Chapter 11

Brake System Safety Standards For Freight & Other Non-Passenger Trains & Equipment: End-of-Train Devices Part 232

Air brake components.

Introduction:

On January 17, 2001, FRA issued a final rule (the new rule) *Brake System Safety Standards for Freight and Other Non-Passenger Trains and Equipment; End-of-Train Devices*, Title 49 CFR Part 232, revising the Federal safety standards governing braking systems and equipment used in freight and other non-passenger railroad train operations. While the new rule became effective on May 31, 2001, FRA staggered the applicability dates of various provisions contained in the new rule. The following provisions and interpretations became applicable on May 31, 2001:

- The General Applicability Provisions -
  Sections 232.1 through 232.13 and 232.17 through 232.21

- Subpart E - End-of-Train Devices

- The amended sections of Part 229
  Sections 229.5(p); 229.25(a); 229.27(b) and 229.53

- The amended sections of Part 231
  Sections 231.0(b)(3); 231.31

- Modification of FRA's "off-air" interpretation by increasing the time previously inspected cars can be off a source of compressed air, without requiring a retest of the cars, from 2 to 4 hours;

- Modification of FRA's interpretation of the statutory "use or haul" language. In the past FRA interpreted the "use or haul" language to mean after train movement occurred. With the implementation of this new regulation, FRA now interprets the language to mean that a piece of equipment is "in use" after it has received the required inspections and is deemed ready for service by the railroad. Therefore, a violation may be submitted for a power brake defect without any train movement occurring.

Paragraph (d) of § 232.1 explains that railroads are to continue to operate under the inspection, testing, and maintenance provisions contained in Part 232 as it existed prior to May 31, 2001 (the old rule) until such time as they are either required to operate pursuant to the requirements of the final rule or elect to comply at an earlier date pursuant to § 232.1(c). The old rule is included as Appendix B to the new rule. Therefore, railroads are required to comply with the requirements contained in the old rule until those requirements are superseded by provisions contained in the new rule. Currently, the only substantive requirements of the new rule which supersede requirements contained in the old rule are the provisions contained in Subparts D and E which contain requirements related to periodic maintenance and end-of-train devices, respectively. Consequently, for railroads subject to the requirements of the new rule, the provisions contained in Sections 232.17 through 232.25 of the old rule have been superceded by Subparts D and E of the new rule.

FRA made the definitions applicable as of May 31, 2001, because portions of the new rule (e.g., Subpart E) became applicable on that date and there are definitions in § 232.5 pertaining to those portions of the new rule. Although § 232.1(b) makes the definitions contained in §232.5 applicable as of May 31, 2001, it was clearly FRA's intent to apply the definitions contained in this section only to the requirements contained in the text of the new rule and not to the requirements contained in the old rule. This intent is evidenced by the preamble discussion related to the definitions in which FRA states: "FRA intends these definitions to clarify the meaning of important terms as they are used in the text of the final rule." (66 FR 4146) Furthermore, FRA intended for specific definitions to become applicable only to those substantive portions of the new rule that are applicable to the industry. This intent is evidenced by FRA's explicit statement that it would not require a "qualified person," as defined in § 232.5 of the new rule, to perform the required tasks under Subpart D, which became applicable on August 1, 2001, until April 1, 2004 when the training requirements become applicable. Thus, the plain meaning of the definition limits its applicability to a date that is no earlier than April 1, 2004, or until such time as a railroad requests earlier application of the new rule.

Subparts A through C and Subpart F of Part 232 become applicable April 1, 2004. Inspectors should use Appendix B to Part 232 – *Part 232 Prior to May 31, 2001, Railroad Power Brakes and Drawbars*, for power brake compliance, ***OR*** refer to a copy of the CFR dated October 1, 2000.

Paragraph (c) of § 232.1 provides an option for railroads to seek early application of the requirements contained in Subparts A through C and Subpart F prior to the April 1, 2004 applicability date.

Subpart D of Part 232 — *Periodic Maintenance and Testing Requirements* — became applicable effective August 1, 2001. Although Subpart D of the new rule requires certain tasks to be performed by a "qualified person," the FRA makes clear in the preamble to the new rule that it will not subject railroads to the qualification and training requirements contained in the new rule until the conclusion of the 3-year period provided for conducting the required training. Thus, FRA does not intend to require a "qualified person," as defined in § 232.5 of the new rule, to perform the required tasks until April 1, 2004. The exception to this is when a railroad elects to apply for early application of the new rule.

Inspectors need to periodically monitor compliance with the periodic single car tests requirements. Violations should be submitted whenever cars are discovered being used well beyond the 5-year limit for single car testing. Also, anytime an Inspector discovers a car that is released from a repair track and has not had a single car test performed within the past 12 months, a violation should be submitted. The Inspector should request the railroad to provide the single car test dates using the UMLER system. If a railroad cannot provide this information, the Inspector should notify the Regional Specialist, who in turn shall notify Headquarters.

Part 232, Inspection Activity Codes (MP&E 00-02)

In the past, questions were raised concerning the method of compiling air brake inspection data. Specifically, that the data did not distinguish whether cars are "on-air" or "off-air" when inspections for air brake compliance, Part 232, are performed. For the purposes of this discussion, "on-air" means the car has sufficient brake pipe pressure to operate the air brake pistons, and the car is inspected with the brakes applied. This could be either with a full service or an emergency brake application. "Off-air" means the car is inspected without the brakes applied.

FRA Inspectors routinely examine cars that are not "on-air" to inspect for the securement of the brake equipment, the position of the retainers, condition of the brake pipe and valves, the operation of angle cocks, etc. Such inspections are included in the car count under the activity code for Part 232. However, many functions of the brakes cannot be observed; *i.e.* piston travel limits, binding or fouling, audible air leaks, etc.

In order to determine whether cars inspected for Part 232 compliance are "on-air" or "off-air", Inspectors shall use the following activity codes for Part 232 inspection activities:

Activity Code	Inspection Activity
232	Any car inspected for Part 232 compliance that does not have the brakes applied.
232A	Any car inspected for Part 232 compliance that has the brakes applied by either a service reduction or an emergency application, so that the functionality of the brakes and piston travel limits can be observed.
232T	Anytime a train air brake test is observed.
232E	An inspection of the End-of-Train Device is conducted.
232S	Monitoring a single car or repair track air brake test.

Inspectors are also reminded that they need to verify the number of cars inspected before entering the number on the inspection report. Do not rely solely upon the representation of railroad personnel or train consist sheets to determine how many cars are inspected There are several methods Inspectors could use, including counting the cars with hand-held counters, or using the train consist and checking off the cars as they are inspected.

Train Brake Inspections (MP&E 98-59)

When performing an initial terminal train air brake test under 49 CFR §232.12(c)-(j), an inspection of the train brakes shall be made to determine that the brakes are applied on each car, the piston travel is correct, brake rigging does not bind or foul, and that all brake equipment is properly secured. The 1,000-mile train air brake test under 49 CFR §232.12(b) also requires that the brakes apply on each car in response to a 20-pound service brake pipe pressure reduction and that the brake rigging is properly secured and does not bind or foul.

Although the regulation does not specify the physical actions necessary to conduct a proper inspection, a railroad may fulfill the inspection requirement only when its inspectors position themselves in a way that permits the required observations noted above to be made. Obviously, a railroad inspector can visually inspect only what he or she is in a position to see. As the vast majority of all freight cars are equipped with air brake equipment (brake cylinders, brake indicators, brake rigging, etc.) that cannot be observed when inspections are made from only one

side of the car, ***a proper initial terminal or 1,000-mile train airbrake inspection shall be performed by inspecting both sides of every car in the train.***

The following inspection practice would satisfy the regulations. After cars are assembled, a qualified individual, while connecting the air hoses on one side, performs an inspection of the brake equipment to ensure that brake components are properly secured, the brake rigging is not binding or fouling, and that brake shoes are in proper condition. The brake system is then charged and the air pressure at the rear of the train is checked to ensure it is at the required level. At that point, the brakes are applied and the qualified individual then performs a brake inspection on the other (second) side of the train to ensure that the brake components and rigging are properly secured and do not bind or foul, and that the brake shoes are against the wheel. During this inspection the individual will also check for proper piston travel, crossing over the cars to side one if the piston travel cannot be observed from side two. At the conclusion of this inspection, the brakes are then released and the individual then walks the release of the brakes or observes the brake release as the train rolls by at a low speed. If a roll-by inspection of the brake release is performed, the individual performing the inspection must have some method of communicating with the train crew the results of the inspection. FRA believes that an inspection of the brake components, rigging, and shoes must be conducted on both sides of virtually every car sometime during the inspection process.

A moving utility vehicle may be used in the performance of these inspections. However, these inspections must be made at a speed and in a manner that will permit the qualified person to clearly observe and determine the condition of the air brake equipment and that the piston travel is within limits.

Train air brake tests that are not conducted in compliance with this interpretation shall be considered to be in non-compliance with the regulations. However, as with any regulatory requirement, inspectors should exercise discretion in how §232.12 is enforced so that our limited resources can be focused on matters likely to produce the greatest safety benefit. The general criteria for determining when enforcement action is appropriate, and which action to take, are set forth in 49 CFR Part 209, Appendix A. A railroad's history of compliance with the relevant set of regulations, especially at the specific location involved, must be considered along with the kind and degree of potential safety hazard a condition poses in light of the immediate factual situation. Where compliance with train air brake testing requirements is poor, and improper inspections or no inspections are being performed, the failure to inspect or improper inspection can — along with the physical defects found on the cars—be strong enforcement candidates. Conversely, if a railroad is generally doing a good job in terms of compliance with the train air brake testing requirements at a particular location, the one-time failure to conduct a proper inspection at that point more likely is not a condition that poses a significant safety hazard.

Violation reports alleging an improper train air brake test due to the failure to inspect both sides of the train as outlined above must specify precisely how the inspection was improper and include supporting evidence for review (e.g. detailed evidence that the brake equipment on one or more cars in the train—citing the specific component or components—could not be properly observed from only one side of the train).

Interpretation of Initial Terminal Air Brake Tests at Remote Locations (MP&E 98-45)

This technical bulletin provides guidance to Inspectors regarding the performance of initial terminal air brake tests at remote locations. There appears to be some confusion as to what is required when a railroad performs initial terminal brake tests at these remote locations. It has been brought to FRA's attention that some trains at these remote locations, after receiving an initial terminal brake test pursuant to 49 CFR 232.12, are departing locations with cars having inoperative or cut-out air brakes.

The regulation requires 100% operative brakes on trains departing initial terminals. FRA does not believe safety would be advanced by allowing something less than this at these remote locations. Therefore, when initial terminal brake tests are performed at these remote locations FRA expects the requirements contained in 232.12 to be followed. Consequently, if a car is found to have defective or inoperative brakes when the initial test is performed, the car must either be repaired or set-out of the train before the train departs.

Clarification for Initial Terminal Road Train Air Brake Tests - Section 232.12(d)(1)
(MP&E 99-01)

Periodically, FRA receives inquiries concerning the amount of brake pipe reduction required when performing an initial terminal brake test. In 1982, FRA issued a technical bulletin (TB) stating FRA's policy. The following information from the earlier TB is still in effect and should clear up any misunderstandings regarding this matter. Inspectors should be governed accordingly.

In recognition of the objectives of the train air brake tests, the pressure-maintaining characteristics of the 26L locomotive air brake equipment, the greater sensitivity of modern control valves on freight cars, and good practice with respect to cutting the brake pipe pressure-maintaining feature out and in, an alternative brake pipe reduction sequence will provide an equally acceptable Initial Terminal Air Brake Test when 26L type equipment is utilized.

A single brake pipe reduction of a minimum of 20 pounds, but not to exceed a full service reduction, will produce similar results and may be made in place of the specified sequence

required in Section 232.12(d)(1) of a 15-pound reduction followed by an increase to full service.

Enforcement Guidance for Inspecting and Testing Brakes on Cars while on Shop or Repair Track (MP&E 00-01)

The following guidance was developed to alleviate confusion over the testing and repairing requirements of brakes on cars that are repaired on a shop or repair track. Particularly, when a mobile repair vehicle is involved.

49 CFR 232.17(a) contains certain inspection and testing requirements of a car's brake system, when a car is on a "shop" or "repair" track. For example; an application and release of brakes must be performed, piston travel must be inspected and adjusted (if necessary), and certain brake system components must be inspected to ensure they are properly positioned and secured. In addition, such cars must receive periodic attention in accordance with the requirements of the currently effective AAR Code of Rules for cars in interchange. AAR rules require that any car on a shop or repair track receive a repair track air brake test if such attention has not been provided to the car within the previous twelve months.

The current regulation does not define what constitutes a shop or repair track. Although AAR's Field Manual of Interchange Rules contains a definition of shop/repair track, FRA believes that AAR's definition is too narrow and does not adequately delineate what constitutes a repair track for the purposes of §232.17(a). FRA believes the definition fails to adequately consider locations where mobile repair vehicles serve in the same capacity as a fixed repair facility and locations where railroads designate tracks as "expedite" or "light repair" tracks for the purpose of performing minor repairs.

In 1994, FRA provided guidance in Technical Bulletin MP&E 94-18, that only light or minor repairs are to be conducted on tracks designated as "expedite" or "light repair" tracks. Currently, FRA does not require railroads to perform air brake related inspections and tests, pursuant to §232.17(a), on cars receiving minor repairs (i.e. straighten safety appliances, replace handholds, replace air hoses, adjust lading, replace coupler knuckle pin, knuckles, etc.), provided the repair work is performed on tracks located outside of a repair shop area. Nor does FRA require the performance of these inspections and tests on a car if a mobile repair vehicle is sent to a remote location to make necessary repairs to the equipment.

However, at locations where a railroad has designated specific tracks to perform repairs on a regular and consistent basis, and when the repairs conducted on those tracks include major repair work (i.e., wheel change, coupler replacement, draft gear repair, repairs requiring an air jack, etc.), FRA considers those tracks to be repair tracks for the purposes of §232.17(a). This includes

locations where mobile repair vehicles have replaced a fixed repair facility or serve in the same capacity as a fixed repair facility. FRA believes it is both illogical and inconsistent with the intent and meaning of the existing regulations to exempt tracks at locations where repairs of all types are regularly and consistently performed, from being considered repair tracks merely because they are serviced by a mobile repair vehicle. Furthermore, it would be inconsistent with previous guidance provided by FRA to allow major repair work to be performed on the "expedite" or "light repair" tracks, merely because the repairs are performed by a mobile repair vehicle. It should be stressed that FRA does not intend to prevent a railroad from designating certain tracks for conducting minor repairs and certain tracks for conducting major repairs at the same location.

Consequently, FRA considers the provisions of §232.17(a) applicable to fixed repair facilities and any location where repairs of all types are regularly and consistently performed, regardless of whether a mobile repair vehicle is used to conduct the repairs. FRA does not consider tracks that are designated only for minor repairs to be a repair track pursuant to §232.17(a); provided such track is used only to conduct minor repairs. However, if a major repair is performed on a car located on a track designated for minor repairs, then the car is subject to the provisions of §232.17(a) before it can be placed in service.

1000 Mile Interpretation - 49 CFR 232.12(b) (MP&E 98-40)

Trains must receive an intermediate inspection at points not more than 1,000 miles apart. It is the carrier's responsibility to designate the points where the 1,000 mile inspection will be made and provide this information to FRA personnel upon request.

All mileage accumulated from the point of the initial terminal air brake test will count toward the 1,000-mile requirements in Section 232.12(b). It should be noted that mileage accrued in Canada and Mexico will count toward the 1,000-mile requirements. When cars are received in interchange, the receiving railroad is responsible for knowing the distance that all of the cars have travelled since their last inspection.

Handling of Defective Cars at Intermediate Inspection Locations (MP&E 98-46)

The following provides guidance to Inspectors when considering enforcement action for the improper handling of cars found with inoperative or cut-out air brakes at locations where intermediate air brake inspections are performed. FRA is concerned that some railroads are moving cars found with inoperative or cut-out air brakes during intermediate brake inspections from that inspection location, when repairs of those cars could possibly have been made at that location. Therefore, FRA feels that some general guidelines should be provided to Inspectors in the field to aid them in determining whether the location is a place where the repairs could be effectuated.

The statutory provisions contained in 49 USC § 20303 (previously 45 USC Section 13) governs the movement of equipment with defective power brakes. This only allows the railroad to move the defective equipment from the place where the defect is first discovered to the nearest location where the necessary repairs can be made. This movement can either be on the railroad where first discovered or at the option of the connecting railroad, on the line of the connecting railroad if the move is no farther than the location on the line where the defect was first discovered. Thus in order to properly move a car for repairs, the railroad must know the defect exists. Although the new regulations provide for tagging requirements in 2004, there are currently no tagging requirements for power brake defects. At interchange, a railroad can refuse to accept a defective car. Until the receiving railroad accepts the car by moving it or otherwise exercising control over it, it is not liable for civil penalties nor is it required to make any repairs. It should be noted, however, that the delivering railroad remains liable for each defective car it tenders in interchange.

The statutory provision contained in 49 U.S.C. § 20303 is an affirmative defense to be established by the railroad. There are seven elements which must be established:

- The car was properly equipped with power brakes in the beginning.
- The car became defective while being used by railroad on its line.
- The railroad discovered the defect prior to movement.
- The movement was from the place where the defect was first discovered.
- Repairs could not be made at the location where the defect was first discovered.
- Movement was necessary to make the necessary repairs.
- The car moved only to the nearest available point where the necessary repairs could be made.

The final rule on freight power brakes contains guidelines to be considered by FRA Inspectors and railroads in determining what constitutes the nearest location where necessary repairs can be performed. See 49 CFR § 232.15(f). The guidelines are equally applicable to determining such locations for all safety appliance defects. The guidelines must be applied on a case-by-case basis to determine if the railroad acted in good faith in moving defect equipment. The following locations should be considered when applying the guidelines discussed in detail below:

- Locations where a mobile repair truck is used on regular basis;
- Locations where a mobile repair truck originates or is permanently stationed;
- Locations with an operative repair track or repair shop; and
- Locations where railroad performs mechanical repairs other than power brake repairs.

In determining whether a location, noted above, is capable of making a particular repair the following factors must be considered:

- The accessibility of the location to persons responsible for making repairs;
- The presence of hazardous conditions that affect the ability to safely make repairs of the type needed at the location;
- The nature of the repair necessary to bring the car into compliance;
- The need for railroads to have in place an effective means to ensure the safe and timely repair of equipment;
- The relevant weather conditions at the location that affect accessibility or create hazardous conditions;
- A location need not have the ability to effectuate every type of safety appliance repair in order to be considered a location where some power brake repairs can be made;
- A location need not be staffed continuously in order to be considered a location where power brake repairs can be performed;
- The ability of a railroad to perform a single car test at a location shall not be considered; and
- The congestion of work at a location shall not be considered.

In addition to considering the factors noted above, the following factors must be considered in determining whether the location is the nearest location where the necessary repairs can be made:

Distance to the location — Although this is a key factor it should not be the determining factor. This must be considered in conjunction with all the factors previously noted as well as the following safety considerations:

- The safety of the employees responsible for getting the equipment to or from a particular location, and
- The safety hazards involved in moving the equipment in the direction of travel necessary to get it to a particular location.

If the location where an intermediate inspection is performed is not a location where the necessary repairs can be made, then the car may be moved for repair. This movement for repair must be made in accordance with 49 U.S.C. § 20303.

§ 20303. Moving defective and insecure vehicles needing repairs

(a) General — A vehicle that is equipped in compliance with this chapter whose equipment becomes defective or insecure nevertheless may be moved when necessary to make repairs,

without a penalty being imposed under section 21302 of this title, from the place at which the defect or insecurity was first discovered to the nearest available place at which the repairs can be made—

(1) on the railroad line on which the defect or insecurity was discovered; or

(2) at the option of a connecting railroad carrier, on the railroad line of the connecting carrier, if not farther than the place of repair described in clause (1) of this section.

(b) USE OF CHAINS INSTEAD OF DRAWBARS.— A vehicle in a revenue train or in association with commercially-used vehicles may be moved under this section with chains instead of drawbars only when the vehicle contains livestock or perishable freight.

(c) Liability.—The movement of a vehicle under this section is at the risk only of the railroad carrier doing the moving. This section does not relieve a carrier from liability in a proceeding to recover damages for death or injury of a railroad employee arising from movement of a vehicle with equipment that is defective, insecure, or not maintained in compliance with this chapter.

Bottom Rod Safety Support (MP&E 98-6)

"Bottom rod safety supports" are only required on those cars that have the bottom rod or handbrake bottom rod below the bolster. There are normally three types of bottom rod safety supports in use. The most common is the heavy wire type (Creco) that fits over the brake beam, with underslung loops to cradle the bottom rod should it become disengaged from the rest of the rigging. The handbrake bottom rod used with the brake beam mounted cylinder, generally has a loop or strip attached to each side of the truck bolster. This allows the handbrake to operate freely and acts as a safety guard. There is an older type that can be attached to the spring plank and a newer cable type.

Air Brake System - Reservoir Connecting Pipes (MP&E 98-8)

There have been incidences where Inspectors have detected freight cars in-service that have reservoir connecting pipes incorrectly applied. The auxiliary portion of the reservoir was connected to the emergency portion of the brake valve and the emergency portion of the reservoir was connected to the service portion of the brake valve. Inspectors should be alert to this condition and take appropriate action when detected.

Testing of Handbrakes on Locomotives Equipped with an Air Release Valve (MP&E 98-11)

On some locomotives, the application of the handbrake actuates an air release valve to the brake cylinder on the side of the truck where the handbrake functions. This system is necessary because the brake cylinder body has to be moved by the application of the handbrake and if the piston is extended, the cylinder body cannot be moved. When the release valve is functioning properly, it will relieve the pressure and allow the piston to retract so that the application of the handbrake will force the cylinder body toward the wheel. If the release valve does not function as intended and the handbrake is applied with the piston extended, the locomotive will not have any holding brakes when the air leaks off. FRA has been advised that there have been incidents of roll-away locomotives because of the failure of this release valve. In many cases, employees have applied the handbrake and shut down locomotives, only to discover later that the handbrake was not applied after the air leaked off.

All Inspectors are reminded that they are not to involve themselves in the manipulation of any apparatus that may cause or allow an adverse condition in any way. Testing for the above described condition must be done only by carrier personnel.

Conditional Use of Air Flow Method For Train Air Brake Qualifications as an Alternative To the Leakage Test For Trains (MP&E 98-15)

The following conditions were given to the Association of American Railroads for use of the air flow method (AFM) for train air brake qualifications:

1. Each controlling locomotive on a train qualified by the AFM shall be provided with an operational air flow indicator;

2. Participating railroads shall provide an operational end-of-train device (see 49 CFR Section 232.19 - 232.25) on all trains except transfer and yard trains with movements not exceeding 20 miles;

3. The AFM will apply only to trains using locomotives that are equipped with an air flow indicator that conforms with FRA's conditions, AAR specifications and calibration procedures, and 26-L freight locomotive air brake equipment;

4. When the AFM is used for train air brake qualifications, the air brake system shall be charged within 15 psi of the highest locomotive feed valve pressure used by that railroad and air flow shall not exceed 60 cubic feet per minute (CFM);

5. The air flow indicator must be calibrated for accuracy at periodic intervals not to exceed 92 days;

6. The air flow indicator shall be clearly visible and legible in daylight and darkness from the engineer's normal operating position;

7. The air flow indicator gauge shall be clearly and uniformly marked to indicate direct reading of air flow in 10 CFM increments from at least 10 CFM to 80 CFM, with numerals indicating, at a minimum of 20, 40, 60, and 80 CFM for continuous monitoring of the air flow into the brake pipe.

8. The air flow indicator calibration test orifices shall be calibrated at temperatures of not less than 20 degrees Fahrenheit;

9. When a train qualified by the AFM is in operation and experiences an increase in brake pipe air flow and/or an increase in brake pipe gradient and the movable pointer does not return to the limits established in the initial terminal train air brake test within a reasonable time, the train crew shall stop the train for inspection and repair leaks, if detected. If unable to make repairs the crew should arrange to set out defective cars and/or proceed with due caution to the next location where corrective action can be taken;

10. All participating railroads shall provide FRA a list of locations where calibrations will be performed and of locations which will be provided with test orifices. Changed, deleted, or additional locations will be reported to FRA within 92 days; and

11. All personnel involved with the AFM of testing of train's air brake systems and operating such trains must be given training and be aware of and understand the conditions of the waiver.

Locomotive Handbrakes - Stencil Requirement for Canadian Railroads -
(MP&E 98-27)

Title 49, CFR, Section 232.10(f)(2) requires that locomotive handbrakes be inspected and repaired as often as service requires with the date suitably stencilled or tagged. Transport Canada's Cab Form 22, Item 8(a) includes this same information. The information in Item 8(a) of Transport Canada Cab Form 22 satisfies FRA's requirement of having "the date suitably stencilled or tagged."

Locomotive Brake Cylinder Pressure (MP&E 98-41)

To address questions concerning the minimum locomotive brake cylinder pressure required by the Federal regulations, the following guidance applies.

Section 229.55(c) states:

> The minimum brake cylinder pressure shall be 30 pounds per square inch.

Section 232.10(n)(8) states:

> Air pressure regulating devices must be adjusted for the following pressures: Self-lapping portion for independent air brake (full application pressure) 30-50 pounds.

These regulations were written when cast iron brake shoes were the standard and the brake cylinder relay air valve delivered 100 percent of the control pressure to the brake cylinders. With the advent of the high friction composition brake shoe, various relay valves have been used depending on whether the rigging was designed for cast iron or composition shoes. To best match the stop distance of cast iron, a two-step relay valve is used for composition shoes. One level is used for the automatic brake where speeds are generally above "switching" speeds and a higher level for the independent brake which is normally used in switching. By tailoring the relay valve to the locomotive, a standard independent brake valve setting can be used universally on a railroad. This setting is usually 45 psi. The resulting brake cylinder pressure may vary 27 psi (with a 60 percent relay) to 72 psi (with a 160 percent relay). The 60 percent relay valves (J-46 or J-64) are normally found on older locomotives which were converted from cast iron shoes with clasp rigging to composition shoes with clasp rigging. FRA considers such locomotives to be in compliance with the regulations.

Brake Hoses on Cars Equipped with 15" End-of-Car Cushioning Units (MP&E 98-55)

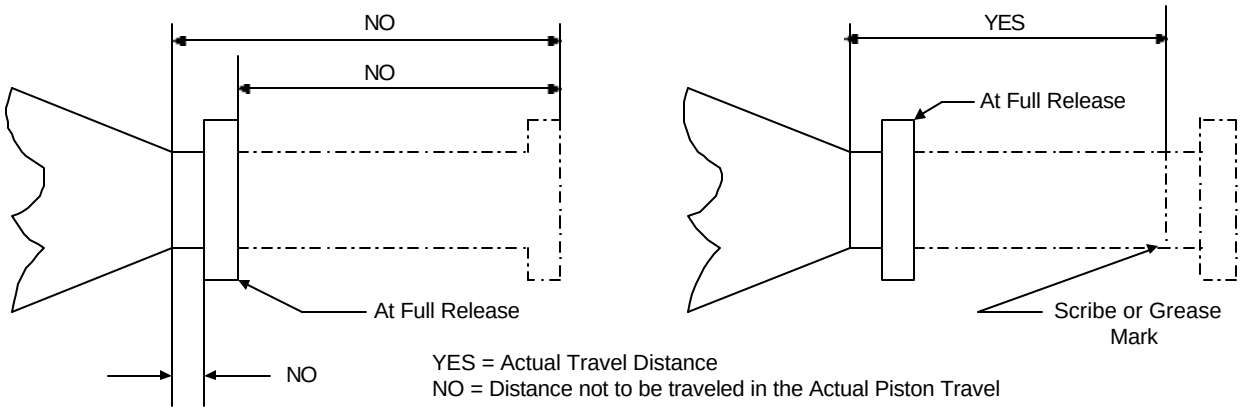
It has been brought to FRA's attention that some freight cars have undergone modifications that includes the installation of a 15" end-of-car cushioning unit, which if not properly installed and maintained, can develop a crimped brake hose condition. Often when the draft system is converted or improperly maintained, brake hose free play can be reduced, thus causing the brake hose to bind in either full buff or full draft positions.

Inspectors need to be vigilant for signs of brake hose deterioration, especially on cars with modified draft systems. If such conditions are found, immediately report them to the railroad. Also forward these findings to the Regional MP&E Specialist, so data can be collected to determine if a widespread problem exists with a specific series of cars.

Measuring Piston Travel (MP&E 98-61)

There has recently been several inquiries concerning the proper method for measuring brake cylinder piston travel on freight cars. In order to achieve consistent compliance, the following procedure will be used to measure piston travel.

The actual movement of the piston is the distance that must be measured. To determine this measurement, the longstanding practice of measuring piston travel from the front of the brake cylinder (non-pressure head) to the grease mark on the hollow rod will be used. If a grease mark is not evident, a line scribed on the hollow rod would suffice. If there is confusion as to what the piston travel should be on a particular car, refer to either the badge plate or stenciling located in a conspicuous place near the brake cylinder. The sketches below should clarify this issue.



Sloan Model 3050-A and 3200-A Angle Cocks (MP&E 98-56)

Sloan Model 3050-A and 3200-A Angle Cocks have caused injuries to several railroad employees. Several railroad employees have experienced personal injury when a Sloan angle cock handle and ball assembly forcefully flew apart, from train line pressure, when turned past the prescribed closed position due to a broken body stop (a.k.a. mechanical stop) for the handle.

FRA contacted the AAR regarding this safety hazard. In response, AAR re-issued instructions for the proper handling/repairing of Sloan Model 3050-A and 3200-A Angle Cocks (Maintenance Advisory, (c-8502) MA-27, dated March 14, 1996).

During routine inspections, all field personnel should be alert to the potential safety hazard and verify that all angle cocks have an effective body stop for the handle.

Two-Way End-of-Train Device Questions and Answers (MP&E 98-63)

On May 31, 2001, Subpart E, *End-of-Train Devices,* became effective. There have been numerous inquiries concerning the inspection and testing requirements of the devices, as well as issues involving enroute failures. The purpose of this bulletin is to answer questions and provide guidance for uniform application and enforcement of this new rule.

Question: When does the device have to be armed?

The device has to armed and operable from the time the train departs the point of installation, until the train reaches destination. If communication cannot be established at the location where the device is installed, the train may move up to one mile from that location at restricted speed, in order to establish communication. If communication is not established within the one-mile movement, the train must be stopped and the device must be either repaired or replaced and communication established before the train can continue, or train orders issued that restricts that train from exceeding 30 mph for the entire trip, provided the train does not traverse any defined heavy grade. If communication is established, the train must be stopped and the appropriate inspection and testing requirements of §232.409 (a) - (c) must be satisfactorily performed before the train can continue.

Question: What tests have to be performed at the point of installation?

It must be understood that installation includes both the front and rear device. When either of these devices are installed and before the train departs, the following must be performed:

1. It must be determined that the identification code entered into the front unit is identical to the unique code of the rear unit.

2. Determine that the quantitative value for brake pipe pressure displayed on the front unit is within 3 pounds per square inch of the reading displayed from either the rear EOT unit or a properly calibrated air gauge at the rear of the train. This reading must be compared after the train is charged.

3. A test has to be made to ensure the device is capable of initiating an emergency power brake application from the rear of the train.

Question: What is the test procedure to ensure the device is capable of initiating an emergency power brake application from the rear of the train?

There are currently four acceptable methods of performing this test. The first three methods

requires attaching the rear-of-train device to the last car of the train, establishing brake pipe pressure, and arming the device.

1. In the first method, the controlling locomotive would transmit an emergency brake application signal with the front unit manual switch causing an emergency application to be initiated from the rear of the train, thereby dumping the whole train into emergency.

2. The second method requires closing the angle cock on the last or second-to-the-last car of the train, and then have the controlling locomotive transmit an emergency brake application signal with the front unit manual switch. Under this method only the last one or two cars of the train will effectuate an emergency brake application.

3. Using the third method, an individual would close the angle cock between the rear-of-train device and the last car. Then have the controlling locomotive transmit an emergency brake application with the front unit manual switch, so that an individual at the rear of the train can determine whether the emergency valve functions properly by either observing the emergency indicator pop out, or observing brake pipe pressure at the rear device go to zero while hearing the exhaust of air from the device.

4. The final acceptable method of inspection is a bench test of the device (front and rear) which would be performed within a reasonable time period prior to the device being armed and placed on the train.

Question: Can anyone perform these tests?

If anyone performs these tests, without the involvement of a train crew member, the locomotive engineer has to be informed that the test (both front and rear device) was successfully performed. This can be by any means determined by the railroad to be appropriate. However, a written or electronic record of the notification has to be maintained in the cab of the controlling locomotive for the engineer. The notification must include the location, date and time the test was performed, and the name of the individual(s) who performed the test. If one individual tested the front device and another individual tested the rear device, the notification would have to include information for the two separate tests. This written information is not required at subsequent crew change points.

Question: Would these tests apply to a train using a distributive power unit (DPU) at the rear of the train?

No. This type of train is excepted from the two-way EOT requirements, provided the train has a locomotive located at the rear of the train, capable of making an emergency brake application through a command effected by radio telemetry, or by a crew member in radio contact with the lead (controlling) locomotive.

Question: What is a bench test?

The purpose of this particular test is to ensure that the front unit will transmit an emergency brake application signal to the rear device and that the rear device is capable of initiating an emergency brake application from the rear of the train. The bench test has to consist of testing both the front and rear units (devices) that will be used on the train. They can be tested independently of each other, as long as the test is performed at the location where the device will be installed on the train. FRA will monitor this practice to ensure safety.

Testing the rear unit requires applying air pressure to the device and then transmitting an emergency brake application from a front unit using the front unit manual switch. The individual performing the test would determine that the emergency valve functions properly by either observing the emergency indicator pop out or by observing the brake pipe pressure displayed on the gauge on the rear device go to zero and hearing the exhaust of air from the device.

The front unit that will be used on the controlling locomotive of a train would be tested by transmitting an emergency brake application from the device using the front unit manual switch, and a rear device would have to successfully receive the signal and activate the emergency air valve.

Both tests must be performed within a reasonable time period prior to the device being armed and placed on the train.

Question: What is a reasonable time period?

A reasonable time period must be determined on a case-by-case basis, based on the factual situation at a specific location, as there are numerous factors that impact the notion of "reasonable." The following discussion is intended as general guidance for Inspectors to consider in determining whether a bench test at a particular location was conducted within a reasonable time of its installation on a train. This discussion is not intended to create or establish any strict time requirements. The following factors should be considered:

- The environment where the device is tested and stored:
  - Free from weather elements?
  - Free from excessive dust?
  - Free from dirt and grease?
  - Accessible to possible tampering?

- Physical treatment of the device after a successful bench test.

- Railroad's tracking and monitoring of devices after testing.

- Use of the locomotive after the testing of the front unit.
- Past effectiveness of bench testing procedures at the particular location.

For example, if the devices are tested and stored in a controlled environment, that is free from weather elements, excessive dust, grease, and dirt, then a reasonable amount of time between the testing and installation of the device might be 8 hours or more. Whereas, in circumstances where the devices are haphazardly thrown into a corner of a shop or are placed in the rear of a truck to be bounced around a yard after being tested, then a reasonable amount of time may be one hour or less. Furthermore, the effectiveness of a railroad's bench testing procedures should always be considered in determining what constitutes a reasonable time period. Consequently, Inspectors should provide detailed evidence and fully describe a railroad's bench testing procedures in order to support any determination that the time period between the bench test and installation of a device on a train was not reasonable.

Question: Can devices be bench tested and taken to other locations for application?

No, because 232.409(c) requires the device shall be tested at the initial terminal or other point of installation. This implies that the device must receive the bench test at the location or yard where it will be installed on the train.

Question: What are the testing requirements if locomotive power is changed and a different front unit is used?

At the point of installation, whether it is the front or rear device, all testing requirements apply. If the locomotive power is changed and a new front device is installed on the train, all testing requirements apply. If the front device is replaced with a device from a trailing locomotive, all testing requirements apply since this is a new installation of the front device.

Question: What about the calibration requirements?

Both the front and rear units have to be calibrated for accuracy according to the manufacturer's specifications and procedures at least once every 368 days. The test shall include testing radio frequencies and modulation. The 368 days does not include up to 92 days of shelf-life prior to placing the unit in service. The date of the calibration, the location where the calibration is made, and the name of the person performing the calibration has to be legibly displayed on a weather-resistant sticker or other marking device affixed to the outside of the device (both the front unit and rear unit.) It is the railroad's responsibility to account for the shelf-life by either entering an in-service date on the sticker or the number of days of shelf-life on the sticker. If the device is integrated into the computer of the locomotive, the sticker information can be entered on Form FRA F6180-49A. The sticker information must be accessible to both FRA Inspectors and train crewmembers. Therefore, it cannot be locked in cabinets, out of view.

Question: Are railroads required to keep spare batteries at specific locations?

No, it is within the railroad's discretion to determine when and where batteries will be kept and charged. There are sufficient incentives for railroads to ensure that the batteries are sufficiently charged at all times: because of the speed restrictions imposed on trains that develop failures en route; and strict liability for failure of the batteries en route. If an Inspector can determine that a battery failed enroute, submission of a violation should be strongly considered.

Question: What actions have to be taken when the device develops a failure en route?

If the device develops a failure en route, the speed of the train is restricted to 30 mph. In addition to observing the 30 mph speed restriction, the train is not permitted to operate over a section of track with an average grade of two percent or greater over a distance of two continuous miles, unless the conditions contained at 232.407(g) are met.

Question: On some units, front-to-rear failures and rear-to-front failures are displayed. Are both of these failures considered an en route failure?

Since the intent of the rule is to have the capability of initiating an emergency brake application at the rear of the train, only the front-to-rear failure is considered an enroute failure. The rear-to-front failure does not affect the ability of the device to initiate the emergency from the rear of the train. If the engineer is unable to determine if the communications failure is front-rear or rear-front, then any communications failure must be considered an enroute failure and corrective action must be taken.

Question: Is an intermittent communication failure considered an en route failure?

No, there has to be a continuous loss of communication between the front and rear unit of at least 16 minutes and 30 seconds. However, based on existing designs of the devices currently used, anytime the display indicates a "**comm loss**," the 16 minutes and 30 seconds have elapsed and the locomotive engineer must comply with the restrictions required for the failure enroute requirements.

Question: Can a train proceed over a heavy grade with a defective device?

A train cannot proceed over a heavy grade unless the defective device is replaced with a fully operational device, or one of the following alternative methods is used:

1. An occupied locomotive helper is attached to the rear of the train with the brake pipe connected and tested to ensure brake operation. The helper engineer will initiate and maintain two-way voice radio communication with the engineer on the head end of the train. If communication is lost prior to passing the crest of the grade, the train should be stopped until communication has been restored, if this can be done safely. If communication is lost once the descent has begun, the helper locomotive

engineer and the head end engineer will act to stop the train if the train reaches a predetermined rate of speed that indicates a need for emergency braking. The predetermined rate of speed is established by the railroad and should be indicated in the railroad's timetable;

2. An occupied caboose is attached to the end of the train with a tested, functional brake valve capable of initiating an emergency brake application from the caboose. The occupant of the caboose must establish and maintain radio voice communication with the head end engineer in the same manner as prescribed for the occupied locomotive helper;

3. A radio-controlled locomotive is located at the rear of the train, and is under continuous control of the head end engineer by means of telemetry, and if the radio-controlled locomotive is capable of initiating an emergency brake application from the lead (controlling) locomotive.

Question: Does this mean the train would have to stop on a grade if a failure occurs?

Whenever a failure occurs enroute, the train is prohibited from operating over a section of track with an average grade of two percent or greater over a distance of two continuous miles. If the train develops the failure while traversing the grade, the engineer should safely continue down the grade or to a specific siding, in accordance with the railroad's operating procedures for bringing the train to a stop at the first available location, rather than bring the train to an immediate stop.

Question: If a helper locomotive is used on the head end of a train, does it have to be linked to the two-way EOT?

If a locomotive helper is attached to the front of the train to help the train over a grade, it would not have to be linked to the two-way EOT *provided* that the locomotive that was originally controlling the train is still armed and capable of initiating an emergency brake command to the rear device and two-way voice radio is initiated and maintained by the helper locomotive engineer with the engineer of the original lead locomotive until the move is completed. If communication is lost, each engineer will immediately act to stop the train if the train reaches a predetermined rate of speed that indicates a need for emergency braking. The predetermined rate of speed is established by the railroad and should be indicated in the railroad's timetable. This only applies to the extent necessary for the helper unit to provide power to get the train over the grade.

Question: If a train were to have problems and stalled in a tunnel where communication is lost, and it took longer than 16 minutes and 30 seconds to correct, could the train move out of the tunnel so that communications could be re-established, or is this a communications failure requiring other corrective measures?

If this incident occurred, the train would be allowed to move out of the tunnel. Once out of the tunnel, if communication is not re-established, the train would have to be brought to an immediate stop. Corrective action for a communication failure would have to be taken.

Question: If a train has to be cut because it has insufficient power to get over a hill, what has to be done with regard to the two-way EOT?

If a train has to be cut because there is insufficient power to pull it over a hill or grade, the device may remain in place on the car at the rear of the train. It does not have to be advanced to the moving section of the train. This only applies to the extent necessary to traverse the grade and only while the train is divided for this procedure.

Question: Can a "Local Train" that is not equipped with a two-way EOT operate above 30 mph?

A local train as defined in 232.407(a)(3), that does not operate over a section of track with an average grade of 2 percent for 2 continuous miles, can run at authorized track speed without a two-way EOT. In many cases, this could be above 30 mph.

Question: Can a "work train" operate above 30 mph if it is not equipped with a two-way EOT?

A work train as defined in 232.407(a)(4), that does not operate over a section of track with an average grade of 2 percent for 2 continuous miles, can run at authorized track speed without a two-way EOT. This could be above 30 mph.

Question: Can any train be dispatched without a two-way EOT if it does <u>not</u> exceed 30 mph?

Only if the train will not travel over a heavy grade as defined in Part 232.407(a)(1), or is specifically excepted from the requirements found at 232.407(e).

Question: If a train is equipped with an electronically controlled brake system (ECP), would an EOT be required?

Yes, because the ECP train sets that are currently operating are an overlay system of regular pneumatic brakes. Since these trains can be run in either electronic or regular pneumatic mode, a two-way EOT device would have to be on the rear of the train. If the train is all electronic, the two-way EOT requirements will be covered by the waiver permitting this type of operation.

Two-Way End-of-Train Device Flowchart (MP&E 98-62)

The following flowchart was developed to provide a better understanding of when a two-way end-of-train device is required. All trains operating over the general railroad system have to comply with this regulation, unless a specific waiver is in effect for a particular operation.