTI (1)	RMI	WPI	CWRP	QTP	ROWP	BAP
110.07	Failure of GRMS to provide exception report listing of specified parameters.																x								
110.08	Failure to provide exception report listing to § 213.7 individual prior to next inspection required under § 213.233.																x								
110.09	Failure to maintain and make available documented calibration procedures on GRMS vehicle.																x								
110.10	Failure to initiate a daily instrument verification procedure.																x								
110.11	Failure to maintain PTLF accuracy within five-percent of 4,000-pound reading.																x								
110.12	Failure to make available GRMS training program.																x								
110.13	Failure of GRMS training program to meet minimum requirements.																x								
110.14	Failure to provide GRMS training to § 213.7 individual whose territory is subject to requirements of § 213.110.																x								
110.15	Failure to initiate required remedial action for exceptions listed on GRMS record of lateral restraint.																x								
110.16	Gage widening exceeds allowable measured with PTLF.																x								
110.17	Failure to provide functional PTLF to § 213.7 individual whose territory is subject to requirements of § 213.110.																x								
110.18	Failure to restore contact between rail and lateral rail restraint components																x								
110.19	Failure to keep GRMS records as required.																x								
110.20	Failure to conduct GRMS inspections at required frequency.																x								
113.01	Transverse Fissure			x	x	x		x	x			x													
113.02	Compound Fissure			x	x	x		x	x			x													
113.03	Horizontal Split Head			x	x	x		x	x			x													
113.04	Vertical Split Head			x	x	x		x	x			x													
113.05	Split Web			x	x	x		x	x			x													
113.06	Piped Rail			x	x	x		x	x			x													
113.07	Bolt-Hole Crack			x	x	x		x	x			x													
113.08	Head Web Separation			x	x	x		x	x			x													
113.09	Broken Base			x	x	x		x	x			x													
113.10	Detail Fracture			x	x	x		x	x			x													

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Defect Codes		Activity Codes																							
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113.11	Engine Burn Fracture			x	x	x		x	x			x													
113.12	Ordinary Break			x	x	x		x	x			x													
113.13	Broken or Defective Weld			x	x	x		x	x			x													
113.14	Damaged Rail			x	x	x		x	x			x													
113.15	Flattened Rail			x	x	x		x	x			x													
115.01	Rail-end mismatch on tread of rail exceeds allowable.			x	x	x		x	x			x													
115.02	Rail-end mismatch on gage side of rail exceeds allowable.			x	x	x		x	x			x													
119.01	Failure of track owner to develop and implement written CWR procedures.																					x			
119.02	Failure to comply with written CWR procedures.																					x			
119.03	Failure of track owner to develop a training program for the implementation of their written CWR procedures.																					x			
119.04	Failure to keep CWR records as required.																					x			
121.01	Rail joint not of structurally sound design and dimension.			x	x	x		x	x			x													
121.02	Cracked or broken joint bar in Classes 3 through 5 track (other than center-break).			x	x	x		x	x			x													
121.03	Center cracked or broken joint bar.			x	x	x		x	x			x													
121.04	Worn joint bar allows excessive vertical movement of rail in joint in Classes 3 through 5 track.			x	x	x		x	x			x													
121.05	Less than 2 bolts per rail at each joint for conventional jointed rail in Classes 2 through 5 track.			x	x	x		x	x			x													
121.06	Less than 1 bolt per rail at each joint for conventional jointed rail in Class 1 track.			x	x	x		x	x			x													
121.07	Less than 2 bolts per rail at any joint in continuous welded rail.			x	x	x		x	x			x													
121.08	Loose joint bars.			x	x	x		x	x			x													
121.09	Torch-cut or burned-bolt hole in rail in Classes 2 through 5 track.			x	x	x		x	x			x													
121.10	Joint bar reconfigured by torch cutting in Classes 3 through 5 track.			x	x	x		x	x			x													
122.01	Torch cut rail applied in Class 3 through 5 track for other than emergency.			x	x	x		x	x			x													
122.02	Failure to remove torch cut rails within specified time frame.			x	x	x		x	x			x													
122.03	Failure to remove non-inventoried torch cut rail within 30 days of discovery.			x	x	x		x	x			x													

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Defect Codes		Activity Codes																							
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122.04	Train speed exceeds allowable over non-inventoried torch cut rail.			x	x	x		x	x			x													
123.01	Insufficient tie plates in Class 3 through 5 track.			x	x	x		x	x			x													
123.02	Object between base of rail and the bearing surface of the tie plate causing concentrated load.			x	x	x		x	x			x													
127.01	Insufficient fasteners in a 39-foot track segment.			x	x	x		x	x			x													
133.01	Loose, worn, or missing switch clips.				x	x		x	x																
133.02	Loose, worn, or missing clip bolts (transit, side jaw, eccentric, vertical).				x	x		x	x																
133.03	Loose, worn, or defective connecting rod.				x	x		x	x																
133.04	Loose, worn, or defective connecting rod fastening.				x	x		x	x																
133.05	Loose, worn, or defective switch rod.				x	x		x	x																
133.06	Loose, worn, or missing switch rod bolts.				x	x		x	x																
133.07	Worn or missing cotter pins.				x	x		x	x																
133.08	Loose or missing rigid rail braces.				x	x		x	x																
133.09	Loose or missing adjustable rail braces.				x	x		x	x																
133.10	Missing switch, frog, or guard rail plates.				x	x		x	x																
133.11	Loose or missing switch point stops.				x	x		x	x																
133.12	Loose, worn, or missing frog bolts.				x	x		x	x																
133.13	Loose, worn, or missing guard rail bolts.				x	x		x	x																
133.14	Loose, worn or missing guard rail clamps, wedge, separator block, or end block.				x	x		x	x																
133.15	Obstruction between switch point and stock rail.				x	x		x	x																
133.16	Obstruction in flangeway of frog.				x	x		x	x																
133.17	Obstruction in flangeway of guard rail.				x	x		x	x																
133.18	Insufficient anchorage to restrain rail movement.				x	x		x	x																
133.19	Flangeway less than 1 1/2 inches wide.				x	x		x	x																
135.01	Stock rail not securely seated in switch plates.				x	x		x	x																
135.02	Stock rail canted by overtightening rail braces.				x	x		x	x																
135.03	Improper fit between switch point and stock rail.				x	x		x	x																
135.04	Outer edge of wheel contacting gage side of stock rail.				x	x		x	x																
135.05	Excessive lateral or vertical movement of switch point.				x	x		x	x																
135.06	Heel of switch insecure.				x	x		x	x																
135.07	Insecure switch stand or switch machine.				x	x		x	x																
135.08	Insecure connecting rod.				x	x		x	x																
135.09	Throw lever operable with switch lock or keeper in place.				x	x		x	x																

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Defect Codes		Activity Codes																							
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135.10	Switch position indicator not clearly visible.				x	x		x	x																
135.11	Unusually chipped or worn switch point.				x	x		x	x																
135.12	Improper switch closure due to metal flow.				x	x		x	x																
135.13	Use of tongue and plane mate where speeds exceed class one				x	x		x	x																
137.01	Insufficient flangeway depth.				x	x		x	x																
137.02	Frog point chipped, broken, or worn in excess of allowable.				x	x		x	x																
137.03	Tread portion of frog worn in excess of allowable.				x	x		x	x																
137.04	Use of flange bearing frog where speed exceeds that permitted by Class 1.				x	x		x	x																
137.99	Severe frog condition not otherwise provided.				x	x		x	x																
139.01	Outer edge of wheel contacting side of spring wing rail.							x	x																
139.02	Toe of wing rail not fully bolted and tight.							x	x																
139.03	Ties under or wing rail not solidly tamped.							x	x																
139.04	Bolt-hole defect in frog.							x	x																
139.05	Head and web separation in frog.							x	x																
139.06	Insufficient tension in spring to hold wing rail against point rail.							x	x																
139.07	Excessive clearance between hold-down housing and horn.							x	x																
141.01	Raised guard worn excessively.							x	x																
141.02	Frog point rebuilt before restoring guarding face.							x	x																
143.01	Guard check gage less than allowable.				x	x		x	x																
143.02	Guard face gage exceeds allowable.				x	x		x	x																
143.03	Cracked or broken guard rail.				x	x		x	x																
205.01	Derail not clearly visible.		x																						
205.02	Derail operable when locked.		x																						
205.03	Reserved																								
205.04	Improper size derail.		x																						
205.05	Improperly installed derail.		x																						
205.06	Loose, worn, or defective parts of derail.		x																						
233.01	Track inspected by other than qualified designated individual.			x	x	x		x	x			x													
233.02	Track being inspected at excessive speed.			x	x	x		x	x			x													
233.03	Failure to inspect at required frequency.									x															
233.04	Failure to initiate remedial action for deviations found.			x	x	x		x	x	x		x													
233.05	One Inspector inspecting more than two tracks.			x						x		x													

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Defect Codes		Activity Codes																							
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233.06	Two Inspectors inspecting more than four tracks.			x						x		x													
233.07	Inspection performed on track outside of maximum allowable track center distances.			x						x		x													
233.08	Main track not traversed within the required frequency.									x															
233.09	Siding track not traversed within the required frequency.									x															
235.01	Failure to inspect turnouts at required frequency.									x															
235.02	Failure to inspect track crossings at required frequency.									x															
235.03	Failure to inspect lift rail assemblies or other transition devices on moveable bridges at required frequency									x															
235.04	Failure to operate specified switches in Classes 3 through 5.							x	x	x															
237.01	Failure to inspect rail for internal defects at required frequency.			x	x	x		x	x	x		x													
237.02	Failure of equipment to inspect rail at joints.			x	x	x		x	x			x													
237.03	Defective rail not marked properly.			x	x	x		x	x			x													
237.04	Failure to reduce operating speed until valid rail inspection is performed.			x	x	x		x	x			x													
239.01	Failure to conduct special inspections when required.			x	x	x		x	x			x													
241.01	Failure to keep records as required.									x															
241.02	Failure of Inspector to complete report at time of inspection.									x															
241.03	Failure of inspector to sign report.									x															
241.04	Failure of Inspector to provide required information.									x															
241.05	Failure of rail inspection record to provide required information.									x															
241.06	Failure to make records available for copying and inspection.									x															
241.07	Electronic system does not maintain the integrity of each record.									x															
241.08	Electronic system allows record or amendments to be modified.									x															
241.09	Electronic amendments not stored separately from record.									x															
241.10	Person making electronic amendment not identified.									x															
241.11	Electronic system corrupts or losses data.									x															

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241.12	Paper copies of records not made available for inspection and copying.									x															
241.13	Inspection reports not available to Inspector or subsequent Inspectors.									x															
241.14	Electronic storage not initiated within 24 hours.									x															
305.01	No written record of names of qualified persons to supervise restorations and renewals of track under traffic and/or to inspect track for defects, or to pass trains over broken rails or pull-aparts, or to maintain or inspect CWR.									x															
305.02	Failure of track owner to provide written authorization to qualified designated individuals.									x															
305.03	Failure to use qualified person to pass trains over broken rails or pull aparts.			x	x	x		x	x			x													
305.04	Train speed exceeds 10 m.p.h. over broken rails or pull aparts.			x	x	x		x	x			x													
305.05	Failure to promptly notify and dispatch person fully qualified under §213.305 to the location of the broken rail or pull apart.			x	x	x		x	x			x													
307.01	Train speed exceeds 200 mph without FRA approval.			x	x	x		x	x			x													
307.02	Freight transported at passenger train speeds in unqualified vehicles.			x	x	x		x	x			x													
307.03	Load distribution & securement in the freight vehicle adversely affects the dynamic performance of the vehicle or the axle loading pattern is not uniform & exceeds the passenger locomotive axle loadings in passenger trains at the same maximum speed.			x	x	x		x	x			x													
307.04	Carrier accepted or transported a hazardous material defined in 49 CFR Part 171.8 which is not acceptable for movement.			x	x	x		x	x																
307.05	Trains operated in excess of 150 mph not in conjunction with a Rule of Particular Applicability addressing other safety issues presented by the system.			x	x	x		x	x																
309.01	Reserved																								
309.02	Work performed during a period of restoration and renewal under traffic conditions which interrupts rail continuity.			x	x	x		x	x			x													
309.03	Work performed during a period of restoration and renewal under traffic conditions which adversely affects track stability.			x	x	x		x	x			x													

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309.04	Removal and replacement of the rail fastenings on more than one tie at a time within 15 feet during a period of restoration and renewal under traffic conditions.			x	x	x		x	x			x													
319.01	Drainage or water-carrying facility not maintained.			x								x													
319.02	Drainage or water-carrying facility obstructed by debris.			x								x													
319.03	Drainage or water-carrying facility collapsed.			x								x													
319.04	Drainage or water-carrying facility obstructed by vegetation.			x								x													
319.05	Drainage or water-carrying facility obstructed by silting.			x								x													
319.06	Drainage or water-carrying facility deteriorated to allow subgrade saturation.			x								x													
319.07	Uncontrolled water undercutting track structure or embankment.			x								x													
321.01	Combustible vegetation around track-carrying structures.			x								x													
321.02	Vegetation obstructs visibility of railroad signs and fixed signals.			x								x													
321.03	Vegetation obstructs passing of day and night signals by railroad employees.			x								x													
321.04	Vegetation interferes with railroad employees performing normal trackside duties.			x								x													
321.05	Vegetation prevents proper functioning of signal and/or communication lines.			x								x													
321.06	Excessive vegetation at train order office, depot, interlocking plant, a carman's building, etc., prevents employees on duty from visually inspecting moving equipment when their duties so require.			x	x	x		x	x			x													
321.07	Excessive vegetation at train meeting points prevents proper inspection of moving equipment by railroad employees.			x								x													
321.08	Excessive vegetation in toepaths and around switches where employees are performing normal trackside duties.			x				x	x			x													
321.09	Vegetation brushing sides of rolling stock.			x								x													
321.10	Vegetation obstructs visibility of grade crossing warning signs and signals by the traveling public.			x								x	x												
323.01	Gage dimension exceeds allowable on tangent track.			x	x	x		x	x			x													

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323.02	Gage dimension is less than allowable on tangent track.			x	x	x		x	x			x													
323.03	Gage dimension exceeds allowable on curved track.			x	x	x		x	x			x													
323.04	Gage dimension is less than allowable on curved track.			x	x	x		x	x			x													
323.05	Reserved																								
323.06	Gage variation within 31 feet exceeds allowable.			x	x	x		x	x			x													
327.01	Reserved																								
327.02	Reserved																								
327.03	Reserved																								
327.04	The alinement of track exceeds the allowable deviation for a 31-foot chord for a single deviation.			x	x	x		x	x			x													
327.05	The alinement of track exceeds the allowable deviation for a 62-foot chord for a single deviation.			x	x	x		x	x			x													
327.06	The alinement of track exceeds the allowable deviation for a 124-foot chord for a single deviation.			x	x	x		x	x			x													
327.07	The alinement of track exceeds the allowable deviation for a 31-foot chord for three or more deviations.			x	x	x		x	x			x													
327.08	The alinement of track exceeds the allowable deviation for a 62-foot chord for three or more deviations.			x	x	x		x	x			x													
327.09	The alinement of track exceeds the allowable deviation for a 124-foot chord for three or more deviations.			x	x	x		x	x			x													
329.01	Reserved																								
329.02	Operating speed exceeds allowable for 3-inches of unbalance, based on curvature and elevation.			x	x	x		x	x			x													
329.03	Reserved																								
329.04	Reserved																								
329.05	Operating speed exceeds allowable for a FRA approved unbalance based on curvature and elevation.			x	x	x		x	x			x													
329.06	Maximum crosslevel on curve exceeds allowable.			x	x	x		x	x			x													
331.01	Reserved																								
331.02	Reserved																								
331.03	Reserved																								
331.04	Reserved																								
331.05	Reserved																								

Appendix E - Activity/Defect Code Matrix

Defect Codes		Activity Codes																							
Code	Description	ATIP (1)	DER	MTH MTW	RXM	RXY	SPCL	TOM	TOY	TREC	TRM	YTH YTW	HGCT	QVT	LRA	TGMS	GRMS	GRMG (1)	VTI (1)	RMI	WPI	CWRP	QTP	ROWP	BAP
331.06	Reserved																								
331.07	Difference in crosslevel between any two points less than 62-feet apart on tangents exceeds allowable.			x	x	x		x	x			x													
331.08	Difference in crosslevel between any two points less than 62-feet apart on curves between spirals exceeds allowable.			x	x	x		x	x			x													
331.09	Difference in crosslevel between any two points less than 62-feet apart on spirals exceeds allowable.			x	x	x		x	x			x													
331.10	Reserved																								
331.11	Reserved																								
331.12	Reserved																								
331.13	Crosslevel differences for six or more consecutive pairs of staggered joints exceeds allowable			x								x													
331.14	The profile of track exceeds the allowable deviation for a 31-foot chord for a single deviation.			x	x	x		x	x			x													
331.15	The profile of track exceeds the allowable deviation for a 62-foot chord for a single deviation.			x	x	x		x	x			x													
331.16	The profile of track exceeds the allowable deviation for a 124-foot chord for a single deviation.			x	x	x		x	x			x													
331.17	The profile of track exceeds the allowable deviation for a 31-foot chord for three or more deviations.			x	x	x		x	x			x													
331.18	The profile of track exceeds the allowable deviation for a 62-foot chord for three or more deviations.			x	x	x		x	x			x													
331.19	The profile of track exceeds the allowable deviation for a 124-foot chord for three or more deviations.			x	x	x		x	x			x													
333.01	Failure to inspect using TGMS at required frequency.									x															
333.02	Failure to operate qualified TGMS as required.									x															
333.03	Failure to keep TGMS records as required.									x															
333.04	Failure of TGMS report to provide required information.									x															
333.05	Failure to field verify a TGMS exception within two days.									x															
333.06	Failure to initiate remedial action for TGMS exception within two days.									x															
333.07	Failure to make TGMS records available for inspection.									x															
333.08	Failure to operate GRMS at required frequency.									x															
333.09	Lateral track capacity of track structure permits a															x									

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Defect Codes		Activity Codes																							
Code	Description	ATIP (1)	DER	MTH MTW	RXM	RXY	SPCL	TOM	TOY	TREC	TRM	YTH YTW	HGCT	QVT	LRA	TGMS	GRMS	GRMG (1)	VTI (1)	RMI	WPI	CWRP	QTP	ROWP	BAP
	gage widening ratio greater than allowed.																								
333.10	Failure to equip at least one vehicle per day with required accelerometers.															x									
333.11	Failure to have written procedures for notification of track personnel when daily accelerometer measurements indicate a possible track-related condition.															x									
333.12	Failure to follow written procedures for notification of track personnel when daily accelerometer measurements indicate a possible track-related condition.															x									
333.13	Failure to operate an instrumented car or portable device to measure carbody and truck frame accelerations at required frequency.															x									
333.14	Failure to reduce train speeds when carbody and truck frame accelerations exceed allowable.															x									
333.15	Failure to keep records of acceleration measurements as required.															x									
333.16	Failure to operate an inspection vehicle with instrumented wheelsets to measure wheel/rail forces at required frequency.															x									
333.17	Failure to reduce train speed when wheel/rail forces exceed allowable.															x									
333.18	Failure to keep record of wheel/rail force measurements as required.									x															
334.01	Insufficient Ballast			x	x	x		x	x			x													
334.02	Fouled Ballast			x	x	x		x	x			x													
335.01	Fewer than minimum allowable number of non-defective ties per 39 feet.			x	x	x		x	x			x													
335.02	No effective support ties within the prescribed distance from a joint.			x	x	x		x	x			x													
335.03	Crossties not effectively distributed to support a 39-foot segment of track.			x	x	x		x	x			x													
335.04	Reserved																								
335.05	Reserved																								
335.06	Track constructed without crossties does not effectively support track structure.			x	x	x		x	x			x													
335.07	Fewer than three non-defective ties each side of an effective tie.			x	x	x		x	x			x													
335.08	Less than nine out of 10 consecutive ties with tie plates.			x	x	x		x	x			x													
335.09	Metal object causing concentrated load between			x	x	x		x	x			x													

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Defect Codes		Activity Codes																							
Code	Description	ATIP (1)	DER	MTH MTW	RXM	RXY	SPCL	TOM	TOY	TREC	TRM	YTH YTW	HGCT	QVT	LRA	TGMS	GRMS	GRMG (1)	VTI (1)	RMI	WPI	CWRP	QTP	ROWP	BAP
	base of rail and bearing surface of tie plate.																								
335.10	Insufficient tie plates.			x	x	x		x	x			x													
337.01	Transverse Fissure			x	x	x		x	x			x													
337.02	Compound Fissure			x	x	x		x	x			x													
337.03	Horizontal Split Head			x	x	x		x	x			x													
337.04	Vertical Split Head			x	x	x		x	x			x													
337.05	Split Web			x	x	x		x	x			x													
337.06	Piped Rail			x	x	x		x	x			x													
337.07	Bolt-Hole Crack			x	x	x		x	x			x													
337.08	Head Web Separation			x	x	x		x	x			x													
337.09	Broken Base			x	x	x		x	x			x													
337.10	Detail Fracture			x	x	x		x	x			x													
337.11	Engine Burn Fracture			x	x	x		x	x			x													
337.12	Ordinary Break			x	x	x		x	x			x													
337.13	Broken or Defective Weld			x	x	x		x	x			x													
337.14	Damaged Rail			x	x	x		x	x			x													
337.15	Flattened Rail			x	x	x		x	x			x													
339.01	Failure to inspect rail for internal defects at required frequency.			x	x	x		x	x			x													
339.02	Failure of equipment to inspect rail at joints.			x	x	x		x	x			x													
339.03	Defective rail not marked properly.			x	x	x		x	x			x													
339.04	Failure to reduce operating speed until valid rail inspection is performed.			x	x	x		x	x			x													
341.01	Failure to conduct initial inspection of new rail.			x	x	x		x	x			x								x	x				
341.02	Failure to inspect new welds made in new or used rail.			x	x	x		x	x			x								x	x				
341.03	Failure to clearly mark rail defect found during initial inspection of new rail and welds.			x	x	x		x	x			x								x	x				
343.01	Failure of track owner to develop and implement written CWR procedures.																					x			
343.02	Failure to comply with written CWR procedures.																					x			
343.03	Failure of track owner to develop a training program for the implementation of their written CWR procedures.																					x			
343.04	Failure to keep CWR records as required.																					x			
345.01	Failure to conduct qualification testing as required.													x									x		
345.02	Operation at Class 6 and above speeds without approval of the FRA Associate Administrator for Safety.													x									x		
347.01	Highway/rail crossings or rail-to-rail crossings at-			x	x	x		x	x			x													

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Defect Codes		Activity Codes																							
Code	Description	ATIP (1)	DER	MTH MTW	RXM	RXY	SPCL	TOM	TOY	TREC	TRM	YTH YTW	HGCT	QVT	LRA	TGMS	GRMS	GRMG (1)	VTI (1)	RMI	WPI	CWRP	QTP	ROWP	BAP
	grade are present on Class 8 and 9 track.																								
347.02	Unapproved warning/barrier systems on class 7 track.			x	x	x		x	x			x												x	x
349.01	Rail-end mismatch on tread of rail exceeds allowable.			x	x	x		x	x			x													
349.02	Rail-end mismatch on gage side of rail exceeds allowable.			x	x	x		x	x			x													
351.01	Rail joint not of structurally sound design and dimension.			x	x	x		x	x			x													
351.02	Cracked or broken joint bar (other than center-break).			x	x	x		x	x			x													
351.03	Center cracked or broken joint bar.			x	x	x		x	x			x													
351.04	Worn joint bar allows vertical movement of rail in joint.			x	x	x		x	x			x													
351.05	Less than 2 bolts per rail at each joint for conventional jointed rail.			x	x	x		x	x			x													
351.06	Reserved																								
351.07	Less than 2 bolts per rail at any joint in continuous welded rail.			x	x	x		x	x			x													
351.08	Loose joint bars.			x	x	x		x	x			x													
351.09	Torch-cut or burned-bolt hole.			x	x	x		x	x			x													
351.10	Joint bar reconfigured by torch cutting.			x	x	x		x	x			x													
352.01	Torch cut rail applied for other than emergency.			x	x	x		x	x			x													
352.02	Failure to remove torch cut rails within specified time frame.			x	x	x		x	x			x													
352.03	Failure to remove non-inventoried torch cut rail within 30 days of discovery.			x	x	x		x	x			x													
352.04	Reserved																								
352.05	Train speed exceeds allowable over torch cut rail.			x	x	x		x	x			x													
353.01	Loose, worn, or missing switch clips.			x	x	x		x	x																
353.02	Loose, worn, or missing clip bolts (transit, side jaw, eccentric, vertical).			x	x	x		x	x																
353.03	Loose, worn, or defective connecting rod.			x	x	x		x	x																
353.04	Loose, worn, or defective connecting rod fastening.			x	x	x		x	x																
353.05	Loose, worn, or defective switch rod.			x	x	x		x	x																
353.06	Loose, worn, or missing switch rod bolts.			x	x	x		x	x																
353.07	Worn or missing cotter pins.			x	x	x		x	x																
353.08	Loose or missing rigid rail braces.			x	x	x		x	x																
353.09	Loose or missing adjustable rail braces.			x	x	x		x	x																
353.10	Missing switch, frog, or guard rail plates.				x	x		x	x																

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Defect Codes		Activity Codes																							
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353.11	Loose or missing switch point stops.				x	x		x	x																
353.12	Loose, worn, or missing frog bolts.				x	x		x	x																
353.13	Loose, worn, or missing guard rail bolts.				x	x		x	x																
353.14	Loose, worn or missing guard rail clamps, wedge, separator block, or end block.				x	x		x	x																
353.15	Obstruction between switch point and stock rail.				x	x		x	x																
353.16	Obstruction in flangeway of frog.				x	x		x	x																
353.17	Obstruction in flangeway of guard rail.				x	x		x	x																
353.18	Insufficient anchorage to restrain rail movement.				x	x		x	x																
353.19	Flangeway less than 1-1/2 inches wide.				x	x		x	x																
353.20	Stock rail not securely seated in switch plates.				x	x		x	x																
353.21	Stock rail canted by overtightening rail braces.				x	x		x	x																
353.22	Improper fit between switch point and stock rail.				x	x		x	x																
353.23	Outer edge of wheel contacting gage side of stock rail.				x	x		x	x																
353.24	Excessive lateral or vertical movement of switch point.				x	x		x	x																
353.25	Heel of switch insecure.				x	x		x	x																
353.26	Insecure switch stand or switch machine.				x	x		x	x																
353.27	Insecure connecting rod.				x	x		x	x																
353.28	Throw lever operable with switch lock or keeper in place.				x	x		x	x																
353.29	Switch position indicator not clearly visible.				x	x		x	x																
353.30	Unusually chipped or worn switch point.				x	x		x	x																
353.31	Improper switch closure due to metal flow.				x	x		x	x																
353.32	Insufficient flangeway depth.				x	x		x	x																
353.33	Frog point chipped, broken, or worn in excess of allowable.				x	x		x	x																
353.34	Tread portion of frog worn in excess of allowable.				x	x		x	x																
353.99	Severe frog condition not otherwise provided				x	x		x	x																
353.35	Outer edge of wheel contacting side of spring wing rail.							x	x																
353.36	Toe of wing rail not fully bolted and tight.							x	x																
353.37	Ties under or wing rail not solidly tamped.							x	x																
353.38	Bolt-hole defect in frog.							x	x																
353.39	Head and web separation in frog.							x	x																
353.40	Insufficient tension in spring to hold wing rail against point rail.							x	x																
353.41	Excessive clearance between hold-down housing and horn							x	x																

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Defect Codes		Activity Codes																							
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353.42	Turnout or crossover not being maintained in accordance with Guidebook.							x	x			x													
353.43	Lift rail assembly or other transition device on moveable bridge not being maintained in accordance with Guidebook.														x										
355.01	Guard check gage less than allowable.				x	x		x	x																
355.02	Guard face gage exceeds allowable.				x	x		x	x																
355.03	Cracked or broken guard rail.				x	x		x	x																
357.01	Derail not clearly visible.		x																						
357.02	Derail operable when locked.		x																						
357.04	Improper size derail.		x																						
357.05	Improperly installed derail.		x																						
357.06	Loose, worn, or defective parts of derail.		x																						
357.07	Derail not present when required		x																						
357.08	Derailing device not of proper design to physically stop or divert movement		x																						
357.09	Derail not interconnected to the signal system when required		x																						
361.01	Failure to provide Right of Way plan																							x	
361.02	Failure of Right of Way plan to contain required information																							x	
365.01	Track inspected by other than qualified designated individual.			x	x	x		x	x			x													
365.02	Track being inspected at excessive speed.			x	x	x		x	x			x													
365.03	Failure to inspect at required frequency.									x															
365.04	Failure to initiate remedial action for deviations found.			x	x	x		x	x	x		x													
365.05	One Inspector inspecting more than two tracks.			x						x		x													
365.06	Two Inspectors inspecting more than four tracks.			x						x		x													
365.07	Inspection performed on track outside of maximum allowable track center distances.			x						x		x													
365.08	Main track not traversed within the required frequency.									x															
365.09	Siding track not traversed within the required frequency.									x															
365.10	Failure to inspect turnouts at required frequency.									x															
365.11	Failure to inspect track crossings at required frequency.									x															
365.12	Failure to inspect lift rail assemblies or other transition devices on moveable bridges at required frequency									x															

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365.13	Failure to operate a train at 100 m.p.h. or less after an eight hour period with no train operation									x															
367.01	Failure to conduct special inspections when required.									x															
369.01	Failure to keep records as required.									x															
369.02	Failure of Inspector to complete report at time of inspection.									x															
369.03	Failure of Inspector to sign report.									x															
369.04	Failure of Inspector to provide required information.									x															
369.05	Failure of rail inspection record to provide required information.									x															
369.06	Failure to make records available for copying and inspection.									x															
369.07	Electronic system does not maintain the integrity of each record.									x															
369.08	Electronic system allows record or amendments to be modified.									x															
369.09	Electronic amendments not stored separately from record.									x															
369.10	Person making electronic amendment not identified.									x															
369.11	Electronic system corrupts or losses data.									x															
369.12	Paper copies of records not made available for inspection and copying.									x															
369.13	Inspection reports not available to Inspector or subsequent Inspectors.									x															
369.14	Electronic storage not initiated within 24 hours.									x															

Notes:

(1) No defects permitted from this type of vehicle (separate report with appropriate source code for field verified defects)