

three leaves broken. An outer coil spring or saddle may not be broken. An equalizer, hanger, bolt, gib, or pin may not be cracked or broken. A coil spring may not be fully compressed when the locomotive is at rest.

(c) A shock absorber may not be broken or leaking clearly formed droplets of oil or other fluid.

#### § 229.67 Trucks.

(a) The male center plate shall extend into the female center plate at least  $\frac{3}{4}$  inch. On trucks constructed to transmit tractive effort through the center plate or center pin, the male center plate shall extend into the female center plate at least  $1\frac{1}{2}$  inches. Maximum lost motion in a center plate assemblage may not exceed  $\frac{1}{2}$  inch.

(b) Each locomotive shall have a device or securing arrangement to prevent the truck and locomotive body from separating in case of derailment.

(c) A truck may not have a loose tie bar or a cracked or broken center casting, motor suspension lug, equalizer, hanger, gib or pin. A truck frame may not be broken or have a crack in a stress area that may affect its structural integrity.

#### § 229.69 Side bearings.

(a) Friction side bearings with springs designed to carry weight may not have more than 25 percent of the springs in any one nest broken.

(b) Friction side bearings may not be run in contact unless designed to carry weight. Maximum clearance of side bearings may not exceed one-fourth inch on each side or a total of one-half inch on both sides, except where more than two side bearings are used under the same rigid superstructure. The clearance on one pair of side bearings under the same rigid superstructure shall not exceed one-fourth inch on each side or a total of one-half inch on both sides; the other side bearings under the same rigid superstructure may have one-half inch clearance on each side or a total of 1 inch on both sides. These clearances apply where the spread of the side bearings is 50 inches or less; where the spread is greater, the side bearing clearance may only be increased proportionately.

#### § 229.71 Clearance above top of rail.

No part or appliance of a locomotive except the wheels, flexible nonmetallic sand pipe extension tips, and trip cock arms may be less than  $2\frac{1}{2}$  inches above the top of rail.

#### § 229.73 Wheel sets.

(a) The variation in the circumference of wheels on the same axle may not exceed  $\frac{1}{4}$  inch (two tape sizes) when applied or turned.

(b) The maximum variation in the diameter between any two wheel sets in a three-powered-axle truck may not exceed  $\frac{3}{4}$  inch, except that when shims are used at the journal box springs to compensate for wheel diameter variation, the maximum variation may not exceed  $1\frac{1}{4}$  inch. The maximum variation in the diameter between any two wheel sets on different trucks on a locomotive that has three-powered-axle trucks may not exceed  $1\frac{1}{4}$  inch. The diameter of a wheel set is the average diameter of the two wheels on an axle.

(c) On standard gauge locomotives, the distance between the inside gauge of the flanges on non-wide flange wheels may not be less than 53 inches or more than  $53\frac{1}{2}$  inches. The distance between the inside gauge of the flanges on wide flange wheels may not be less than 53 inches or more than  $53\frac{1}{4}$  inches.

(d) The distance back to back of flanges of wheels mounted on the same axle shall not vary more than  $\frac{1}{4}$  inch.

#### § 229.75 Wheels and tire defects.

Wheels and tires may not have any of the following conditions:

(a) A single flat spot that is  $2\frac{1}{2}$  inches or more in length, or two adjoining spots that are each two or more inches in length.

(b) A gouge or chip in the flange that is more than  $1\frac{1}{2}$  inches in length and  $\frac{1}{2}$  inch in width.

(c) A broken rim, if the tread, measured from the flange at a point five-eighths inch above the tread, is less than  $3\frac{3}{4}$  inches in width.

(d) A shelled-out spot  $2\frac{1}{2}$  inches or more in length, or two adjoining spots that are each two or more inches in length.

(e) A seam running lengthwise that is within  $3\frac{3}{4}$  inches of the flange.

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(f) A flange worn to a  $\frac{7}{8}$  inch thickness or less, gauged at a point  $\frac{3}{8}$  inch above the tread.

(g) A tread worn hollow  $\frac{5}{16}$  inch or more on a locomotive in road service or  $\frac{3}{8}$  inch or more on a locomotive in switching service.

(h) A flange height of  $1\frac{1}{2}$  inches or more measured from tread to the top of the flange.

(i) Tires less than  $1\frac{1}{2}$  inches thick.

(j) Rims less than 1 inch thick on a locomotive in road service or less than  $\frac{3}{4}$  inch on a locomotive in yard service.

(k) A crack or break in the flange, tread, rim, plate, or hub.

(l) A loose wheel or tire.

(m) Fusion welding may not be used on tires or steel wheels of locomotives, except for the repair of flat spots and worn flanges on locomotives used exclusively in yard service. A wheel that has been welded is a welded wheel for the life of the wheel.

### ELECTRICAL SYSTEM

#### § 229.77 Current collectors.

(a) Pantographs shall be so arranged that they can be operated from the engineer's normal position in the cab. Pantographs that automatically rise when released shall have an automatic locking device to secure them in the down position.

(b) Each pantograph operating on an overhead trolley wire shall have a device for locking and grounding it in the lowest position, that can be applied and released only from a position where the operator has a clear view of the pantograph and roof without mounting the roof.

#### § 229.79 Third rail shoes.

When locomotives are equipped with both third rail and overhead collectors, third-rail shoes shall be deenergized while in yards and at stations when current collection is exclusively from the overhead conductor.

#### § 229.81 Emergency pole; shoe insulation.

(a) Each locomotive equipped with a pantograph operating on an overhead trolley wire shall have an emergency pole suitable for operating the pantograph. Unless the entire pole can be

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safely handled, the part of the pole which can be safely handled shall be marked to so indicate. This pole shall be protected from moisture when not in use.

(b) Each locomotive equipped with third-rail shoes shall have a device for insulating the current collecting apparatus from the third rail.

#### § 229.83 Insulation or grounding of metal parts.

All unguarded noncurrent-carrying metal parts subject to becoming charged shall be grounded or thoroughly insulated.

#### § 229.85 Doors and cover plates marked "Danger".

All doors and cover plates guarding high voltage equipment shall be marked "Danger—High Voltage" or with the word "Danger" and the normal voltage carried by the parts so protected.

#### § 229.87 Hand-operated switches.

All hand-operated switches carrying currents with a potential of more than 150 volts that may be operated while under load shall be covered and shall be operative from the outside of the cover. Means shall be provided to show whether the switches are open or closed. Switches that should not be operated while under load shall be legibly marked with the words "must not be operated under load" and the voltage carried.

#### § 229.89 Jumpers; cable connections.

(a) Jumpers and cable connections between locomotives shall be so located and guarded to provide sufficient vertical clearance. They may not hang with one end free.

(b) Cable and jumper connections between locomotive may not have any of the following conditions:

(1) Broken or badly chafed insulation.

(2) Broken plugs, receptacles or terminals.

(3) Broken or protruding strands of wire.

#### § 229.91 Motors and generators.

A motor or a generator may not have any of the following conditions:

(a) Be shorted or grounded.