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of automatic brake if operating in automatic brake operation or by use of electro-pneumatic brake if operating in electro-pneumatic brake operation. Steam or power must not be shut off unless required and running test must be made by applying train air brakes with sufficient force to ascertain whether or not brakes are operating properly. If air brakes do not properly operate, train must be stopped, cause of failure ascertained and corrected and running test repeated.

§ 232.17 Freight and passenger train car brakes.

(a) *Testing and repairing brakes on cars while on shop or repair tracks.* (1) When a freight car having brake equipment due for periodic attention is on shop or repair tracks where facilities are available for making air brake repairs, brake equipment must be given attention in accordance with the requirements of the currently effective AAR Code of Rules for cars in interchange. Brake equipment shall then be tested by use of a single car testing device as prescribed by the currently effective AAR Code of Tests.

(2)(i) When a freight car having an air brake defect is on a shop or repair track, brake equipment must be tested by use of a single car testing device as prescribed by currently effective AAR Code of Tests.

(ii) All freight cars on shop or repair tracks shall be tested to determine that the air brakes apply and release. Piston travel on a standard body mounted brake cylinder which is less than 7 inches or more than 9 inches must be adjusted to nominally 7 inches. Piston travel of brake cylinders on all freight cars equipped with other than standard single capacity brake, must be adjusted as indicated on badge plate or stenciling on car located in a conspicuous place near brake cylinder. After piston travel has been adjusted and with brakes released, sufficient brake shoe clearance must be provided.

(iii) When a car is equipped for use in passenger train service not due for periodical air brake repairs, as indicated by stenciled or recorded cleaning dates, is on shop or repair tracks, brake equipment must be tested by use of single car testing device as prescribed by currently effective AAR Code of Tests. Piston travel of brake cylinders must be adjusted if required, to the standard travel for that type of brake cylinder. After piston travel has been adjusted and with brakes released, sufficient brake shoe clearance must be provided.

(iv) Before a car is released from a shop or repair track, it must be known that brake pipe is securely clamped, angle cocks in proper position with suitable clearance, valves, reservoirs and cylinders tight on supports and supports securely attached to car.

(b)(1) Brake equipment on cars other than passenger cars must be cleaned, repaired, lubricated and tested as often as required to maintain it in a safe and suitable condition for service but not less frequently than as required by currently effective AAR Code of Rules for cars in interchange.

(2) Brake equipment on passenger cars must be clean, repaired, lubricated and tested as often as necessary to maintain it in a safe and suitable condition for service but not less frequently than as required in Standard S–045 in the Manual of Standards and Recommended Practices of the AAR.

(3) Copies of the materials referred to in this section can be obtained from the Association of American Railroads, 1920 L Street, NW., Washington, DC 20036.

(72 Stat. 86 (45 U.S.C. 9); sec. 6 (e), (f), 80 Stat. 939 (49 U.S.C. 1655); and sec. 1.49(c) of the regulations of the Office of the Secretary of Transportation, 49 CFR 1.49(c))

[47 FR 36795, Aug. 23, 1982, as amended at 49 FR 1988, Jan. 17, 1984]

§ 232.19 End of train device.

(a) An end of train device shall be comprised of a rear-of-train unit (rear unit) located on the last car of a train and a front-of-train (front unit) unit located in the cab of the locomotive controlling the train.

(b) *Rear unit.* The rear unit shall be capable of determining the rear car brake pipe pressure and transmitting that information to the front unit for display to the locomotive engineer. The rear unit shall be—

(1) Capable of measuring the rear car brake pipe pressure with an accuracy of ±3 psig and brake pipe pressure variations of ±1 psig;

(2) Equipped with a ''bleeder valve'' that permits the release of any air under pressure from the rear of train unit or the associated air hoses prior to detaching the rear unit from the brake pipe;

(3) Designed so that an internal failure will not cause an undesired emergency brake application;

(4) Equipped with either an air gauge or a means of visually displaying the rear unit's brake pipe pressure measurement; and

(5) Equipped with a pressure relief safety valve to prevent explosion from a high pressure air leak inside the rear unit.

(c) *Reporting rate.* Multiple data transmissions from the rear unit shall occur immediately after a variation in the rear car brake pipe pressure of ±2 psig and at intervals of not greater than 70 seconds when the rear car brake pipe pressure variation over the 70-second interval is less than ±2 psig.

(d) *Operating environment.* The rear unit shall be designed to meet the performance requirements of paragraphs (b) and (c) of this section under the following environmental conditions:

(1) At temperatures from −40 °C to 60 °C;

(2) At a relative humidity of 95% noncondensing at 50 °C;

(3) At altitudes of zero to 12,000 feet mean sea level;

(4) During vertical and lateral vibrations of 1 to 15 Hz., with 0.5 g. peak to peak, and 15 to 500 Hz., with 5 g. peak to peak;

(5) During the longitudinal vibrations of 1 to 15 Hz., with 3 g. peak to peak, and 15 to 500 Hz., with 5 g. peak to peak; and

(6) During a shock of 10 g. peak for 0.1 second in any axis.

(e) *Unique code.* Each rear unit shall have a unique and permanent identification code that is transmitted along with the pressure message to the front-of-train unit. A code obtained from the Association of American Railroads, 50 F Street, NW., Washington, DC 20036 shall be deemed to be a unique code for purposes of this section. A unique code also may be obtained from the Office of Safety Enforcement (RRS–10), Federal Railroad Administration, Washington, DC 20590.

(f) *Front unit.* (1) The front unit shall be designed to receive data messages from the rear unit and shall be capable of displaying the rear car brake pipe pressure in not more than one-pound increments.

(2) The display shall be clearly visible and legible in daylight and darkness from the engineer's normal operating position.

(3) The front device shall have a means for entry of the unique identification code of the rear unit being used. The front unit shall be designed so that it will display a message only from the rear unit with the same code as entered into the front unit.

(4) The front unit shall be designed to meet the requirements of 232.19(d) (2), (3), (4), and (5). It shall also be designed to meet the performance requirements in this paragraph—

(i) At temperatures from 0°C to 60°C;

(ii) During a vertical or lateral shock of 2 g. peak for 0.1 second; and

(iii) During a longitudinal shock of 5 g. peak for 0.1 second.

(g) *Radio equipment.* (1) The radio transmitter in the rear unit and the radio receiver in the front unit shall comply with the applicable regulatory requirements of the FCC and use of a transmission format acceptable to the FCC.

(2) If power is supplied by one or more batteries, the operating life shall be a minimum of 36 hours at 0°C.

(h) *Inspection.* (1) Upon installation of an end-of-train device, it shall be determined that the identification code entered into the front unit is identical to the unique identification code on the rear-of-train unit.

(2) The functional capability of the device shall be determined at the point of installation, after charging the train, by comparing the quantitative value displayed on the front unit with the quantitative value displayed on the rear unit or on an air gauge. The end device may not be used if the difference between the two readings exceeds three pounds.

(3) The rear unit shall be calibrated for accuracy at least every 92 days. A tag, sticker, or other method of information storage that provides the date of the last calibration, the location where the calibration was made, and

the name of the person doing the calibration shall be affixed to the rear unit.

[51 FR 17303, May 9, 1986]

APPENDIX A TO PART 232—SCHEDULE OF CIVIL PENALTIES [1]

Section	Violation	Willful violation
232.1 Power brakes, minimum percentage	$5,000	$7,000
232.2 Drawbars; standard height	2,500	5,000
232.3 Power brakes and appliances for operating power brake systems	2,500	5,000
Rules for Inspection, Testing and Maintenance of Air Brake Equipment:		
232.10 General rules—locomotives:		
(b) Air brake equipment not inspected or tested to assure it is in a safe and suitable condition	2,500	5,000
(c) Compressor not tested for capacity	2,500	5,000
(d) Main reservoir not tested	2,500	5,000
(e) Air gauges not tested; if inaccurate not repaired or replaced	2,500	5,000
(f)(1) Operating portion of air brake equipment, dirt collectors, and filters not cleaned, repaired, and tested	2,500	5,000
(2) Hand brakes, parts and connections not inspected or suitably stenciled	1,000	2,000
(g) Date of testing or cleaning of air brake equipment not displayed in the cab	1,000	2,000
(h)(1) Minimum brake cylinder piston travel insufficient	2,500	5,000
(2) Maximum brake cylinder piston travel excessive	2,500	5,000
(i)(1) Foundation brake rigging, safety supports and brake shoes	2,500	5,000
(2) Foundation brake rigging or safety supports have improper clearance to the rails	2,500	5,000
(j)(1) Main reservoir leakage	2,500	5,000
(2) Brake pipe leakage	2,500	5,000
(3) Brake cylinder leakage	2,500	5,000
(4) Main reservoir safety valve	2,500	5,000
(5) Governor	2,500	5,000
(6) Compressor governor when used in connection with automatic air brake system	2,500	5,000
(k) Communicating signal system on locomotive	1,000	2,000

APPENDIX A TO PART 232—SCHEDULE OF CIVIL PENALTIES [1]—Continued

Section	Violation	Willful violation
(l) Enginemen taking charge of locomotive	2,500	5,000
(m) Drain cocks on air compressors of steam locomotives	2,500	5,000
(n) Air pressure regulating devices	2,500	5,000
232.11 Train air brake system tests:		
(b) Communicating signal system on passenger train	2,500	5,000
(c) Effective and operative air brakes	2,500	5,000
(d) Condensation from yard line or motive power	2,500	5,000
232.12 Initial terminal road train air brake tests:		
(a) Total failure to perform initial terminal test	10,000	(1)
(b) 1,000 mile inspection not performed	5,000	10,000
(c)–(j) partial failure to perform initial terminal test	2,500	5,000
232.13 Road train and intermediate terminal train air brake tests:		
(a) Passenger trains: locomotive is detached	5,000	7,500
(b) Freight trains: locomotive is detached	5,000	7,500
(c)(1) Locomotive or caboose is changed, or one or more cars are cut off from the rear end or head end	5,000	7,500
(2) Brake pipe pressure restored	5,000	7,500
(3) Electropneumatic application and release test	5,000	7,500
(d)(1) Cars are added at a point other than a terminal	5,000	7,500
(2)(i) Cars added at a terminal and have not been charged and tested	5,000	7,500
(ii) Cars added at a terminal and have not been charged and tested	5,000	7,500
(3) Brake pipe pressure restored at the rear of freight train	5,000	7,500
(e)(1) Transfer train and yard train movements	2,500	5,000
(2) Transfer train and yard train movements exceeding 20 miles	5,000	7,500
(f) Locomotives, cars or train standing on a yard	5,000	7,500
(h) Device is used to comply with test requirement	2,500	5,000
232.14 Inbound brake equipment inspection:		
(a) Inspection of trains upon arrival at terminals	1,000	2,000
(b) Special instructions provide for immediate brake inspection and repairs	1,000	2,000

APPENDIX A TO PART 232—SCHEDULE OF CIVIL PENALTIES [1]—Continued

Section	Violation	Willful violation
232.15 Double heading and helper service:		
(a) Engineman of the leading locomotive shall operate the brakes	5,000	7,500
(b) Electropneumatic brake valve	5,000	7,500
232.16 Running tests	2,500	5,000
232.17 Freight and passenger train car brakes:		
(a) Testing and repairing brakes on cars while in shop or on repair track:		
(1) Periodic attention on freight car air brake equipment while car is on repair track	5,000	7,500
(2)(i) Single car testing of freight cars	2,500	5,000
(ii) Repair track tests of freight cars	2,500	5,000
(iii) Single car testing of freight cars	2,500	5,000
(iv) Car is released from a shop or repair track	2,500	5,000
(b)(1) Brake equipment on cars other than passenger cars	2,500	5,000
(2) Brake equipment on passenger cars	4,000	6,000
232.19 End of train device:		
(a) Location of front unit and rear unit	2,500	5,000
(b) Rear unit	2,500	5,000
(c) Reporting rate	2,500	5,000
(d) Operating environment	2,500	5,000
(e) Unique code	2,500	5,000
(f) Front unit	2,500	5,000
(g) Radio equipment	2,500	5,000
(h) Inspection	2,000	4,000

[1] A penalty may be assessed against an individual only for a willful violation. The Administrator reserves the right to assess a penalty of up to $20,000 for any violation where circumstances warrant. See 49 CFR part 209, appendix A.

[53 FR 52934, Dec. 29, 1988]

APPENDIX B TO PART 232—SPECIFICATIONS AND REQUIREMENTS FOR POWER BRAKES AND APPLIANCES FOR OPERATING POWER-BRAKE SYSTEMS FOR FREIGHT SERVICE

PURPOSE

The purpose of this specification is to define and prescribe requirements for power brakes and appliances for operating powerbrake systems.

DEFINITIONS

For purposes of this specification, terms used herein are defined as follows:

1. *Power brake.* A combination of parts operated by compressed air and controlled manually, pneumatically or electrically, by means of which the motion of a car or locomotive is retarded or arrested.

2. *Power-brake system.* The power brakes on locomotives and cars of a train so interconnected that they can be operated together and by means of which the motion of the train is retarded or arrested.

3. *Brake valve.* The value of the locomotive equipment by means of which operation of the power-brake system is controlled.

4. *Equalizing reservoir.* The small reservoir connected to the brake valve only, the pressure of which is reduced by the engineer for making service applications.

5. *Brake pipe.* The line of pipe and hose extending throughout the length of the train by means of which compressed air is supplied to the brake devices on the several cars and the pressures so controlled as to effect the application and release of the brakes.

6. *Operating valve.* Device on each car, the operation of which result in (a) admission of air to brake cylinder, (b) release of air from brake cylinder, and (c) charging of one or more reservoirs.

7. *Service reduction.* A decrease in brake-pipe pressure, usually of from 5 to 25 pounds, at a rate sufficiently rapid to move the operating valve to service position, but at a rate not rapid enough to operate the valve to emergency position. Quick service is that feature of the operating valve which provides for local reduction of brake-pipe pressure.

8. *Service application.* A brake application which results from one or more service reductions.

9. *Full service reduction.* A service reduction sufficient in amount to cause equalization of pressure in brake cylinder with pressure in the reservoir from which compressed air is supplied to brake cylinder.

10. *Full service application.* A brake application which results from one or more brake-pipe reductions sufficient in amount to cause a full service reduction.

11. *Emergency reduction.* A depletion of brake-pipe pressure at a rate sufficiently rapid to move the operating valve to emergency position.

12. *Emergency application.* A brake application which results from an emergency reduction.

13. *Emergency brake-cylinder pressure.* The force per square inch exerted upon piston in brake cylinder by compressed air which is admitted to brake cylinder as a result of an emergency reduction. Effective emergency brake-cylinder pressure is a pressure not less than 15 percent nor more than 20 percent greater than the brake-cylinder pressure obtained from a full service reduction on the game car and from the same initial pressures.