

(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

Defect	Length of defect (inch)		Percent of rail head cross-sectional area weakened by defect		If defective rail is not replaced, take the remedial action prescribed in note
	More than	But not more than	Less than	But not less than	
Transverse fissure			70..... 100.....	5..... 70..... 100.....	B. A2. A.
Compound fissure			70..... 100.....	5..... 70..... 100.....	B. A2. A.
Detail fracture Engine burn fracture Defective weld			25..... 80..... 100.....	5..... 25..... 80..... 100.....	C. D. [A2] or [E and H]. [A] or [E and H].
Horizontal split head Vertical split head Split web Piped rail Head web separation	1 2 4 (¹)	2..... 4..... (¹)			H and F. I and G. B. A.
Bolt hole crack	½ 1 1½ (¹)	1..... 1½..... (¹)			H and F. H and G. B. A.
Broken base	1 6	6.....			D. [A] or [E and I].
Ordinary break					A or E.
Damaged rail					D.
Flattened rail	Depth > ¼ and Length > 8				H.

(¹) Break out in rail head.

NOTES: A. Assign person designated under §213.305 to visually supervise each operation over defective rail.

A2. Assign person designated under §213.305 to make visual inspection. That person may authorize operation to continue without visual supervision at a maximum of 10 m.p.h.

for up to 24 hours prior to another such visual inspection or replacement or repair of the rail.

B. Limit operating speed over defective rail to that as authorized by a person designated under § 213.305(a)(1)(i) or (ii). The operating speed cannot be over 30 m.p.h.

C. Apply joint bars bolted only through the outermost holes to defect within 20 days after it is determined to continue the track in use. Limit operating speed over defective rail to 30 m.p.h. until joint bars are applied; thereafter, limit speed to 50 m.p.h. When a search for internal rail defects is conducted under § 213.339 and defects are discovered which require remedial action C, the operating speed shall be limited to 50 m.p.h., for a period not to exceed 4 days. If the defective rail has not been removed from the track or a permanent repair made within 4 days of the discovery, limit operating speed over the defective rail to 30 m.p.h. until joint bars are applied; thereafter, limit speed to 50 m.p.h.

D. Apply joint bars bolted only through the outermost holes to defect within 10 days after it is determined to continue the track in use. Limit operating speed over the defective rail to 30 m.p.h. or less as authorized by a person designated under § 213.305(a)(1)(i) or (ii) until joint bars are applied; thereafter, limit speed to 50 m.p.h.

E. Apply joint bars to defect and bolt in accordance with § 213.351(d) and (e).

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

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

H. Limit operating speed over defective rail to 50 m.p.h.

I. Limit operating speed over defective rail to 30 m.p.h.

(b) As used in this section—

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

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

horizontal split head from which they originate.

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

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

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

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

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

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

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

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

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

(12) *Flattened rail* means a short length of rail, not a joint, which has flattened out across the width of the rail head to a depth of $\frac{3}{8}$ inch or more below the rest of the rail. Flattened

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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, entrapment 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.

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§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).

(e) If a valid search for internal defects cannot be conducted for reasons described in paragraph (d) of this section, the track owner shall, before the expiration of time limits—

(1) Conduct a valid search for internal defects;

(2) Reduce operating speed to a maximum of 25 miles per hour until such time as a valid search for internal defects can be made; or

(3) Remove the rail from service.

§213.341 Initial inspection of new rail and welds.

The track owner shall provide for the initial inspection of newly manufactured rail, and for initial inspection of new welds made in either new or used rail. A track owner may demonstrate compliance with this section by providing for:

(a) *In-service inspection*—A scheduled periodic inspection of rail and welds that have been placed in service, if conducted in accordance with the provisions of §213.339, and if conducted not later than 90 days after installation, shall constitute compliance with paragraphs (b) and (c) of this section;

(b) *Mill inspection*—A continuous inspection at the rail manufacturer's mill shall constitute compliance with the requirement for initial inspection of new rail, provided that the inspection equipment meets the applicable requirements specified in §213.339. The track owner shall obtain a copy of the manufacturer's report of inspection and retain it as a record until the rail receives its first scheduled inspection under §213.339;

(c) *Welding plant inspection*—A continuous inspection at a welding plant, if conducted in accordance with the provisions of paragraph (b) of this section, and accompanied by a plant operator's report of inspection which is retained as a record by the track owner, shall