TRACK STANDARDS\(^1\)/

Subpart A - General

§ 213.3 Application

Track standards apply to all standard gauge track in the general railroad system except (a) track located inside an installation which is not part of the general railroad system or (b) used exclusively for rapid transit.

§ 213.4 Excepted Track

A track owner may except a designated segment of track from coverage under the regulation if (a) it is identified in the timetable, special instruction, general order or other records; (b) it is not located within 30 feet of an adjacent track over which speeds may be in excess of 10 miles per hour; (c) it is inspected at the same frequency as for Class 1 track; (d) it is not located on a bridge or 100 feet on either side of a bridge, or located on a public street or highway, if cars containing placarded hazardous materials are moved over the track; (e) the operation over that segment shall have further limitations: (1) no train shall be operated at speeds in excess of 10 miles per hour; (2) no revenue passenger train shall be operated; (3) no freight train may be operated that contains more than 5 cars placarded as hazardous materials; and (4) the gage on excepted track shall not be more than 4 feet 10 1/4 inches.

§ 213.5 Responsibility for Compliance

If an owner of track knows or has notice that the track does not comply with these regulations, he shall (a) bring the track into compliance; or (b) halt operations over that track; or (c) operate under the authority of a person designated who has at least one year of supervisory experience in railroad track maintenance; or a combination of supervisory experience and a course training in track maintenance (or a college level education related to track maintenance).

§ 213.9 Speed Limits

Operations over excepted track may continue without the necessity to comply with the provisions of the higher classes of track.

---

\(^1\) Because of the complexity of the track standards, the specific sections are cited.
The maximum allowable operating speeds over the various classes of track are as follows:

<table>
<thead>
<tr>
<th>Over track that meets all of the requirements prescribed in this part for —</th>
<th>The maximum allowable operating speed for freight trains is —</th>
<th>The maximum allowable operating speed for freight trains is —</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exempted track</td>
<td>10</td>
<td>N/A</td>
</tr>
<tr>
<td>Class 1 track</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Class 2 track</td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td>Class 3 track</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>Class 4 track</td>
<td>60</td>
<td>80</td>
</tr>
<tr>
<td>Class 5 track</td>
<td>80</td>
<td>90</td>
</tr>
</tbody>
</table>

A segment of track that does not meet all of the requirements for its intended class shall be reclassified to the next lowest class for which it does not meet the requirements. If the segment does not at least meet the requirements of Class 1 track, the railroad may continue Class 1 speeds for up to 30 days without bringing it into compliance under a designated and qualified person's supervision.

§ 213.11 Restoration or Renewal

If during a period of restoration or renewal, track does not meet all of the requirements, the work on the track must be under the continuous supervision of a designated person who has at least one year supervisory experience in railroad track maintenance. The term "continuous supervision" means the physical presence of that person at a job site. If the work is performed over a large area, it is not necessary that each phase of the work be done under visual supervision of that person.

§ 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.

Subpart B - 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.

§ 213.37 Vegetation

Vegetation on railroad property which is on or immediately adjacent to roadbed must be controlled so that it does not (a) become a fire hazard to track carrying structures; (b) obstruct visibility of railroad signs and signals along the right of way and 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.

Subpart C - Track Geometry

§ 213.53 Gage

Gage must be within the limits prescribed in the following table:

<table>
<thead>
<tr>
<th>Class of track</th>
<th>The gage must be —</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At least</td>
</tr>
<tr>
<td>Excepted Track</td>
<td>N/A</td>
</tr>
<tr>
<td>1..................</td>
<td>4'8&quot;</td>
</tr>
<tr>
<td>2 and 3..........</td>
<td>4'8&quot;</td>
</tr>
<tr>
<td>4 and 5..........</td>
<td>4'8&quot;</td>
</tr>
</tbody>
</table>

§ 213.55 Alinement

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

<table>
<thead>
<tr>
<th>Class of track</th>
<th>TANGENT TRACK</th>
<th>CURVED TRACK</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The deviation of the mid-offset from 62-foot line1/ may not be more than—</td>
<td>The deviation of the mid-ordinate from a 31-foot chord2/ may not be more than —</td>
</tr>
<tr>
<td>1..................</td>
<td>5&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>2..................</td>
<td>3&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>3..................</td>
<td>1 3/4&quot;</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>4..................</td>
<td>1 1/2&quot;</td>
<td>1&quot;</td>
</tr>
<tr>
<td>5..................</td>
<td>3/4&quot;</td>
<td>1/2&quot;</td>
</tr>
</tbody>
</table>

1/ The ends of the line must be at points on the gage side of the line rail, 5/8 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, 5/8 of an inch below the top of the railhead.

§ 213.57 Curves; elevation and speed limitations.

(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. (The first sentence of paragraph (a) is applicable September 21, 1999.)

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

\[ V_{\text{max}} = \sqrt{\frac{E_a + 3}{0.0007D}} \]

D = Degree of curvature (degrees). n2

(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.

(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 --

\[ V_{\text{max}} = \sqrt{\frac{E_a + 4}{0.0007D}} \]

Where --

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

\( E_a \) = Actual elevation of the outside rail (inches). n1

n1 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.

D = Degree of curvature (degrees). n2

n2 Degree of curvature is determined by averaging the degree of curvature over the same track segment as the elevation.

(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.

(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 4-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 6 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 --

4
(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 n3 and instrumentation used to qualify the equipment and the maximum values for wheel unloading and roll angles which were observed during testing;

n3 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 4 and 6 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.

(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.

(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.

(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.

(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 vehicle 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 vehicle 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 vehicle 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.

§ 213.59 Elevation of curved track; runoff.

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

(b) Elevation runoff shall be at a uniform rate, within the limits of track surface deviation prescribed in § 213.63, and it shall 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.

§ 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:

<table>
<thead>
<tr>
<th>Track surface</th>
<th>1 (Inches)</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>The runoff in any 31 feet of rail at the end of a raise may not be more than</td>
<td>3 3/4</td>
<td>3</td>
<td>2</td>
<td>1 1/2</td>
<td>1</td>
</tr>
<tr>
<td>The deviation from uniform profile on either rail at the mid-ordinate of a 62-foot chord may not be more than</td>
<td>3 1/2</td>
<td>3</td>
<td>2</td>
<td>1 1/2</td>
<td>1</td>
</tr>
<tr>
<td>The deviation from zero crosslevel at any point on tangent or reverse crosslevel elevation on curves may not be more than</td>
<td>3 2 3/4</td>
<td>2 1/4</td>
<td>2</td>
<td>1 1/4</td>
<td>1</td>
</tr>
<tr>
<td>The difference in crosslevel between any two points less than 62 feet apart may not be more than* fn 1,2</td>
<td>3 2 1/4</td>
<td>2</td>
<td>1 3/4</td>
<td>1 1/2</td>
<td>1</td>
</tr>
</tbody>
</table>
*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

\[
\begin{array}{cccc}
2 & 1 & \frac{3}{4} & 1 & \frac{1}{4} & 1 & \frac{3}{4}
\end{array}
\]

\[fn1\] Except as limited by § 213.57(a), where the elevation at any point in a curve equals or exceeds 6 inches, the difference in crosslevel within 62 feet between that point and a point with greater elevation may not be more than 1 1/2 inches. (Footnote 1 is applicable September 21, 1999.)

\[fn2\] However, to control harmonics on Class 2 through 5 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 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. (Footnote 2 is applicable September 21, 1999.)

Subpart D - Track Structure

§ 213.103 Ballast

All track must be supported by a 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 equipment and thermal stress exerted by the rails; (c) provide adequate drainage for the track; (d) maintain proper track cross level, surface and alinement.

§ 213.109 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;
   (ii) Maintain surface; and
   (iii) Maintain alinement.

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

(3) At least 1 crosstie of the type specified in paragraph (c) and (d) of this
section that is located at a joint location as specified in paragraph (f) of this section.

(c) Each 39-foot segment of: Class 1 track shall have 5 crossties; Classes 2 and 3 track shall have 8 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 1/2 inch relative to the crossties; or

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

(d) Each 39 foot segment of track shall have the minimum number and type of crossties as indicated in the following table (this paragraph (d) is applicable September 21, 2000)

<table>
<thead>
<tr>
<th>Class of Track</th>
<th>Tangent track and curves ≥ 2 degrees</th>
<th>Tumouts and curved track over 2 degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1 track ..........</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Class 2 track ..........</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Class 3 track ..........</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Class 4 and 5 track ....</td>
<td>12</td>
<td>14</td>
</tr>
</tbody>
</table>

(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 1/2 inch relative to the crossties; or

(4) Cut by the tie plate through more than 40 percent of a crosstie’s thickness this paragraph (e) is applicable September 21, 2000.

(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 diagrams:
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.

§213.110 Gage Restraint Measurement Systems

(a) This 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. Track owners must also provide FRA with at least 10 days notice prior to the removal of a line segment from GRMS designation.
(b) 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.

(c) 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. The 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.

(d), (e) and (f) The mathematical formulas prescribed in these paragraphs are 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 comprise 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. The Task Group recommended that the loaded track gage measurement be taken at the point of application of the lateral load, as is the practice on existing in-service GRMS vehicles that use displacement transducers mounted on the instrumented wheelset. This final rule provides for the use of other gage measuring technologies, such as optical and laser gage measuring systems, by allowing the measurement of loaded gage to be taken no more than 12 inches from the lateral load application point.

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).

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

\[ \text{PLG 24} = \text{UTG} + A \times (\text{LTG} - \text{UTG}) \]

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 --
\[
A = \frac{13.513}{(.001 \times L - .000258 \times V) - .009 \times (.001 \times L - .000258 \times V)^2}
\]
Note: The A factor shall not exceed (3.184) under any valid loading configuration.
where --
L=Actual lateral load applied (pounds).
V=Actual vertical load applied (pounds).
The measured gage value shall be converted to a Gage Widening Ratio (GWR) as follows --
\[
GWR = \frac{(LTG - UTG)}{16,000} \times \frac{1}{L}
\]
(g), (h) and (i) GRMS vehicles must be also capable of producing strip chart traces 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 designated as fully qualified under § 213.7 prior to the next inspection required under § 213.233 of this part.

(j) The track owner is required to institute procedures that will ensure the integrity of data collected by the GRMS and PTLF systems. Daily GRMS instrument verification procedures should ensure that measurements made on the ground of loaded and unloaded gage parameters correlate to those recorded by the instrumentation. Track owners shall maintain documented calibration procedures on each GRMS vehicle and make them available upon request from an FRA representative. 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/minus five percent.

(k) This paragraph recognizes the need for all 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 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.

This paragraph specifies the parameters and threshold levels to be reported as a record of lateral restraint following an inspection by a GRMS vehicle. The regulation requires that two levels of exceptions are 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 mph 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.

Footnote 2 in the Remedial Action Table of this section recognizes that typical good track will increase in total gage by as much as 1/4 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 1/4 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 1/4 inch allowance in gage applies only to GRMS loaded gage, and does not apply to PTLF gage measurements or to measurements made by more traditional methods.

<table>
<thead>
<tr>
<th>GRMS Parameter</th>
<th>If measurement value exceeds</th>
<th>Remedial action required</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First Level Exception</td>
<td></td>
</tr>
<tr>
<td>UTG</td>
<td>58 inches</td>
<td>(1) Immediately protect the Exception location with a 10 mph 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 inches</td>
<td></td>
</tr>
<tr>
<td>PLG24</td>
<td>59 inches</td>
<td></td>
</tr>
<tr>
<td>GWR</td>
<td>1.0 inches</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Second Level Exception</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LTG</td>
<td>57 3/4 inches</td>
<td>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</td>
</tr>
</tbody>
</table>
compliance with § 213.53(b) of this part as measured with the PTLF.

PLG24 58 inches
GWR 0.75 inches

[fn1] Definitions for the GRMS parameters referenced in this table are found in paragraph (p) of this section.

[fn2] This note recognizes that typical good track will increase in total gage by as much as 1/4 inch due to outward rail rotation under GRMS loading conditions. For Class 2 & 3 track, the GRMS LTG values are also increased by 1/4 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 appropriate remedial actions must be taken by the track owner. This 1/4 -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.

(m) 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 5/8 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 5/8 inch shall constitute a deviation from Class 1 standards.

(n) The track owner must 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 track owner is not required to maintain records of Second Level exceptions. However, as required in paragraph (i), reports of all exceptions, including Second Level exceptions, must be provided to the appropriate fully qualified § 213.7 individuals prior to the next inspection required under § 213.233. Second Level exceptions are also described in the Remedial Action Table in Paragraph (l).

(o) On line segments where the annual tonnage exceeds two million gross tons, or where the maximum operating speeds for passenger trains exceeds 30 mph, GRMS inspections must be performed annually, with no more than 14 months between inspections. 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.
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 mph, the interval between GRMS inspections cannot exceed 24 months. 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.

This subsection lists the following definitions: gage restraint measurement system; gage widening ratio; L/V ratio; load severity; loaded track gage; portable track loading fixture; projected loaded gage; and unloaded track gage.

§ 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.

Remedial Action

<table>
<thead>
<tr>
<th>Defect</th>
<th>Length of defect (inch)</th>
<th>Length of defect (inch)</th>
<th>Percent of rail head cross sectional area weakened by defect</th>
<th>Percent of rail head cross sectional area weakened by defect</th>
<th>If defective rail is not replaced the remedial action pre-scribed in note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transverse fissure</td>
<td>More than 70</td>
<td>70</td>
<td>5 A.</td>
<td></td>
<td>B.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>70</td>
<td></td>
<td>A2.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td></td>
<td></td>
<td>A.</td>
</tr>
<tr>
<td>Compound fissure</td>
<td>More than 70</td>
<td>70</td>
<td>5 B.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>70</td>
<td></td>
<td>A2.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td></td>
<td></td>
<td>A.</td>
</tr>
<tr>
<td>Detail fracture</td>
<td></td>
<td>25</td>
<td>5 C.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defect</td>
<td>Length of defect (inch)</td>
<td>Length of defect (inch)</td>
<td>Percent of rail head cross sectional area weakened by defect</td>
<td>Percent of rail head cross sectional area weakened by defect</td>
<td>If defective rail is not replaced the remedial action prescribed in note</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------------</td>
<td>-------------------------</td>
<td>-------------------------------------------------------------</td>
<td>-------------------------------------------------------------</td>
<td>---------------------------------------------------------------------</td>
</tr>
<tr>
<td>Engine burn fracture</td>
<td></td>
<td></td>
<td>80</td>
<td>25</td>
<td>D.</td>
</tr>
<tr>
<td>Defective weld</td>
<td></td>
<td></td>
<td>100</td>
<td>80</td>
<td>[A2] or [E and H].</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>100</td>
<td></td>
<td>[A] or [E and H].</td>
</tr>
<tr>
<td>Horizontal split head</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td>H and F.</td>
</tr>
<tr>
<td>Vertical split head</td>
<td>2</td>
<td>4</td>
<td></td>
<td></td>
<td>I and G.</td>
</tr>
<tr>
<td>Split web</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>B.</td>
</tr>
<tr>
<td>Piped rail</td>
<td>(fn1)</td>
<td>(fn1)</td>
<td>(fn1)</td>
<td></td>
<td>A.</td>
</tr>
<tr>
<td>Head web separation</td>
<td>1/2</td>
<td>1</td>
<td></td>
<td></td>
<td>H and F.</td>
</tr>
<tr>
<td>Bolt hole crack</td>
<td>1</td>
<td>1 1/2</td>
<td></td>
<td></td>
<td>H and G.</td>
</tr>
<tr>
<td></td>
<td>1 1/2</td>
<td></td>
<td></td>
<td></td>
<td>B.</td>
</tr>
<tr>
<td></td>
<td>(fn1)</td>
<td>(fn1)</td>
<td>(fn1)</td>
<td></td>
<td>A.</td>
</tr>
<tr>
<td>Broken base</td>
<td>1</td>
<td>6</td>
<td></td>
<td></td>
<td>D.</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>[A] or [E and I].</td>
</tr>
<tr>
<td>Ordinary break</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A or E.</td>
</tr>
<tr>
<td>Damaged rail</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>D.</td>
</tr>
<tr>
<td>Flattened rail</td>
<td>Depth &gt; 3/8 and length &gt; 8.</td>
<td></td>
<td></td>
<td></td>
<td>H.</td>
</tr>
</tbody>
</table>

(fn1) break out in rail head
Notes:

A. Assigned 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 mph until joint bars are applied; thereafter limit speed to 50 mph 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 2 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 mph until joint bars are applied; thereafter, limit speed to 50 mph 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 mph 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 mph 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 mph 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 mph or the maximum allowable speed under § 213.9 for the class of track concerned, whichever is lower.

Under this section the regulations define transverse fissure, compound fissure, horizontal split head, vertical split head, split web, piped rail, broken base, detail fracture, engine burn factor, ordinary break, damaged rail.

§ 213.115 Rail End Mismatch

Any mismatch of rails at joints may not be more than set forth in the following table.

<table>
<thead>
<tr>
<th>Class of track</th>
<th>Any mismatch of rails at joints may not be more than the following—</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>On the trend of the rail ends (inch)</td>
</tr>
<tr>
<td>1</td>
<td>1/4</td>
</tr>
<tr>
<td>2</td>
<td>1/4</td>
</tr>
<tr>
<td>3</td>
<td>3/16</td>
</tr>
<tr>
<td>4,5</td>
<td>1/8</td>
</tr>
</tbody>
</table>

§ 213.119 Continuous welded rail (CWR); general

Each track owner with track constructed of CWR shall have in effect and comply with 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 by December 21, 1998. 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, intrack 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 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.

(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 kindly 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 § 213.7 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 must 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 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 misalignment 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.

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 or 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 section to the rail/crosstie structure against longitudinal displacement.

§ 213.121 Rail Joints

(a)  Each rail joint, insulated joint, and compromise joint must be of the proper design and dimensions for the rail on which it is applied.

(b)  If a joint bar on Classes 3 through 5 track is cracked, broken, or because of wear allows vertical movement of either rail when all bolts are tight, it must be replaced.

(c)  If a joint bar is cracked or broken between the middle two bolt holes it must be replaced.

(d)  In the case of conventional jointed track, each rail must be bolted with at least two bolts at each joint in Classes 2 through 5 track, and with at least one bolt at each joint.

(e)  In the case of continuous welded rail track, each rail must be bolted with at least two bolts at each joint.

(f)  Each joint bar must be held in position by trackbolts 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 out-of-face, no slip, joint-to-rail contact exists by design, the requirements of this
paragraph do not apply. Those locations are considered to be continuous welded rail track and must meet all the requirements for continuous welded rail track prescribed in this part.

(g) No rail or angle bar having a torch cut or burned bolt hole may be used in Classes 3 through 5 track.

§ 213.122 Torch cut rail

(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.

(b) Following the expiration of the time limits specified in paragraphs (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.

§ 213.123 Tie plates

(a) In Classes 3 through 5 track where timber crossties are in use there shall be tie plates under the running rails on at least eight of any 10 consecutive ties.

(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.

§ 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.

§ 213.133 Turnouts and track crossings
(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.

(b) Classes 4 through 5 track must be equipped with rail anchors 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 tracks this paragraph is applicable September 21, 1999.

(c) Each flangeway at turnouts and track crossings must be at least 1 1/2 inches wide.

§ 213.135 Switches

(a) Each stock rail must be securely seated in switch plates, but care must be used to avoid canting the rail by overtightening the rail braces.

(b) Each switch point must 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 on a tie must not adversely affect the fit of the switch point to the stock rail.

(c) Each switch must be maintained so that the outer edge of the wheel tread cannot contact the gauge side of the stock rail.

(d) The heel of each switch rail must be secure and the bolts in each heel must be kept tight.

(e) Each switch stand and connecting rod must be securely fastened and operable without excessive lost motion.

(f) Each throw lever must be maintained so that it cannot be operated with the lock or keeper in place.

(g) Each switch position indicator must be clearly visible at all times.

(h) Unusually chipped or worn switch points must be repaired or replaced. Metal flow must be removed to insure proper closure.

(i) Tongue and Plate Mate switches which by design exceed Class 1 and excepted track maximum gage limits are permitted in Class 1 and excepted track.

§ 213.137 Frogs

(a) The flangeway depth measured from a plane across wheel-bearing area of a frog on Class 1 track may not be less than 1 3/8 inches, or less than 1 1/2 inches on Classes 2 through 5 track.
(b) If a frog point is chipped, broken, or wore more than 5/8 of an inch down and 6 inches back, operating speed over that frog may not be more than 10 miles per hour.

(c) If the tread portion of a frog casting is worn down more than 3/8 of an inch below the original contour, operating speed over that frog may not be more than 10 miles per hour.

(d) Where frogs are designed as flange-bearing, flangeway depth may be less than shown for Class 1 if operated at Class 1 speeds.

§ 213.139 Spring rail frogs

(a) The outer edge of a wheel tread may not contact the gage side of a spring wing rail.

(b) the toe of each wing rail must be solidly tamped and fully and tightly bolted.

(c) Each frog with a bolt hole defect or head-web separation must be replaced.

(d) Each spring must have a compression sufficient to hold the wing rail against the point rail.

(e) The clearance between the holddown housing and the horn may not be more than 1/4 of an inch.

§ 213.141 Self-guarded frogs

(a) The raised guard on a self-guarded frog may not be worn more than 3/8 of an inch.

(b) If repairs are made to the self-guarded frog without removing it from service, the guarding face must be restored before rebuilding the point.

§ 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

<table>
<thead>
<tr>
<th>Class of track</th>
<th>Guard check gauge—the distance between the gauge line of a frog to the guard line of its guard rail or guarding face, measured across the track at right angles to the gauge line, may not be less than—</th>
<th>Guard face gauge—the distance between guard lines, measured across the track at right angles to the gauge line, may not be more than—</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Guard check gauge—the distance between the gauge line of a frog to the guard line of its guard rail or guarding face, measured across the track at right angles to the gauge line, may not be less than—</td>
<td>Guard face gauge—the distance between guard lines, measured across the track at right angles to the gauge line, may not be more than—</td>
</tr>
</tbody>
</table>
Subpart E--Track Appliances and Track-Related Devices

§ 213.201 -- Scope.
This subpart prescribes minimum requirements for certain track appliances and track-related devices.

§ 213.205 -- Derails.
(a) Each derail shall be clearly visible.

1A line along that side of the flangeway which is nearer to the center of the track and at the same elevation as the gauge line.

2A 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.
(b) When in a locked position, a derail shall be free of lost motion which would prevent it from performing its intended function.
(c) Each derail shall be maintained to function as intended.
(d) Each derail shall be properly installed for the rail to which it is applied. (This paragraph (d) is applicable September 21, 1999.)

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.
(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.
(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.

(c) Each track inspection shall be made in accordance with the following schedule-
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 day interval between inspections. | Twice weekly with at least calendar Day interval between inspections. |

(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.

§ 213.235 -- Inspection of switches, track crossings, and lift rail assemblies or other transition devices on moveable bridges.

(a) Except as provided in paragraph (c) of this section, each switch, turnout, track crossing, and moveable bridge lift rail assembly or other transition device shall be inspected on foot at least monthly.

(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 3 month period.

(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.

§ 213.237 -- Inspection of rail.

(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 applicable January 1, 1999.)

(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. (This paragraph (d) is not retroactive to tests performed prior to September 21, 1998.)
(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.

§ 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.

§ 213.241 -- 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) Each record of an inspection under §§ 213.4, 213.233, and 213.235 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.
(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.
(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.

Subpart G—Train Operations at Track Classes 6 and Higher

§ 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.

§ 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.

(d) 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.

§ 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) Inspect 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;
   (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.
   (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 apart 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 apart: 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.

§ 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:

<table>
<thead>
<tr>
<th>Over track that meets all of the requirements prescribed in this subpart</th>
<th>the maximum allowable operating speed for trains fn1 is--</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 6 track</td>
<td>110 m.p.h.</td>
</tr>
<tr>
<td>Class 7 track</td>
<td>125 m.p.h.</td>
</tr>
<tr>
<td>Class 8 track</td>
<td>160 m.p.h. fn2</td>
</tr>
<tr>
<td>Class 9 track</td>
<td>200 m.p.h.</td>
</tr>
</tbody>
</table>

fn1 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.

fn2 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.

§ 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.

§ 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.

§ 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.

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

§ 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.

§ 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:

<table>
<thead>
<tr>
<th>Class of track</th>
<th>The gage must be at least--</th>
<th>But not more than--</th>
<th>The change of gage within 31 feet must not be greater than</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>8&quot;</td>
<td>4'9 1/4 &quot;</td>
<td>1/2 &quot;</td>
</tr>
<tr>
<td>7</td>
<td>4'8&quot;</td>
<td>4'9 1/4 &quot;</td>
<td>1/2 &quot;</td>
</tr>
<tr>
<td>8</td>
<td>4'8&quot;</td>
<td>4'9 1/4 &quot;</td>
<td>1/2 &quot;</td>
</tr>
<tr>
<td>9</td>
<td>4'8 1/4 &quot;</td>
<td>4'9 1/4 &quot;</td>
<td>1/2 &quot;</td>
</tr>
</tbody>
</table>

§ 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:

<table>
<thead>
<tr>
<th>Chord length</th>
<th>Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>31'</td>
<td>7'9&quot;</td>
</tr>
<tr>
<td>62'</td>
<td>15'6&quot;</td>
</tr>
<tr>
<td>124'</td>
<td>31'0&quot;</td>
</tr>
</tbody>
</table>

(b) For a single deviation, alinement may not deviate from uniformity more than the amount prescribed in the following table:

<table>
<thead>
<tr>
<th>Class of track</th>
<th>The deviation from uniformity of the mid-chord offset for a 31-foot chord may not be more than-- (inches)</th>
<th>The deviation from uniformity of the mid-chord offset for a 62-foot chord may not be more than-- (inches)</th>
<th>The deviation from uniformity of the mid-chord offset for a 124-foot chord may not be more than-- (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>1/2</td>
<td>3/4</td>
<td>1 1/2</td>
</tr>
<tr>
<td>7</td>
<td>1/2</td>
<td>1/2</td>
<td>1 1/4</td>
</tr>
<tr>
<td>8</td>
<td>1/2</td>
<td>1/2</td>
<td>3/4</td>
</tr>
<tr>
<td>9</td>
<td>1/2</td>
<td>1/2</td>
<td>3/4</td>
</tr>
</tbody>
</table>
(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:

<table>
<thead>
<tr>
<th>Class of track</th>
<th>The deviation from uniformity of the mid-chord offset for a 31-foot chord may not be more than-- (inches)</th>
<th>The deviation from uniformity of the mid-chord offset for a 62-foot chord may not be more than-- (inches)</th>
<th>The deviation from uniformity of the mid-chord offset for a 124-foot chord may not be more than-- (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>3/8</td>
<td>1/2</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>3/8</td>
<td>3/8</td>
<td>7/8</td>
</tr>
<tr>
<td>8</td>
<td>3/8</td>
<td>3/8</td>
<td>1/2</td>
</tr>
<tr>
<td>9</td>
<td>3/8</td>
<td>3/8</td>
<td>1/2</td>
</tr>
</tbody>
</table>

§ 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) (1) The maximum allowable operating speed for each curve is determined by the following formula:

\[ V_{\text{max}} = \sqrt{\frac{E[a] + 3}{0.0007D}} \]

Where-

\[ V_{\text{max}} \] = Maximum allowable operating speed (miles per hour).

\[ E[a] \] = Actual elevation of the outside rail (inches) n4.

n4 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 \( V_{\text{max}} \) formula applies to the spirals on both ends of the curve.

\[ D \] = Degree of curvature (degrees) n5.
n5 Degree of curvature is determined by averaging the degree of curvature over the same track segment as the elevation.

3 = 3 inches of unbalance.

(2) 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:

\[ V_{\text{max}} = \sqrt{\frac{E_a + E_u}{0.0007D}} \]

Where-

- \( V_{\text{max}} \) = Maximum allowable operating speed (miles per hour).
- \( E_a \) = Actual elevation of the outside rail (inches).
- \( D \) = Degree of curvature (degrees).
- \( E_u \) = Unbalanced elevation (inches).

(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 super-elevation, \( E_a \), 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 and instrumentation used to qualify the equipment and the maximum values for wheel unloading and roll angles which were observed during testing;

   n6 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.

§ 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:

<table>
<thead>
<tr>
<th>Track surface</th>
<th>Class of track</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6 (in.)</td>
</tr>
</tbody>
</table>

The deviation from uniform fn1 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 fn2.

|                | 1 1/2 | 1 1/2 | 1 1/2 | 1 1/2 |

[fn1] Uniformity for profile is established by placing the midpoint of the specified chord at the point of maximum measurement.

[fn2] 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 purposes 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:
The deviation from uniform profile on either rail at the midordinate of a 31-foot chord may not be more than 3/4 in. for Class 6, 7/8 in. for Class 7, 1/2 in. for Class 8, and 3/8 in. for Class 9.

The deviation from uniform profile on either rail at the midordinate of a 62-foot chord may not be more than 3/4 in. for Class 6, 3/4 in. for Class 7, 3/4 in. for Class 8, and 1/2 in. for Class 9.

The deviation from uniform profile on either rail at the midordinate of a 124-foot chord may not be more than 1 1/4 in. for Class 6, 1 in. for Class 7, 7/8 in. for Class 8, and 7/8 in. for Class 9.

§ 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, 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:
      \[ \frac{L_{TG} - U_{TG}}{L} \times 16,000 \]
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).

(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.
### Vehicle/Track Interaction Safety Limits

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Safety limit</th>
<th>Filter/window</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wheel/Rail Forces [fn1]</strong></td>
<td></td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>Single Wheel</td>
<td>≥ 0.1</td>
<td>5 ft</td>
<td>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.</td>
</tr>
<tr>
<td>Vertical Load Ratio</td>
<td></td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Net Axle L/V Ratio</strong></td>
<td>≤ 0.5</td>
<td>5 ft</td>
<td>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.</td>
</tr>
<tr>
<td><strong>Truck Side L/V Ratio</strong></td>
<td>≤ 0.6</td>
<td>5 ft</td>
<td></td>
</tr>
</tbody>
</table>
Accelerations
Carbody Lateral $\leq 0.5$ g peak-10 Hz 1 sec
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 fn2 $\leq 0.6$ g peak-10 Hz 1 sec
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 $\leq 0.4$ g RMS 10 Hz 2 sec
Truck hunting [fn4] shall not develop below the maximum authorized speed.

[fn1] 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.
[fn2] Carbody lateral and vertical accelerations shall be measured near the car ends at the floor level.
[fn3] 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.
[fn4] 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.

§ 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.

§ 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 tooload, 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 3/8 inch relative to the crossties;
   (5) So deteriorated that rail seat abrasion is sufficiently deep so as to cause loss of rail fastener tooload;
   (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.
§ 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

<table>
<thead>
<tr>
<th>Defect</th>
<th>Length of defect (inch)</th>
<th>Percent of rail head cross sectional area weakened by defect</th>
<th>If defect rail is not replaced take the remedial action prescribed in note</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>More than</td>
<td>But not more than</td>
<td>But not less than</td>
</tr>
<tr>
<td>Transverse fissure</td>
<td></td>
<td>70</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>Compound fissure</td>
<td>70</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Detail fracture</td>
<td>25</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Engine burn fracture</td>
<td>80</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>fracture</td>
<td>100</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>Defective weld</td>
<td></td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Horizontal split head</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Vertical split head</td>
<td>2</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Split web</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Piped rail</td>
<td>(‘)</td>
<td>(‘)</td>
<td>(‘)</td>
</tr>
<tr>
<td>Head web separation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bolt hole crack</td>
<td>1/2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1/2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 1/2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(‘)</td>
<td>(‘)</td>
<td>(‘)</td>
</tr>
<tr>
<td>Broken base</td>
<td>1</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ordinary break</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Damaged rail</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flattened rail</td>
<td>Depth &gt; 3/8 and</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Length ≥ 8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(‘) Indicates 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 3/8 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.

§ 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 § 213.337(a).
§ 213.341 -- Initial inspection of new rail and welds.

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 miles per hour until such time as a valid search for internal defects can be made; or
3. Remove the rail from service.

§ 213.343 -- Continuous welded rail (CWR).

Each track owner 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.
§ 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 alignment 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 two consecutive seconds as expressed by the square root of \( V^2 + L^2 \) 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(k).

(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.
Based on test results and submissions, FRA will approve a maximum train speed and value of cant deficiency for revenue service.

§ 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.

§ 213.349 -- Rail end mismatch.  
Any mismatch of rails at joints may not be more than that prescribed by the following table:

<table>
<thead>
<tr>
<th>Class of track</th>
<th>Any mismatch of rails at joints may not be more than the following--</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>On the tread of the rail ends</td>
</tr>
<tr>
<td>Class 6, 7, 8 and 9</td>
<td>1/8</td>
</tr>
</tbody>
</table>

§ 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.
§ 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 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.

§ 213.353 -- Turnouts, crossovers 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.

§ 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-

<table>
<thead>
<tr>
<th>Class of track</th>
<th>Guard check gage--The Distance between the gage line of a frog to the guard line of its guard rail or guarding face measured across the track at right angles to the gage line fn2 may not be less than</th>
<th>Guard face gage--The distance between guard lines fn1 measured across the track at right angles to the gage line fn2 may not be more than</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 6 track</td>
<td>4' 6 1/2 &quot;</td>
<td>4' 5&quot;</td>
</tr>
</tbody>
</table>
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"

fn1 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.
fn2 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.

§ 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.

§ 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 alignment 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.

§ 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.

§ 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 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 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-

<table>
<thead>
<tr>
<th>Class of track</th>
<th>Required frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>6, 7, 8</td>
<td>Twice weekly with at least 2 calendar-day's interval between inspections.</td>
</tr>
<tr>
<td>9</td>
<td>Three times per week.</td>
</tr>
</tbody>
</table>

(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 miles per hour over the track before the resumption of operations at the maximum authorized speed.
§ 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.

§ 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.

Appendix A- Maximum Allowable Curving Speeds
Appendix B-Penalty Schedule
Appendix C- Agency Policy on Safety of Railroad Bridges