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Two-Way End-of-Train Telemetry Devices; Final Rule

DEPARTMENT OF TRANSPORTATION

Federal Railroad Administration

49 CFR Part 232

[FRA Docket No. PB–9, Notice No. 6]

RIN 2130–AA73

Two-Way End-of-Train Telemetry Devices

AGENCY: Federal Railroad Administration (FRA), DOT.

ACTION: Final rule.

SUMMARY: FRA is revising the regulations governing train and locomotive power braking systems to include provisions pertaining to the use and design of two-way end-of-train telemetry devices (two-way EOTs). Two-way EOTs provide locomotive engineers with the capability of initiating an emergency brake application that commences at the rear of the train. These revisions are designed to improve the safety of railroad operations by requiring the use of these devices on a variety of freight trains in accordance with legislation enacted in 1992 and by providing minimum performance and operational standards related to the use and design of two-way EOTs.

EFFECTIVE DATE: The rule is effective July 1, 1997.

ADDRESSES: Any petition for reconsideration should be submitted to the Docket Clerk, Office of Chief Counsel, Federal Railroad Administration, 400 Seventh Street, S.W., Room 8201, Washington, D.C. 20590.

FOR FURTHER INFORMATION, CONTACT: Thomas Peacock, Motive Power and Equipment Division, Office of Safety, RRS–14, Room 8326, FRA, 400 Seventh Street, S.W., Washington, D.C. 20590 (telephone 202–632–3345), or Thomas Herrmann, Trial Attorney, Office of the Chief Counsel, FRA, 400 Seventh Street, S.W., Washington, D.C. 20590 (telephone 202–632–3167).

SUPPLEMENTARY INFORMATION:

Background

The train air brake system is complex and sensitive. A simplified summary of its operation may be useful in understanding the use and desirability of the technology required by this final rule. The train air brake system is composed of three major parts: (i) a signal sender; (ii) a signal relayer; and (iii) a signal receiver/responder.

The brake valve on the locomotive is the signal sender. Operation of the valve permits air to be pumped into or released from the brake pipe. The pressure change resulting from the additional or reduced air supply in the brake pipe is the ''signal.'' The brake pipe, also known as the train air line, is the ''signal relayer.'' The brake pipe is the continuous air line running from the front of the train to the rear of the train. The continuity of the air line from car to car is accomplished by means of flexible air hoses. The brake pipe is closed (sealed) at the rear of the train and pressurized so that, apart from air leakage in the system, changes in the brake pipe pressure are made through operation of the brake valve on the locomotive.

When the engineer ''sets the brakes,'' air is released from the brake pipe through the locomotive brake valve. This release of air reduces the pressure of the brake pipe, beginning at the front of the train. The pressure reduction moves down the brake pipe to the rear of the train. Thus, the signal is relayed by the brake pipe to the entire train. Similarly, when the brakes are released, the locomotive brake valve is positioned so that air is pumped into the brake pipe, sending a pressure increase through the brake pipe. A pressure reduction in the brake pipe rather than a pressure increase initiates a brake application. Consequently, the train air brake system is said to be ''failsafe,'' i.e., if an air hose bursts, the resulting loss of air pressure in the brake pipe will initiate a brake application.

The third major part of the train air brake system is the ''signal receiver/responder'' valves located on each car, which receive and interpret the changes in the brake pipe pressure. These valves initiate the application or release of the brake on each individual car. The degree of braking effort is determined by the degree of the brake pipe pressure drop, generally described as a partial service reduction, a full service reduction, or an emergency application.

An EOT device is a radio telemetry device composed of a front unit, located in the cab of the controlling locomotive, and a rear unit, located at the rear of the train and attached to the brake pipe. Provisions governing the use of one-way EOTs were incorporated into the power brake regulations in 1986. *See* 49 CFR 232.13 and 232.19. One-way EOTs have the capability of interpreting rear-of-train brake pipe pressure and of transmitting that information via radio to the front receiving unit in the cab of the controlling locomotive. Optional features include the transmission of information regarding rear end motion and battery status. Many of the rear units of an EOT also incorporate rear-end marking devices required by 49 CFR Part 221. One-way EOTs only have the ability to transmit information from the rear unit to the front unit.

Since the advent of EOTs, technological advances have been made to incorporate ''two-way communication'' into the system. The two-way EOTs, in addition to the features of the one-way EOTs, have the ability of transmitting from the controlling locomotive an emergency brake application that begins at the rear of the train. This is a desirable feature in event of a blockage or separation in the train's brake pipe that would prevent the pneumatic transmission of the emergency brake application throughout the entire train. In 1986, FRA concluded that mandating the installation of two-way EOTs was not warranted. At that time, cabooseless trains operating without two-way EOTs lacked any ability to initiate an emergency brake application from the rear of the train and in FRA's view there was no demonstrated a need for the EOT to do so. Furthermore, at that time EOTs with two-way capability were not commercially available. In addition, since two-way capability requires two-way signal transmission, the cost of the devices sharply increased. Nevertheless, FRA made a public commitment then to monitor developments in EOT technology and to review the subject periodically. *See* 51 FR 17300, 17301 (May 9, 1986).

Since 1986, significant advances have been made in the development of two-way EOTs, and they are now commercially available in the marketplace from several manufacturers. In 1987, two-way EOTs were mandated in Canada as a condition for elimination of cabooses. FRA received recommendations from the National Transportation Safety Board (NTSB) and petitions from the United Transportation Union, the Brotherhood of Locomotive Engineers, the Oregon Public Utilities Commission, the Washington Utilities and Transportation Commission, and the Montana Public Service Commission to require two-way EOTs on all cabooseless trains operating in certain territories.

In 1992, Congress amended the Federal rail safety laws by adding certain statutory mandates related to power brake safety. *See* 49 U.S.C. 20141 (formerly contained in Section 7 of the Rail Safety Enforcement and Review Act, Pub. L. No. 102–365 (September 3, 1992), amending Section 202 of the Federal Railroad Safety Act of 1970, formerly codified at 45 U.S.C. 421, 431 *et seq.*). These amendments specifically address two-way EOTs by adding a new subsection which states:

(r) POWER BRAKE SAFETY.—
* * * (3)(A) The Secretary shall require 2-way end of train devices (or devices able to perform the same function) on road trains other than locals, road switchers, or work trains to enable the initiation of emergency braking from the rear of the train. The Secretary shall promulgate rules as soon as possible, but not later than December 31, 1993, requiring such 2-way end of train devices. Such rules shall at a minimum—

(i) set standards for such devices based on performance;

(ii) prohibit any railroad, on or after the date that is one year after promulgation of such rules, from acquiring any end of train device for use on trains which is not a 2-way device meeting the standards set under clause (i);

(iii) require that such trains be equipped with 2-way end of train devices meeting such standards not later than 4 years after promulgation of such rules; and

(iv) provide that any 2-way end of train device acquired for use on trains before such promulgation shall be deemed to meet such standards. (B) The Secretary may consider petitions to amend the rules promulgated under subparagraph (A) to allow the use of alternative technologies which meet the same basic performance requirements established by such rules. (C) In developing the rules required by subparagraph (A), the Secretary shall consider data presented under paragraph (1).

(4) The Secretary may exclude from the rules required by paragraphs (1), (2), and (3) any category of trains or rail operations if the Secretary determines that such an exclusion is in the public interest and is consistent with railroad safety. The Secretary shall make public the reasons for granting any such exclusion. The Secretary shall at a minimum exclude from the requirements of paragraph (3)—

(A) trains that have manned cabooses;

(B) passenger trains with emergency brakes;

(C) trains that operate exclusively on track that is not part of the general railroad system;

(D) trains that do not exceed 30 miles per hour and do not operate on heavy grades, except for any categories of such trains specifically designated by the Secretary; and

(E) trains that operate in a push mode.

Pub. L. No. 102–365, § 7; codified at 49 U.S.C. 20141, superseding 45 U.S.C. 431(r).

Proceedings to Date

In response to the statutory mandate, the various recommendations, and due to its own determination that the power brake regulations were in need of revision, FRA published an Advance Notice of Proposed Rulemaking (ANPRM) on December 31, 1992 (57 FR 62546) and conducted a series of public workshops in early 1993. A section of the ANPRM was specifically designed to elicit comments, information, and views on two-way EOTs, and a portion of the public workshops covered this topic. *See* 57 FR 62550–62551. Based on the comments and information received, FRA published an NPRM regarding revision the power brake regulation which contained specific requirements related to two-way EOTs. *See* 57 FR 47700, 47713–14, 47731, 47734, and 47743.

Following publication of the NPRM in the Federal Register (59 FR 47676), FRA held a series of public hearings in 1994 to allow interested parties the opportunity to comment on specific issues addressed in the NPRM. Public hearings were held in Chicago, Illinois on November 1–2; in Newark, New Jersey on November 4; in Sacramento, California on November 9; and in Washington, D.C. on December 13–14, 1994. These hearings were attended by numerous railroads, organizations representing railroads, labor organizations, rail shippers, and State governmental agencies. Due to the strong objections raised by a large number of commenters, FRA announced by notice published on January 17, 1995 that it would defer action on the NPRM and permit the submission of additional comments prior to making a determination as to how it would proceed in this matter. 60 FR 3375. In the January notice, FRA also stressed that it did not intend to defer implementation of the requirement for two-way EOTs beyond an effective date of December 31, 1997.

In the ANPRM and the NPRM, FRA identified 11 recent incidents that might have been avoided had the involved trains been equipped with two-way EOTs. *See* 57 FR 62550; 59 FR 47713–14. In addition, on December 14, 1994, in Cajon Pass in California, an intermodal train operated by The Atchison, Topeka and Santa Fe Railway Company (Santa Fe) collided with the rear end of a unit coal train operated by the Union Pacific Railroad Company, resulting in the serious injury of two crew members and total estimated property damages in excess of $4 million. After investigation of this incident, the NTSB concluded that, had the train been equipped with a two-way EOT, the collision could have been avoided because the engineer could have initiated an emergency brake application from the end of the train. On December 15, 1995, based on the conclusion reached above, the NTSB made the following recommendation to FRA:

> Separate the two-way end-of-train requirements from the Power Brake Law NPRM, and immediately conclude the end-of-train device rulemaking so as to require the use of two-way end-of-train telemetry devices on all cabooseless trains. (R–95–44).

Furthermore, on February 1, 1996, again in Cajon Pass, a westward Santa Fe freight train derailed on a descending three-percent grade. The incident resulted in fatal injuries to two of the crew members, serious injuries to a third, and the derailment of 45 of 49 cars and four locomotives. Although investigation of this incident is currently in progress, it appears as though it could have been avoided had the train been equipped with a means for the train crew to have effected an emergency brake application from the rear of the train. The two aforementioned incidents resulted in FRA's issuance on February 6, 1996, of Emergency Order No. 18 (61 FR 5058), which requires the affected railroad to ensure that its train crews have the ability to effect an emergency brake application from the rear of the train on all westward freight trains operating through Cajon Pass.

Consequently, based on these considerations and after review of all the comments submitted, FRA determined that in order to limit the number of issues to be examined and developed in any one proceeding it would proceed with the revision of the power brake regulations via three separate processes. In light of the testimony and comments received on the NPRM, emphasizing the differences between passenger and freight operations and the brake equipment utilized by the two, FRA decided to separate passenger equipment power brake standards from freight equipment power brake standards. As passenger equipment power brake standards are a logical subset of passenger equipment safety standards, the passenger equipment safety standards working group will assist FRA in developing a second NPRM covering passenger equipment power brake standards. *See* 49 U.S.C. 20133(c). In addition, a second NPRM covering freight equipment power brake standards will be developed with the assistance of FRA's Railroad Safety Advisory Committee. *See* 61 FR 29164. Furthermore, in the interest of public safety and due to statutory as well as internal commitments, FRA determined that it would separate the issues related to two-way EOTs from both the passenger and freight issues, address them in a public regulatory conference, and issue a final rule on the subject as soon as practicable.

Pursuant to a notice published on February 21, 1996 (61 FR 6611), FRA held an informal public regulatory conference on March 5, 1996, in Washington, D.C. to further discuss issues related to the proposed

requirements on two-way EOTs contained in the NPRM. In accordance with the Administrative Procedure Act (5 U.S.C. 551 *et seq.*), the public regulatory conference was a continuation of the power brake rulemaking proceeding. In this notice, based on a review of the substantial number of comments submitted in connection with the ANPRM and the NPRM regarding two-way EOTs, FRA identified and provided some discussion of seven major issue areas regarding two-way EOTs including: the definition of ''mountain grade territory,'' en route failures of the devices, trains subject to the requirements, initial terminal requirements, design requirements, calibration requirements, and cost/benefit information. As part of the cost/benefit discussion, FRA identified 26 potentially preventable accidents had the trains involved been equipped with two-way EOTs. *See* 61 FR 6615. This public regulatory conference was attended by representatives of at least seven railroads, two organizations representing Class I and short line railroads, four labor organizations, two manufacturers of the two-way EOTs, and one State public utilities commission. Written comments were received from most of these parties or their representative. The comment period for this proceeding closed on April 15, 1996; however, comments received after that date have been considered.

Discussion of Comments and Conclusions

Those parties filing comments and presenting testimony regarding two-way EOTs at the hearings following publication of the ANPRM and NPRM as well as the public regulatory conference have provided the agency with a wealth of facts and informed opinions and have been extremely helpful to FRA in resolving the issues. While most commenters provided testimony or written comments on more than one issue, and while most of the comments supported the position(s) of at least one other commenter, the issues themselves were centered around a few key concepts. Rather than attempt to paraphrase each commenter's response to each of the proposed regulatory sections in the NPRM, FRA believes it is better, and more understandable, to discuss the key issue areas in this proceeding and present the thrust of the comments on each of these.

A. Replacement of Term ''Mountain Grade'' with ''Heavy Grade''; Definition of Heavy Grade

In the NPRM as well as in the Notice of Public Regulatory Conference, FRA consistently used the term ''mountain grade'' territory to describe those areas where trains, even though operating below 30 mph, would be required to be equipped with a two-way EOT. Several commenters recommended that FRA abandon its use of the term ''mountain grade'' territory because it is confusing and inconsistent with the language used in the statute. *See* 49 U.S.C. 20141(c). In order to remain consistent with the language used in the statutory mandate and to avoid confusion by affected parties, FRA will not use the term ''mountain grade'' territory in the final regulations and will instead use the term ''heavy grade.''

In Appendix C of the NPRM, FRA proposed a definition of mountain grade territory as a section of track of distance, D, with an average grade of 1.5 percent or more over that distance which satisfies the following relationship:

$(30/V)^2G^2D \leq 12$

Where:

G = average grade x 100

D = distance in miles over which average grade is taken

V = speed of train

See 59 FR 47719, 47753. FRA also provided a chart containing mountain grade territory curves based on an application of the definition. *See* 59 FR 47753. FRA developed this empirical relationship based on most commenters' suggestions that some type of formula be developed based on a variety of factors, including train tonnage, speed, length of grade, percent of grade, and distance of grade. FRA determined that the three most important variables in defining mountain grade were: (i) the speed of the train (V); (ii) the steepness of the grade (G); and (iii) the length of the grade (D).

Many commenters found the definition contained in the NPRM confusing, inaccurate, and impractical. These commenters suggested that the definition would result in known mountain or heavy grades not being covered by the two-way EOT requirement, while other areas never before believed to be mountain grades would fall within the requirement. Several commenters also recommended that the definition be eliminated and that the two-way EOT requirements apply solely to trains operating in excess of 30 mph. The California Public Utilities Commission suggested that, short of requiring the devices on every train, the fundamental criterion should be the ability of the train to stop within a safe distance based solely on the ability of the independent locomotive brakes. Other commenters suggested that other criteria be used to define mountain grade territory and that the formula be simplified. One commenter recommended that the proposed definition be eliminated, and that the two-way EOT requirements be applied to trains operating over 30 mph and to heavy tonnage and long trains as defined in FRA's proposal.

Based on these comments as well as its reconsideration of the proposed definition, FRA acknowledged that the definition contained in the NPRM was confusing and inaccurate in its Notice of Public Regulatory Conference published on February 21, 1996. *See* 61 FR 6612. In that Notice, FRA requested alternative suggestions and proposed replacing the term ''mountain grade'' with ''heavy grade'' and defining ''heavy grade'' as: any portion of a railroad with an average grade of one percent or greater where the product of the average percent grade (as a decimal) and the distance over which the grade persists (in miles) is greater than or equal to .03. Thus a one percent (.01) average grade for three miles or a two percent (.02) average grade for 1.5 miles would meet the definition. *See* 61 FR 6613. Although this definition was accepted by some commenters as being better than that proposed in the NPRM, none of the commenters endorsed the definition, and several stated that it was either too hard to enforce or was too broad or too narrow.

Several commenters provided alternative definitions of mountain or heavy grade. The Association of American Railroads (AAR) and The American Short Line Railroad Association (ASLRA) suggested that mountain or heavy grade be defined as ''a section of track with a continuous grade of 2 percent or greater over a distance of 2 miles.'' Many commenters objected to this alternative, stating that it excludes known mountain or heavy grade territories. Several of these commenters identified specific locations with grades of greater than one percent but less than two percent for long distances that would not fall within the definition proposed by the AAR (such as Feather River Canyon in California and the grade at Pig's Eye Yard in St. Paul, Minnesota). In the alternative, the AAR recommended that the term mountain or heavy grade not be specifically defined in the regulation and that each railroad define the term in its operating rules filed with FRA. The stated advantage to this approach is that each railroad could tailor the definition

to its particular operating territory and FRA could object should a railroad fail to include a section of track FRA believed to be mountain or heavy grade territory. Several commenters objected to this alternative, stating that such a regulation would be difficult to enforce since every railroad would have different definitions of the term and such a regulation could result in railroads intentionally defining the term in order to negate its applicability to their operation. The ASLRA further recommended that shorter, lower tonnage trains be excluded from any definition of mountain or heavy grade due to the costs involved with equipping these types of operations and the fact that the safety data does not support the need for the use of the devices on these types of operations solely because they operate in mountain or heavy grade territory. The ASLRA also suggested that an alternative to the use of two-way EOTs be permitted for trains operating with 4,000 trailing tons or less by permitting them to use retaining valves, set in the high pressure position before operating over a descending grade.

The Brotherhood of Railway Carmen (BRC) recommended that ''heavy grade'' be defined as any grade greater than one percent. The BRC believed that such a definition was clear, enforceable, and not overly restrictive. This commenter felt that variables such as speed, tonnage, and train length were too subject to manipulation and change to be included in a clear, enforceable definition. Other commenters objected to this definition, stating that it was overly broad and would include areas never considered to be heavy grades. Several commenters recommended that two-way EOTs be required on all trains operating on main line track regardless of speed or grade. Many parties objected to this suggestion stating that it is clearly in excess of Congress' intent to provide exceptions for various operations based on their operating speeds, terrain, and type of service being provided.

The California Public Utilities Commission (CAPUC) recommended that a performance standard be adopted to determine which operations would be subject to the requirements. This performance standard would be based on the ability of the independent locomotive brakes to stop a train. In its written comments, the CAPUC provided a detailed discussion of calculating the standard for various grades and tonnages based on the amount of independent locomotive brake present on a given train. However, the CAPUC emphasized that values contained in its analysis were illustrative and that further research would be required to develop the concept. At the public regulatory conference, several parties objected to this type of performance approach as too complicated and very difficult, if not impossible, to enforce due to the amount of information necessary to calculate the formula.

Conclusions

In its statutory mandate, Congress specifically provided an exception from any two-way EOT requirements for certain trains that do not operate on heavy grades. *See* 49 U.S.C. 20141(c)(4). In order to give effect to, and remain consistent with, this statutory provision, FRA is compelled to develop an understandable and easily enforceable standard for determining whether a segment of track should be considered heavy grade territory. FRA believes that any regulations related to two-way EOTs must include provisions excluding from the requirements certain operations that do not operate on heavy grades. Consequently, FRA does not think it would be consistent with the statutory mandate or with the safety data reviewed in this proceeding to require the use of two-way EOTs on all trains operating on main line track regardless of speed or grade, as recommended by some commenters. FRA believes that a performance standard based on tons per axle of independent locomotive brake offers an attractive approach; however, the proposal would require significant refinement and might not be capable of reliable application in the field. FRA also believes that the AAR alternative, permitting each railroad to define the term heavy grade, could result in inconsistent standards, without an adequate safety rationale, opening the regulation to legal challenge, and would require considerable agency resources to review and verify the submissions of each railroad across the country.

In determining the most effective way to define heavy grade, FRA not only considered the comments submitted but also considered and analyzed a variety of factors which affect the operation of a train in grade territory. These included such things as: the steepness of grade; the effect of cresting speed; the location of a trainline blockage; the weight of the train; the number of locomotives; the length of grade; and the life of brake shoes under stress. After consideration of these factors, FRA determined that any definition of heavy grade should attempt to incorporate the effects of as many of these factors as possible without creating a requirement which would be extremely complex or overly intrusive on the operations of a railroad. For example, one factor FRA considered to be overly intrusive was placing limitations on the cresting speeds of trains at various grades. FRA determined that there was no universally applicable standard and that establishing such limitations may actually create additional safety concerns.

In the aftermath of recent accidents on heavy grades, FRA became aware of the great value of including heavy grade descent plans in the training and instruction of operating employees. A heavy grade descent plan can incorporate the wisdom and experience of engineers long familiar with descending a particular heavy grade and provide a vehicle for sharing the different ways the grade can successfully be traversed. Such a plan should take into account a wide variety of factors such as those listed above. FRA strongly encourages railroads to develop and use heavy grade descent plans and to share ''best practices'' for training operating employees to handle heavy grades. While requiring the use of heavy grade descent plans or changing requirements for training operating employees is outside the scope of this rulemaking, FRA thinks that railroads should be aware in the context of this rule of the potential for heavy grade descent plans to enhance safety. FRA will address heavy grade descent plans and training practices through other vehicles in the near future.

As noted above, the AAR and the ASLRA proposed to define heavy grade as a section of track with a continuous grade of two percent for two miles. FRA believes this basic and simple definition is a good starting point as it takes into account both the percentage of grade and the distance over which that grade extends. However, FRA agrees with many of the commenters that this definition fails to capture several areas traditionally considered to be heavy or mountain grades. Furthermore, after a review of the potentially preventable accidents identified in the Notice of Public Regulatory Conference (61 FR 6615) as well as other recently identified accidents/incidents, it is apparent that train tonnage or length should also be a factor in determining whether a particular segment of track is considered heavy grade territory for a particular train. In order to keep the definition of heavy grade as simple to understand as possible, FRA will use only total trailing tons as a supplemental factor since it somewhat incorporates train length. Consequently, FRA will use a simple, two-level approach in defining heavy grade, using the total trailing tons of a train as one

of the two bases for determining whether the train is operating over a heavy grade.

The ASLRA recommended that FRA exclude trains with less than 4,000 trailing tons from the requirements relating to heavy grades, contending that the safety data do not support the use of the devices on these shorter, lower-tonnage trains and that such an exclusion would reduce the economic impact of the requirements on smaller railroads. After a review of the accident/incident data, FRA agrees that lower-tonnage trains tend to have fewer problems operating over heavy grades than higher-tonnage trains. Virtually all of the accidents/incidents cited by FRA in its cost/benefit analysis as potentially preventable with a high degree of confidence involve long, heavy-tonnage trains or trains operating in excess of 30 mph. Consequently for simplicity's sake, FRA will adopt the definition of heavy grade suggested by the AAR and the ASLRA for trains operating with 4,000 trailing tons or less, with one modification: FRA will require use of a two-way EOT on trains operating with 4,000 trailing tons or less when operated on a segment of track with an average rather than a continuous grade of two percent or more for a distance of two or more miles. FRA believes that the use of average grade instead of continuous grade will capture some of the locations with brief dips below two percent (i.e., 1.9 or 1.8 percent) raised as examples by several commenters. Furthermore, FRA does not believe that the use of retaining valves, even on a train operating with less than 4,000 trailing tons, provides the same measure of safety as an armed and operable two-way EOT and, thus, FRA will not permit the use of retaining valves as an alternative to the use of a two-way EOT.

As mentioned above, FRA will apply a separate definition of heavy grade for trains operating with greater than 4,000 trailing tons. A review of the accidents/incidents considered by FRA as potentially preventable, had the train involved been equipped with a two-way EOT, reveals that those incidents occurring on steep grades almost always involved trains operating with greater than 4,000 trailing tons. FRA believes that the definition of heavy grade for these types of trains needs to be broad enough to encompass the areas identified by several commenters noted above, yet sufficiently limited so as not to be overly burdensome to the industry. Consequently, based on FRA's proposed definition contained in its Notice of Public Regulatory Conference (61 FR 6613) and based upon comments received from the BRC and CAPUC as well as others, FRA will define heavy grade for trains operating with greater than 4,000 trailing tons as segments of track with an average grade of one percent or greater over a distance of three or more miles. FRA does not believe this definition will be overly burdensome to the industry since the ASLRA stated that 17 of the 21 mountain grade railroads it surveyed have average train tonnage of less than 4,000 trailing tons and most of the trains operated by Class I railroads over this type of terrain will be operating in excess of 30 mph at some point between origin and destination of the intact consist.

Both of the definitions of heavy grade discussed above include a minimum distance over which the average grade must extend. If a strict percentage approach were adopted (i.e. 1 or 2 percent), then areas where brief dips in the grade reach those percentages for very short distances would bring a train within the requirement for use of the device when in reality these brief dips do not create a safety concern. The two and three mile minimum distance requirements were adopted based on an analysis of the relevant potentially preventable accident/incident data as well as the natural rolling resistance of a train and the brake shoe life of the independent locomotive brakes if cautious cresting speeds are assumed. The grade and mileage components of the definitions are sufficiently restrictive to capture all of the past relevant potentially preventable accidents/incidents but broad enough to prevent brief dips in the terrain from being considered heavy grades.

B. Applicability

Based on the statutory mandate and after review of the comments received and the accidents relied on for support of the use of two-way EOTs, FRA in the NPRM proposed that the devices be required equipment on trains that operate at speeds in excess of 30 mph and on trains that operate in mountain grade territories. *See* 59 FR 47743. In addition to those operations specifically excluded from two-way EOT requirements by the statute (49 U.S.C. 20141(c)), FRA found sufficient safety justification for excluding two other types of operations: (i) Freight trains equipped with a locomotive capable of initiating a brake application located in the rear third of the train length; and (ii) trains equipped with fully independent secondary braking systems capable of safely stopping the train in the event of failure of the primary system. In order to provide the industry with time to acquire a sufficient number of two-way EOTs and to ease the economic impact of acquiring the devices, FRA proposed that the requirement for use of the devices, not become effective until December 31, 1996. *See* 59 FR 47713, 47743. FRA also proposed that all two-way EOTs purchased prior to the effective date of the final rule would be deemed to meet the design requirements contained in the proposal. *See* 59 FR 47713, 47743. There were very few comments submitted in response to the NPRM specifically addressing the applicability requirements contained in the NPRM other than stylistic suggestions. One commenter did recommend that the exception for trains operating in a push mode be amplified to require that the control cab on the rear of train be occupied, display a reading of the brake pressure, and be capable of making an emergency application.

At the public regulatory conference several commenters raised objections to FRA's proposal regarding local and work trains that were reiterated in the written comments. In the NPRM, FRA proposed to require the use of two-way EOTs on local and work trains that exceeded 30 mph. *See* 59 FR 47743. FRA also proposed definitions of these types of trains. *See* 59 FR 47726. Several commenters objected to the proposed restrictions on these types of trains contending that they are inconsistent with the statutory mandate. The AAR proposed that these types of trains not be subject to the two-way EOT requirements and reiterated the definitions contained in the NPRM for local and work trains. In the statutory provision, Congress stated that two-way EOTs shall be required ''on road trains other than locals, road switchers, or work trains. . . .'' *See* 49 U.S.C. 20141(b)(1). However, the statute does not define the terms local, road switcher, or work trains and does not include them in the specific exclusions contained in the legislation. *See* 49 U.S.C. 20141(c). At the public regulatory conference it was generally agreed that any definition of local trains would essentially subsume the term ''road switcher'' and, thus, separate definitions would not be required for purpose of these regulations. Several commenters suggested that due to the nature of the work performed by local and work trains (e.g., delivery or pick-up switching en route and repairs) that any requirement that they be equipped with two-way EOTs would have a tremendous economic impact on the industry. These commenters also suggested that due to the shorter distances these trains generally travel

the safety rationale for requiring use of the devices is far less apparent. Other commenters recommended that FRA narrowly define local and work train in order to prevent a possible loophole wherein carriers could designate all their trains as local trains and, thus, circumvent the two-way EOT requirements. Several commenters also objected to treating local and work trains any differently than road trains as they incur the same operational difficulties and pose the same threat to safety.

One commenter expressed concern over the proposed exception granted to trains with a locomotive capable of making a brake application located in the rear third of the train. Generally, this commenter was concerned with how the locomotive, located in the rear third of the train, would be operated and whether the locomotive would be required to have the capability of effectuating an emergency brake application in both directions from its position in the train. Another commenter suggested that the proposed exception for trains operating in the push mode be reworded so as only to permit the exception if the train has the ability to initiate an emergency brake application from the rear of the train. One railroad recommended that an exception from the requirements regarding two-way EOTs be granted to railroads that do not operate on ruling grades exceeding .5 percent.

Conclusions

Although it is arguable, as some commenters suggested, that Congress intended for locals, road switchers, and work trains *per se* to be granted an exception from the requirements related to two-way EOTs, FRA does not believe Congress intended to except trains merely based on a label placed on the operation. FRA believes that Congress intended for the term ''locals, road switchers, or work trains'' to be narrowly construed by FRA and not so broadly defined that the requirements for two-way EOTs are rendered meaningless in many circumstances.

In the NPRM, FRA attempted to limit the local or work train exception by proposing the 30 mph standard. However, after reconsideration of the accident/incident data compiled in relation to this proceeding and the comments submitted, FRA admits that the proposed exception was probably not the most effective means of limiting the application of the requirements for these types of operations.

Therefore, in the final rule, rather than impose a blanket speed criterion, FRA intends to define local and work trains narrowly and not except such trains when operated in heavy-grade territory. FRA will start with the definitions proposed in the NPRM for local and work trains (59 FR 47726) and add an additional limiting factor of 4,000 trailing tons. FRA will further narrow the definition of a local train by adding the limitation that the train travel a distance that is no greater than that which can be operated by a single crew in a single tour of duty. In FRA's view, local trains operating with greater than 4,000 trailing tons for extended distances and work trains operating with greater than 4,000 trailing tons lose the characteristics of being traditional local or work trains and begin to look more like any other road train susceptible to the same operational problems and difficulties and, thus, fall outside the exception contemplated by Congress for local and work trains. FRA believes this approach is consistent with Congress' intent and FRA's rationale expressed with regard to defining heavy grades. This approach not only recognizes the operational necessity for the services these types of trains provide and the nature of the duties they engage in when en route, while preventing the potential for confusion or abuse of the term local or work train, but also ensures that those trains most likely to benefit from the added safety provided by two-way EOTs are so equipped.

FRA also intends to amend the exceptions contained in the NPRM relating to trains operated in a push mode and trains with a locomotive in the rear third of the train in order to clarify the exceptions and address the concerns raised by some commenters with regard to these exceptions. The exception for trains operated in the push mode will be clarified to include language that the train must have the ability to effectuate an emergency brake application from the rear of the train. In addition, the exception for trains operated with a locomotive in the rear third of the train will be amended to require that the locomotive be capable of effectuating an emergency brake application in both directions from its location in the train. FRA believes that although this method of operation does not provide all the safeguards provided by a two-way EOT, it provides other operational and train-handling benefits as well as many of the safeguards provided by a two-way EOT and, thus, there is no compelling need for the devices in these operations.

Finally, FRA rejects the suggestion of one railroad that an exception be granted for trains that do not operate on grades exceeding .5 percent regardless of the train's speed. Although these types of trains would not be operating on heavy grades, such an exception would be contrary to Congressional intent.

C. En Route Failures

In the NPRM, FRA proposed that if a two-way EOT or equivalent device becomes incapable of initiating an emergency brake application from the rear of the train while the train is en route, then the speed of that train would be limited to 30 mph. *See* 59 FR 47714, 47743. FRA's rationale for this limitation was that, under the statute, two-way EOT devices are not required on trains that travel less than 30 mph. Operating with a non-functional two-way EOT device is the same as not having a device; consequently, trains operating with failed two-way EOT devices should be subjected to this same limitation. Furthermore, FRA suggested that the concerns raised by several railroads regarding train delays, missed deliveries, and safety were not justified. The AAR as well as several railroads commented that these devices are very reliable and have an extremely low failure rate, if properly maintained. FRA believed that the concerns of the railroads were outweighed by the potential harm to both the public and railroad employees caused by trains being allowed to operate without the devices at speeds which Congress and FRA think require the added safety benefits provided by these devices.

Several railroads commented on FRA's proposal, reinforcing the view that such a limitation could cause serious train delays and missed deliveries and would actually produce additional safety hazards due to the bunching of trains. Commenters also suggested that FRA failed to include the cost of this limitation in its analysis. Other commenters noted that subsequent to the drafting of the NPRM, Canada eliminated its speed restriction for failure of a two-way EOT en route.

At the public regulatory conference and in written comments, the AAR again objected to any speed restriction for en route failures of the devices, stating that any speed restriction would be costly both in terms of operating expense and reduced customer satisfaction. In support of this statement, the AAR provided a cost analysis regarding various speed restrictions. The AAR also proposed an alternative method for handling en route failures. This proposal required that the conductor report the location, date, time, and description of the failure; that the train be equipped with a train brake status system; and that the train be moved only to the nearest forward point

capable of repairing or replacing the unit. Several commenters objected to this alternative as well as other alternatives permitting speeds greater than 30 mph on the grounds that they basically provide incentives to operate a train with a defective two-way EOT device. Many commenters felt that if carriers are permitted to proceed to the next point where repairs can be made then the same problems inherent with moving cars with any defect will result: repair points will disappear, or locations will be declared unable to make repairs or replacements.

Several commenters supported the proposed 30-mph speed restriction for en route failures. The BRC endorsed the proposed speed restriction, but would like to see it coupled with a requirement that the device be repaired or replaced at the next yard, terminal, or crew change point, whichever comes first. This commenter believed that the speed reduction was the only viable incentive for ensuring that railroads properly maintain the devices. At the public regulatory conference it was also discovered that, contrary to the information provided in response to the NPRM, Canada has not eliminated the 25-mph speed restriction for en route failures of two-way EOTs. The Canadian Legislative Director for the United Transportation Union stated that although the order requiring a speed reduction to 25 mph for en route failures of the devices was revoked, it was revoked only on the premise that the general operating instructions of the railroads would contain the requirements of the order, which they do, and it is a violation of the Canadian Rail Safety Act to violate the railroad's general operating instructions. Thus, the speed restriction for en route failure of the devices still exists in Canada, and no evidence was submitted to show the restriction has adversely affected railroad operations. FRA has received no written comments disputing the statements regarding the Canadian requirements as presented at the public regulatory conference.

Although supporting the 30-mph speed restriction for en route failures, the CAPUC was concerned that the limitation did nothing to address en route failures that occur in heavy grade territory. This commenter suggested that many trains do not operate over 30 mph when in mountain or heavy grade territory and, thus, for railroads operating such trains the risk of a 30-mph restriction provides no incentive to keep the devices operational. One commenter suggested an alternative to the speed restriction: requiring trains that develop en route failures to immediately stop and have the crew determine whether the train can be operated at a safe speed to the next location for repairs. This proposal also provided that if the train proceeded the crew would be exonerated from any discipline resulting from a rules violation or accident.

Both oral and written comments were received in relation to the question of what constitutes an en route failure of the device. In the NPRM, FRA merely stated that a failure will be considered the inability to initiate an emergency brake application from the rear of the train. Although this provides some guidance, it does not really address the problem of loss of communication and at what point that loss constitutes a failure of the device. Commenters and FRA recognize that brief communication interruptions between the front and rear units commonly occur and that these lapses may not be critical since the signal for an emergency application is transmitted at a much higher wattage than the ordinary communication signals between the two units. The AAR recommended that a failure not be declared until communication between the front and rear units cannot be established for 16 minutes and 30 seconds. This time frame was proposed based on the design of the devices, which automatically checks communication between the units every ten minutes. If no response is received, the front unit automatically requests communication from the rear 15 seconds later; if no response is received to that request, another request is made six minutes later; and if there is still no response, the front unit makes another request 15 seconds later. No other commenters presented measurable criteria for determining when an en route failure occurs.

Conclusions

FRA intends to require trains which experience en route failures of the two-way EOT device to limit their speed to 30 mph. FRA believes this is a logical outgrowth of the requirement that trains operating in excess of 30 mph be equipped with the devices. FRA agrees with many of the commenters that to permit speeds in excess of 30 mph would be akin to providing an incentive to operate without the devices. The railroads as well as the manufacturers of the devices stated that the failure rate for the devices is extremely low. These parties indicated that the majority of the failures were due to depleted batteries, which FRA believes will be reduced to a great extent by the requirements contained in this regulation regarding the charging of batteries throughout the trip. (*See* discussion regarding inspection and calibration of the devices.) FRA also believes that the 30-mph speed limitation on trains experiencing en route failures will encourage railroads to ensure that the devices are properly functioning when they are installed and will ensure that a sufficient number of the devices are available at various locations throughout a train's trip, both of which will further mitigate the effects of the speed restriction. Furthermore, trains in Canada have been operating for several years with a 25-mph speed restriction on trains that experience en route failures of the devices, and there were no comments submitted indicating the problems suggested by the railroads. Consequently, FRA believes that failure of these devices will be extremely rare and that the concerns expressed and the costs estimated by the railroads regarding train delays and missed deliveries are not justified and are overstated.

FRA does not intend to mandate locations where these devices must be repaired or replaced if they should fail en route. FRA believes each railroad is in the best position to determine the locations where additional devices can or must be maintained and stored to ensure the efficiency of its own operation. Furthermore, FRA believes that the requirements limiting the speed of a train operating with a defective device, as well as the inspection and battery charge requirements, are sufficient to promote the prompt repair or replacement of defective units and to ensure that the devices will be operational throughout a train's trip.

FRA will adopt the AAR's suggestion for determining when a loss of communication between the front and rear units should be considered a failure of the device en route. As noted in the above discussion, brief losses of communication do occur between the front and rear unit, and FRA does not intend to consider these communication gaps as failures en route. As pointed out by several commenters, the signal calling for the initiation of an emergency brake application is continuously transmitted at a wattage that is greater than five times the wattage at which ordinary communications between the two units are transmitted. Thus, brief communication gaps will be overcome by the increased wattage at which the signal calling for an emergency brake application is transmitted. The 16 minutes and 30 seconds recommended by the AAR is based on the current design of the automatic communication between the front and rear units and

constitutes an enforceable standard for determining when a loss of communication should be considered an en route failure.

As noted by some commenters, the issue of failures approaching the crest of heavy grades is not adequately addressed by simply limiting train speed. Nor is it sufficient to know that the train line is open and properly charged at the crest. As two recent accidents appear to illustrate, buff (compressive) forces in the train may cause blockages in the train line as the train descends the grade that may not have been present while the train was stretched on its upward climb. Therefore, it is particularly critical, in order to realize the benefits contemplated by the Congress, that the two-way EOT be operative as the train begins its descent down heavy grades. Although FRA believes that the requirements limiting the speed of a train operating with a defective device, as well as the inspection and battery charge requirements, are sufficient to promote the prompt repair or replacement of defective units and to ensure that the devices will be operational throughout a train's trip in most instances, FRA believes that additional safeguards must be provided when a train experiences a failure of its two-way EOT when operating on particularly heavy grades. FRA believes these added safeguards are necessary for those trains that operate over sections of track with an average grade of two percent or greater for two continuous miles. FRA's Emergency Order No. 18 permits operation over a heavy grade down the Cajon Pass of California only if the two-way EOT system is operative or provided one of certain other alternative measures is provided. The alternative measures include the following:

1. *Use of an occupied helper locomotive at the end of the train*. If this method is used, the helper locomotive engineer shall initiate and maintain two-way voice radio communication with the engineer on the head end of the train; this contact shall be verified just prior to passing the crest of the grade. If there is a loss of communication prior to passing the crest of the grade, the helper locomotive engineer and the head-end engineer shall act immediately to stop the train until voice communication is resumed. If there is a loss of communication once the descent has begun beyond Summit, the helper locomotive engineer and the head-end engineer shall act to stop the train if the train has reached a predetermined rate of speed that indicates the need for emergency braking. The brake pipe of the helper locomotive must be connected and cut in to the train line and tested to ensure operation; and trains shall be stopped when helpers are cut in or cut off from trains being assisted.

2. *Use of an occupied caboose at the end of the train* with a tested, functioning brake valve capable of initiating an emergency brake application from the caboose. If this method is used the train service employee in the caboose and the engineer on the head end of the train shall establish and maintain two-way voice radio communication and respond appropriately to the loss of such communication in the same manner as prescribed for helper locomotives.

3. *Use of a radio-controlled locomotive* in the rear third of the train under continuous control of the engineer in the head end by means of telemetry, but only if such radio-controlled locomotive is capable of initiating an emergency application on command from the lead locomotive.

Railroads typically maintain available helper locomotives and have crews on call to address exigencies in heavy grade territory, such as failure of one or more locomotives en route. FRA believes that, given the high reliability of two-way EOTs, the marginal costs of using helper locomotives cut into the train line—under the control of a crew in contact with the lead unit of the primary locomotive consist—would not be significant in relation to the risk of a run-away train. Accordingly, FRA will require that the two-way EOT be operative or that one of the approved alternative methods of operation be employed whenever a train required to be equipped with a two-way EOT operates over a section of track with an average grade of two percent or greater for a distance of two miles.

D. Design Requirements

In order to maintain uniformity in the performance of two-way EOTs, FRA proposed basic performance and design requirements for these devices in the NPRM. As two-way EOTs that are currently in production meet the design requirements already established for one-way devices contained at 49 CFR 232.19, FRA proposed to retain those requirements, apply them to two-way EOTs and add specific requirements to ensure two-way communication and the ability to initiate an emergency brake application from the rear of the train. In the NPRM, FRA recognized that currently available two-way EOTs have several optional features that could prove beneficial to railroads, and although FRA recommended that railroads obtain as many of the optional features as they can when purchasing the devices, FRA did not propose to mandate their use and feels each railroad is in the best position to determine which features benefit its operation.

In the NPRM, FRA proposed a requirement that the rear unit automatically begin restoring the brake function (recharging the air brake system) within 60 seconds after it has initiated an emergency application. *See* 59 FR 47731. FRA proposed this requirement based on the belief that currently manufactured two-way EOTs are designed with this feature. Several commenters in response to the NPRM and the Notice of Public Regulatory Conference suggested that the proposed provision requiring the automatic restoration of the brake function after 60 seconds should be eliminated. These commenters stated that the brake function should not be restored until the train has come to a complete stop or that the locomotive engineer should retain control of the restoration, or both. These commenters also stated that many railroads require the train to be inspected after an emergency application and do not want the brakes to be reset prior to the completion of the inspection.

In the Notice of Public Regulatory Conference, FRA attempted to clarify the proposal regarding the availability of the front-to-rear communications link being checked automatically by stating that the NPRM inadvertently contained a requirement of 10 minutes and that it should have read ''10-seconds.'' *See* 61 FR 6614. Several parties commented on this clarification, including the manufacturers of the devices, stating that a 10-second requirement would be impossible to meet with current technology and would result in a battery drain within a short time. These commenters stated that FRA correctly proposed a 10-minute requirement in the NPRM as that is the current industry standard and has been the standard for devices used in Canada for several years.

The AAR recommended that FRA should not require that the rear unit respond only to the front unit of that train. This commenter indicated that some railroads want the ability to activate the rear unit from a location other than the front end of the train in an emergency, such as, where the crew of the train becomes disabled. Finally, one commenter recommended that a separate, labeled, and protected emergency switch should not be mandated if the EOT's emergency

application could be integrated into the existing emergency brake controls.

Conclusions

Based on the comments received, FRA does not intend to change its position regarding the mandating of any of the optional features currently available on two-way EOTs. As FRA stated in the NPRM, it encourages railroads to obtain as many of the optional features as possible when purchasing the devices, but believes that each railroad is in the best position to determine which features best suit its operation. FRA agrees with many of the commenters that requiring the braking function to be automatically restored within 60 seconds after an emergency application has been initiated would hinder the safe practices of many railroads with regard to inspecting the train after an emergency application is made or leaving the train within the control of the locomotive engineer. FRA also agrees with those commenters that noted that FRA improperly suggested a change in the Notice of Public Regulatory Conference with regard to the time frame for checking the front-to-rear communications link. Consequently, FRA will leave the requirement at 10 minutes as proposed in the NPRM, rather than the 10 seconds contained in the Notice of Public Regulatory Conference.

FRA further agrees with the AAR's recommendation that some leeway be provided in the requirement that the rear unit respond to only the front unit of that train in order to permit railroads to activate the rear unit from a location other than the front end, provided it can be done in such a way as to ensure the security of such a procedure. FRA believes this can be easily accommodated by changes in the wording contained in the proposal to permit the rear unit to respond to an emergency command from any ''properly associated front unit.'' This language should permit the flexibility desired by some railroads.

FRA does not believe it would be beneficial to remove the provision requiring a separately labeled and manually controlled switch for initiating an emergency brake transmission command, as suggested by one commenter. At present, FRA is unfamiliar with the technology that would integrate the EOT's emergency application with the existing emergency brake controls. Implementation of integrated electronic controls of pneumatic brakes has not yet achieved the degree of reliability that would be desirable as a platform for this key safety function. Thus, FRA believes that such technology would best be introduced through a waiver or possibly through future regulations addressing the introduction of new technology, currently under consideration by the Railroad Safety Advisory Committee working group on freight power brakes.

E. Inspection and Calibration

At the ANPRM stage, FRA received several comments regarding the batteries used in two-way EOTs. Several commenters suggested that the most frequent cause of failure of two-way EOTs is battery failure. These commenters also indicated that this problem could be cured by replacing batteries at initial terminals. Other commenters suggested that some minimum charge be required at initial terminals and that inspections be performed during all brake tests and at crew change points. Several commenters also suggested that interchangeable battery packs were necessary because some railroads were unable to charge the devices that come onto their lines from other railroads. Based on these comments, FRA proposed that any train equipped with a two-way EOT or its equivalent shall not depart from the point where the train is originally assembled unless (i) the device is capable of initiating a brake application from the rear of the train and (ii) the batteries of the device are charged to at least 75 percent of watt-hour capacity. *See* 59 FR 47734.

At the public regulatory conference the issue of the amount of battery charge that should be required at initial terminals was discussed. Several commenters initially recommended that a percentage of watt-hour capacity be required at this location, ranging from 100 percent to 50 percent. However, as the discussion progressed, it was apparent that many commenters favored some type of performance requirement. In its written comments, the AAR recommended that FRA merely require that the EOT be sufficiently charged so that it can be reasonably expected that the EOT will remain operative until the next terminal capable of charging the batteries or installing replacements. The AAR suggested that such an approach would ensure that the devices are sufficiently charged without the use of an arbitrary percentage that may be too high, requiring railroads to spend resources to unnecessarily charge batteries, or that may be too low to ensure a sufficient charge throughout the trip. Other commenters recommended that if a performance standard is adopted which requires sufficient battery charge to ensure completion of the train's trip then strict liability needs to attach to instances where depleted batteries are the cause of an en route failure. It was stressed that this sort of liability should apply only to the batteries supporting the telemetry capabilities of the devices, not to the rear-end marker function. As noted previously, most EOTs incorporate the rear-end marking device required by 49 CFR Part 221 into their design, and there are separate batteries within the rear units which provide power to these devices. Several commenters stated that if FRA were to limit the operating speed of trains experiencing en route failures of the devices then a performance standard related to battery charge would probably work since railroads would have an incentive to keep them charged.

In addition to battery-charge requirements, there was some discussion as to what would be required at the initial terminal with regard to testing the devices to ensure they are capable of initiating a brake application from the rear of the train. Several parties commented that there were several different methods for testing such ability. Basically, four possible methods for testing the devices were identified in the various comments. One method would be to attach the device to the rear of the train and then have the controlling locomotive transmit an emergency brake application signal with the front unit causing an emergency application to be initiated from the rear of the train, thereby having the entire train effectuate an emergency application of the brakes. A second method would be to attach the device to the rear of the train, close the angle cock on the last or second-to-the-last car of the train (an angle cock is a lever which permits the closing of the brake pipe so that no air can travel past that point in the brake pipe), and then have the controlling locomotive transmit an emergency brake application signal from the front unit. Under this method only the last one or two cars of the train would effectuate an emergency brake application as the closed angle cock would prevent further propagation of the signal down the trainline. The third method would involve a check of the emergency valve on the rear unit after the unit is attached and armed, without placing any cars in the train into emergency. This method would require an emergency application to be transmitted by the controlling locomotive and then a visual check of the emergency valve on the rear unit to ensure the valve functions properly. The final method of inspection would be a bench test of the device which would be performed prior to the device being

armed and placed on the train. One commenter suggested that if bench testing is permitted it should be required to be done within a short time prior to the device being placed on the train. The BRC recommended that, in addition to testing requirements, the FRA needed to require additional periodic inspections and maintenance to ensure the devices are working properly.

In the NPRM, FRA also proposed to extend the calibration period for all EOTs from 92 days to 365 days. *See* 59 FR 47700, 47731. Currently, the regulations require one-way EOTs to be calibrated for accuracy every 92 days. *See* 49 CFR 232.19(h)(3). FRA based this proposed extension not only on its own experience but also on the comments received from several parties that the devices are fairly reliable and can operate for years without calibration. Furthermore, FRA stated that the 92-day calibration period was established at a time when there was little experience with the devices, noting that since that time, not only has calibration of the devices not proven to be a problem, but technology has further improved the reliability of the devices. Although several commenters, both at the ANPRM and NPRM stage, commented on the unreliability of the devices, these comments generally addressed either the failure of the railroads to properly perform the calibrations or the misuse of the devices. Comments submitted subsequent to the public regulatory conference basically reiterated the positions expressed previously. The AAR and manufacturers of the devices supported a 365-day calibration period, stating that the calibration of the devices does not drift periodically and that when the devices fail they fail completely, as the calibration of the devices does not deteriorate over time. One manufacturer commented that the mean time between failures of its devices is in excess of 15,000 hours. The BRC restated its objection to the proposed extension of the calibration period citing carrier abuses of the devices and the extreme operating conditions under which the devices are used.

Conclusions

FRA intends to adopt a performance standard relative to both the requirements for charging batteries as well as testing requirements at the initial terminal or point of installation of the devices. FRA agrees with many of the commenters that rather than merely picking a percentage of watt-hours to which the batteries must be charged at initial terminals, it would be much more effective to establish a performance standard for this requirement. Due to the fact that FRA intends to impose a speed limitation on trains that experience en route failures of the devices and since a vast majority of the en route failures are attributable to dead batteries, FRA believes there is a major incentive to the railroads to ensure the batteries are sufficiently charged. Consequently, FRA intends to establish a standard that requires the batteries on the rear unit to be sufficiently charged at the initial terminal or point of installation and throughout the train's trip to ensure that the device will remain operative throughout the trip. This requirement is only intended to apply to the batteries supporting the telemetry capabilities of the devices. Furthermore, as recommended by several commenters and agreed to by carrier representatives, FRA will impose a strict liability standard regarding failures due to insufficiently charged batteries; that is, it will be a per se violation if a device fails en route due to insufficiently charged batteries. FRA will rely on witness statements, interviews, and carrier repair records to establish whether a failure of the device was the result of insufficiently charged batteries.

FRA also intends to require that the devices be inspected at the initial terminal or other point of installation to ensure that the device is capable of initiating an emergency brake application from the rear of the train. Rather than require a specific method of ensuring this capability, FRA will permit the railroads to develop a method that best fits the circumstances and their operations. At this time, FRA recognizes four different methods, discussed in detail above, that would be sufficient to test this capability; they include: dumping the whole train into emergency once the device is attached; closing the angle cock on the last one or two cars and then activating an emergency application on those cars; inspection and testing of the emergency valve on the device once it is attached to ensure it functions properly without placing any cars in emergency; and bench testing the devices prior to their being armed and placed on the train within a reasonable time period prior to attaching the device to the train. Use of a method other than those listed above will not be permitted if FRA finds that it does not sufficiently ensure that the device is capable of initiating an emergency brake application. Due to the speed limitation being imposed for en route failures, FRA does not believe it is necessary to mandate additional inspections or maintenance as the carriers have sufficient incentive to ensure the devices are adequately maintained.

No new information was provided FRA in relation to the proposed extension of the calibration requirements from 92 days to 365 days. Consequently, FRA continues to believe, based on its own experiences and the comments submitted, that these devices are fairly reliable and can be operated for long periods of time without calibration problems. FRA believes that the current 92-day requirement is outdated due to improved technology and is not consistent with the reality that calibration of these devices has not proven to be a problem. Furthermore, FRA believes that much of the abuse and misuse of these devices cited by one commenter will be corrected due to the restrictions imposed on trains operating with devices that are defective or fail en route.

Section-by-Section Analysis

As most of the issues and provisions have been discussed and addressed in detail in the preceding discussions, this section-by-section analysis will explain the provisions of the final rule and changes from the NPRM by briefly highlighting the rationales or referring to the prior discussion. The discussions and conclusions contained above should be considered in conjunction with the analysis contained below. Each comment received has been considered by FRA in preparing this final rule. Because the provisions regarding two-way EOTs were part of a much broader NPRM addressing all power brake provisions, the section citations in the final rule will vary considerably from the citations referred to in the NPRM.

Section 232.21

This new section of the regulations contains design standards for two-way EOTs. Except for a few modifications, as noted below, this section essentially contains the same requirements as proposed in the NPRM at § 232.117 (59 FR 47731). This section indicates that two-way EOTs are to be designed not only in accordance with the standards contained in this section but also those contained in § 232.19 applicable to one-way devices, except those in § 232.19(b)(3). FRA intends that enforcement actions taken pursuant to these design and performance requirements would be principally focused at manufacturers of the devices. It is noted that, failure to use a device meeting the design and performance criteria contained in this section could

result in enforcement action against a railroad pursuant to § 232.23(b).

FRA has eliminated the requirement regarding the automatic restoration of the braking function by the rear equipment within 60 seconds after it has initiated an emergency application as proposed in the NPRM at § 232.117(e). FRA agrees with many of the commenters that requiring the braking function to be automatically restored within 60 seconds after an emergency application has been initiated would hinder the safe practices of many railroads with regard to inspecting the train after an emergency application is made or leaving the train within the control of the locomotive engineer.

Subsections (a)-(g) are unchanged from the provisions proposed in the NPRM at § 232.117(a)-(d) and (f)-(h). These requirements pertain to the design and performance of the front and rear units necessary to ensure that a proper communication link exists between the front and rear units and to ensure that a safe and timely emergency brake application can and is initiated from the rear of the train. The only comments received regarding any of these provisions related to subsections (e) and (f). As noted earlier, one commenter requested that a separate, labeled, and protected emergency switch should not be mandated if the EOT's emergency application could be integrated into the existing emergency brake controls. As previously stated, FRA is unfamiliar with the technology that would integrate the EOT's emergency application with the existing emergency brake controls and thus, does not feel elimination of this requirement is appropriate. FRA believes that such technology would best be introduced through a waiver or possibly through future regulations addressing the introduction of new technology, currently under consideration by the Railroad Safety Advisory Committee working group on freight power brakes.

In the Notice of Public Regulatory Conference, FRA attempted to clarify the proposal regarding the availability of the front-to-rear communications link being checked automatically by stating that the NPRM inadvertently contained a 10-minute, instead of a 10-second, requirement. *See* 61 FR 6614. Several parties commented on this clarification, including the manufacturers of the devices, stating that the 10-second requirement would be impossible to meet with current technology and would result in a battery drain within a short time. These commenters stated that FRA correctly proposed a 10-minute requirement in the NPRM as that is the current industry standard and has been the standard for devices used in Canada for several years. FRA agrees with these commenters and will leave the requirement at 10 minutes as proposed in the NPRM.

Subsection (h) has been modified slightly from that proposed in the NPRM at § 232.117(i) by replacing the word ''its'' with the phrase ''a properly.'' This revision is made in response to a recommendation by the AAR that some leeway be provided in the requirement that the rear unit only respond to front unit of that train to permit railroads to activate the rear unit from a location other than the front unit of the train, provided it can be done in such a way as to ensure the security of such a procedure. FRA believes the revised language permits the rear unit to respond to an emergency command from any properly associated front unit and, thus, should permit the flexibility desired by some railroads.

Section 232.23

This new section of the regulations contains the operating requirements related to two-way EOTs. This section also contains general applicability standards and identifies those operations excepted from the requirements related to two-way EOTs.

Subsection (a) contains the definitions of key terms necessary for identifying those operations excepted from the requirements related to two-way EOTs. These definitions are intended solely for determining the applicability of the requirements related to two-way EOTs and should not be used in connection with other provisions contained in FRA regulations. With the exception of the definition of a ''train'' contained in (a)(2), the other definitions contained in this section have been revised from those proposed in the NPRM at § 232.5 (59 FR 47723-26) based on a review of the accident data and the comments received.

Heavy Grade

(For a detailed discussion of the all the comments, issues, and conclusions involving this definition, interested parties should review the preceding discussion regarding the definition of heavy grade contained in part A of the ''Discussion of Comments and Conclusions'' portion of this document.) Although FRA used the term ''mountain grade'' to describe this idea in previous proposals, FRA has determined, in order to avoid confusion and remain consistent with the statutory provision, it will use the term ''heavy grade'' in the final rule. FRA will use a bi-level approach in defining heavy grade, using the total trailing tons of the train as one factor in determining whether a train is operating on a heavy grade and, thus, subject to the requirements related to two-way EOTs. A train operating with 4,000 trailing tons or less will be considered to be operating on a heavy grade if a section of track over which it operates has an average grade of 2 percent or greater for a distance of 2 miles. A train operating with greater than 4,000 trailing tons will be considered to be operating on a heavy grade if a section of track over which it operates has an average grade of 1 percent or greater for 3 miles. FRA feels this definition is consistent with the available accident data and addresses many of the concerns raised in the comments submitted.

Local Train

(See part the preceding ''Discussion of Comments and Conclusions'' portion of this document under the heading ''Applicability'' for a detailed discussion of this issue.) Although FRA believes Congress intended an exception for local trains, FRA believes that Congress intended for the term to be narrowly construed. Rather than attempt to narrowly construe the term in the exceptions portion of the rule as was done in the NPRM, FRA decided to narrowly define the term based on the traditional idea of what constitutes a local train. Consequently, FRA has limited the distance such a train moves to that which can be operated by a single crew in a single tour of duty and has limited the size of the trains to 4,000 trailing tons or less. FRA also believes this definition is consistent with the overall structure of these requirements. If a train, even though designated by a railroad as a local train, falls outside the parameters contained in this definition then, it will be considered an ordinary train subject to the two-way EOT requirements.

Work Train

(See the preceding ''Discussion of Comments and Conclusions'' portion of this document under the heading ''Applicability'' for a detailed discussion of this issue.) FRA used the same reasoning for defining work trains as is it did for local trains. If a train fails to meet the definition contained in this subsection, even though labeled a work train by the railroad, it will be considered an ordinary train subject to the two-way EOT requirements.

Subsection (b) contains the general requirement for equipping trains with two-way EOTs. FRA recognizes that the Class I, II, and III railroads have voluntarily committed to equip the vast

majority of the trains covered by these rules by the effective date of the requirements. Therefore, FRA believes that an effective date of July 1, 1997 is a realistic deadline for complying with these requirements. FRA will consider extending this date only in the event that manufacturing delays result in a railroad's inability to secure an adequate number of the devices; however, FRA will not consider extension of the effective date beyond the statutorily mandated date of December 31, 1997. This section also provides that in order to be properly equipped the two-way EOT must meet the performance criteria contained in § 232.21.

Subsections (c) and (d) basically contain the statutory requirements regarding present and future purchases of EOT devices. These provisions require that all EOTs purchased after one year from the date of publication of these requirements shall have two-way capabilities meeting the design and performance requirements contained in § 232.21 and that all two-way devices acquired prior to the promulgation of this rules shall be grandfathered as meeting the design and performance requirements contained in § 232.21. In essence, these requirements eventually result in one-way EOTs being gradually phased out of use as they are replaced by two-way EOTs.

Subsection (e) contains a listing of those trains that are excepted from the requirements relating to two-way EOTs, previously proposed in the NPRM at § 232.813(e) (59 FR 47743). The majority of the exceptions were specifically provided for in the statute. See 49 U.S.C. § 20141(c). FRA has revised the exceptions contained in paragraphs (e)(1) and (e)(2) from those proposed in the NPRM, in order to clarify the scope of the exceptions. Paragraph (e)(1) has been rewritten to ensure that the locomotive located in the rear third of the train has the capability to initiate an emergency brake application and is in continuous communication with the controlling locomotive. Paragraph (e)(2) has been revised to clarify that the exception is for trains operating in a push mode only if the locomotive at the rear of the train has the ability to initiate an emergency brake application from that location. Paragraph (e)(3) has been revised to ensure that the caboose is manned by a crew member and is equipped with an emergency brake valve. The local and work train exceptions contained in paragraphs (e)(6) and (e)(7) have been revised from those proposed in the NPRM to remain consistent with the definitions contained in subsection (a) and are limited in that the exception does not apply if these types of trains are operating on heavy grade. As the definitions of both ''local train'' and ''work train'' limit their size to 4,000 trailing tons or less, heavy grades for these trains will be sections of track with an average grade of 2 percent or greater for 2 miles. (See the preceding ''Discussion of Comments and Conclusions'' portion of this document under the ''Applicability'' heading for a detailed discussion of this issues related to local and work trains and other exceptions.)

Subsection (f)(1) requires that the devices be properly armed and operable at the time a train departs from the point where the device is installed. FRA believes that this requirement, although not specifically contained in the NPRM, could have be inferred from the proposed initial terminal requirements regarding these devices at § 232.309 (59 FR 47734) and the testing and inspection requirements contained in § 232.25. However, several commenters wanted a specific provision contained in the final regulations to prevent any confusion or misunderstanding.

Subsection (f)(2) contains the performance standard related to the amount of battery charge required when the devices are in use. The standard requires that the batteries on the rear units be sufficiently charged at the train's initial terminal or the point where the device is installed and throughout the train's trip to ensure that the device will remain operative until the train reaches destination. In the NPRM at § 232.309(e) (59 FR 57734), FRA proposed a 75 watt-hour requirement for the batteries at initial terminals; however, based the comments received as discussed above, FRA believes this is an ideal situation in which to use a performance standard. Due to the speed restrictions being mandated for en route failures, coupled with FRA's intent to apply strict liability for en route failures due to insufficiently charged batteries, FRA feels there are sufficient incentives for railroads to ensure that the batteries on the rear units are sufficiently charged at all times. This requirement is intended only to apply to the batteries supporting the telemetry capabilities of the devices. FRA does not intend this provision to require that the place where the batteries should be sufficiently charged for the train to reach its final destination should be the initial terminal or the point where the device is installed; it is within the railroad's discretion to determine when and where the batteries will be charged, and railroads should be cognizant of their strict liability for failure of the batteries en route and mindful of the speed restrictions that will be imposed. (See the preceding ''Discussion of Comments and Conclusions'' portion of this document under the ''Inspection and Calibration'' heading for a detailed discussion of this issue.)

Subsection (g) contains the speed restriction being placed on trains that experience en route failure of the devices. This is identical to the restriction proposed in the NPRM at § 232.815(f) (59 FR 47743). This subsection also contains the definition of when a loss of communication between the front and rear units will be considered an en route failure. If a train experiences an en route failure of the two-way EOT, it will be required to limit its speed to 30 mph. FRA believes this is a logical outgrowth of the requirement that trains operating in excess of 30 mph be equipped with the devices. FRA believes that failure of these devices will be very rare and that the concerns raised by several commenters regarding the costs and delays associated with this requirement are not justified. FRA further believes that many of the failures currently reported will be greatly reduced since a majority of them are the result of depleted batteries, which FRA feels will be a thing of the past due to this speed restriction and the requirements contained in this rule regarding the charging of batteries. The definition of when a loss of communication between the front an rear units will be considered an ''en route failure'' is based on the automatic communications built into the devices. FRA does not intend for brief losses of communication to be considered failures en route since these brief gaps should be overcome by the increase in the wattage at which the emergency signal is transmitted and continuous rate at which the signal calling for an emergency brake application is transmitted. (See the preceding ''Discussion of Comments and Conclusions'' portion of this document under the ''En Route Failures'' heading for a detailed discussion of these issues.)

Paragraph (g)(1) of this subsection contains the operating restrictions for trains which experience en route failures of the two-way EOT when operating on especially heavy grades. Although FRA believes that the requirements limiting the speed of a train operating with a defective device, as well as the inspection and battery charge requirements, are sufficient to ensure the prompt repair or replacement of defective units and to ensure that the devices will be operational throughout a train's trip in most instances, FRA

believes that additional safeguards must be provided when a train experiences a failure of its two-way EOT when operating on particularly heavy grades. FRA believes these added safeguards are necessary for those trains that operate over sections of track with an average grade of 2 percent or greater for 2 continuous miles. (See the preceding ''Discussion of Comments and Conclusions'' portion of this document under the ''En Route Failures'' heading for a detailed discussion of these issues.)

Section 232.25

This new section of the regulation contains the inspection, testing, and calibration requirements related to EOT devices. This section contains the provisions previously contained in § 232.19(h) but with some revisions, as noted below.

Subsections (a) and (b) basically contain the provisions previously contained in § 232.19(h)(1) and (h)(2). Although these provisions previously pertained only to one-way EOTs, FRA intends them to be equally applicable to two-way EOTs and proposed that in the NPRM at § 232.115 (59 FR 47730). The provisions contain the language ''after each installation'' as proposed in order to clarify when these requirements are to be performed.

Subsection (c) contains a type of performance standard test that is to be performed at the initial terminal of the train or at the point where a two-way EOT is first installed on the train, as an EOT device may not always be installed at the initial terminal. At these locations the devices must be tested to ensure that they are capable of initiating an emergency brake application from the rear of the train. In the preceding discussion, FRA indicated that it intended to leave it to the railroad's discretion as to how this test will be conducted. FRA recognized that there are currently four different acceptable methods of performing this test: dumping the whole train into emergency once the device is attached; closing the angle cock on the last one or two cars and then activating an emergency of those cars; inspection of the emergency valve on the device once it is attached to ensure it functions properly without placing any cars into emergency; and bench testing the devices prior to their being armed and placed on the train within a reasonable time period of attaching the device to the train. FRA also noted that use of a method other than those contained above will not be permitted, if FRA finds that it does not sufficiently ensure that the device is capable of initiating an emergency brake application. This subsection also requires that if the testing of the device is conducted by an individual other than a member of the train crew then the locomotive engineer be informed that the test was performed. (See the preceding ''Discussion of Comments and Conclusions'' portion of this document under the ''Inspection and Calibration'' heading for a detailed discussion of these issues.)

Subsection (d) contains the calibration and recordkeeping requirements for EOT devices as previously proposed in the NPRM at § 232.115(h)(3) (59 FR 47731). FRA continues to believe, based on its own experiences and the comments submitted, that these devices are fairly reliable and can be operated for long periods of time without calibration problems. FRA believes that the current 92-day requirement is excessive due to improved technology and is not consistent with the reality that calibration of these devices has not proven to be a problem. Furthermore, FRA believes that much of the abuse and misuse of these devices cited by one commenter will be corrected due to the restrictions imposed on trains operating with devices that are defective or fail en route. (See the preceding ''Discussion of Comments and Conclusions'' portion of this document under the ''Inspection and Calibration'' heading for a detailed discussion of these issues.)

Regulatory Impact

This rulemaking is the result of a specific and direct legislative mandate that required use of an existing technology to prevent accidents caused by obstructions of train air brake lines. FRA has sought to carry out that mandate, issuing regulations necessary for safety. FRA has also conducted a regulatory impact analysis and an assessment of impacts upon small entities under the Regulatory Flexibility Act.

The final rule seeks to prevent very serious accidents associated with loss of braking control on freight trains, focusing on scenarios posing serious risk while avoiding the creation of exceptions that could undermine the purpose the statute sought to achieve. Analysis conducted in support of this proceeding has assisted in the crafting of a final rule that provides flexibility to employ various technologies to achieve the regulatory purpose.

The analysis below reports the results of economic analysis using historical data as the basis for estimating future risk, discusses the limitations of that approach, and indicates the agency's rationale for striking the balance included in the final rule. A key component of that rationale is the recognition that the actual consequences of catastrophic accidents are difficult or even impossible to predict. Given the grave potential for serious consequences from accidents caused by loss of braking control on freight trains, FRA has applied that focus on risk reduction. The natural consequence of that strategy is relief for smaller railroads operating lighter trains at reduced speeds, except in the limited instances where very heavy grades must be negotiated.

The consequences of an accident caused by a run-away train tend to be extreme, with potential for deaths, economic disruption and lasting environmental damage. An example of this type of disaster, discussed below, occurred on February 1, 1996 in Cajon Pass in California. The value of casualties, which included: 2 fatalities, 1 severe injury, and 32 minor injuries (32 emergency responders required medical treatment due to inhalation of toxic chemicals) combined with damages due to railroad property damage and casualties, would be approximately $9.8 million. Costs to the United States Environmental Protection Agency for monitoring environmental clean-up and mitigation (through May 1996) were $16,014. The costs to the involved railroad for environmental damages were estimated at approximately $4.2 million. These damages are included in the economic analysis discussed below with a total value of approximately $14 million, for railroad property, casualties, and environmental damages.

Executive Order 12866 and DOT Regulatory Policies and Procedures

This final rule has been evaluated in accordance with existing regulatory policies and procedures and is considered to be significant under DOT policies and procedures (44 FR 11304) because of Congressional and public interest in promoting rail safety. This final rule has also been reviewed under Executive Order 12866 and is considered ''significant'' under that Order. Consequently, FRA has prepared a regulatory evaluation addressing the economic impact of the proposed rule. The regulatory evaluation estimates the economic costs and consequences of this proposed rule as well as its anticipated benefits and impacts. This regulatory evaluation has been placed in the docket and is available for public inspection and copying during normal business hours on the Seventh Floor, Office of Chief Counsel, FRA, 1120 Vermont Avenue, N.W., Washington, D.C. Copies may also be obtained by

submitting a written request to the FRA Docket Clerk at Room 8201, 400 Seventh Street, S.W., Washington, D.C. 20590.

Potential costs and benefits of the proposed rule were calculated for a 20-year period using the seven percent discount rate required by Federal regulatory guidelines. It is estimated that the net present value (NPV) costs associated with the rule total approximately $264 million over the 20-year period of analysis. Our analysis of the historical accidents that could have been prevented by two-way EOTs indicates that about three accidents per year may not have occurred had these devices been in place. Assuming that the same type of accidents would continue to occur in the absence of two-way devices, we have calculated that the benefit of installing these devices will result in a reduction of accidents, casualties and damages worth approximately $92 million over 20 years (again, discounted to present value).

Although FRA identified 26 potentially preventable accidents in its Notice of Public Regulatory Conference (61 FR 6615), the number of potentially preventable accidents was reduced to sixteen for purposes of this regulatory impact analysis based on comments received and an application of the provisions of this final rule to the factual situations of each of the accidents. In quantifying the benefits related to this final rule, FRA generally identified two types of accidents which could be prevented through the use of two-way EOTs. These included accidents due to brake pipe obstruction and accidents due to other brake related problems. An effectiveness rate was then assigned to each of the accidents based on the level of confidence by FRA safety experts that the accidents could have been prevented had the train been equipped and used a two-way EOT. The property damages and costs related to injuries and fatalities associated with each of the potentially preventable accidents are contained in Table 1 below.

TABLE 1—POTENTIALLY PREVENTABLE ACCIDENTS

DATE	PLACE	CAUSE	INJURIES	FATALITIES	RR PROPERTY UPDATED TO 12/95 $	RATE OF EFFECTIVENESS	ACCIDENTS PREVENTABLE BENEFIT
910918	Sprague, WA	OBSTRUCTED BRAKE PIPE.	4	1	$4,327,634	0.9	$6,883,771
910304	Waterfall, WY	OTHER BRAKE RELATED.	4	0	1,626,483	0.5	824,041
920307	Kansas City, MO	OBSTRUCTED BRAKE PIPE.	2	0	492,307	0.9	452,796
920611	Money, MS	OTHER BRAKE RELATED.	2	0	677,113	0.5	343,956
931001	Keystone, NB	OBSTRUCTED BRAKE PIPE.	2	0	2,653,038	0.9	2,463,064
931011	Fulton, KY	OTHER BRAKE RELATED.	0	0	14,589	0.5	7,295
931221	Wood, IA	OTHER BRAKE RELATED.	0	0	428,535	0.5	214,268
931225	Seward, NB	OBSTRUCTED BRAKE PIPE.	4	0	1,947,358	0.9	3,575,122
940118	Cowen, WV	OBSTRUCTED BRAKE PIPE.	0	0	1,381,380	0.9	1,243,242
940907	Gillette, WY	OTHER BRAKE RELATED.	0	0	3,677,160	0.9	3,309,444
941122	Tenn Pass, CO	OBSTRUCTED BRAKE PIPE.	1	0	1,503,495	0.9	3,206,020
941214	Cajon, CA	OBSTRUCTED BRAKE PIPE.	3	0	4,058,544	0.9	3,936,999
950209	Nelsons, WI	OTHER BRAKE RELATED.	1	0	30,696	0.9	65,291
950406	Argonne, MI	OTHER BRAKE RELATED.	0	1	268,529	0.9	2,671,676
960201	Cajon, CA	OBSTRUCTED BRAKE PIPE.	32	2	3,756,294	0.9	15,851,369
960214	E. St. Paul, MN	OBSTRUCTED BRAKE PIPE.	9	0	2,723,956	0.9	3,504,965
	TOTAL		65	4	29,567,109		48,553,320

Although the quantified benefits of the proposed rule are exceeded by the estimated costs, with a NPV cost of approximately $172 million over 20 years, FRA believes that the accident information collected by FRA does not adequately reflect the true costs to society due to brake-related accidents. Further, as discussed below, considerable variation in accident severity can be expected.

The potential benefits, which have not been quantified in this analysis due to a lack of information, may equal or substantially exceed the benefits which have been quantified. As shown in the most recent ''preventable'' accidents identified by FRA, there is a significant risk that similar accidents in the future could release large amounts of hazardous materials which, if the accident occurred in a densely populated or environmentally sensitive area, could produce truly catastrophic results. The costs of evacuation and medical treatment for those near the accident site could be substantial, and associated road closures also produce significant economic impact to travelers

and the communities nearby. Should a hazardous material release impact a river or stream, the consequences to wildlife in the area could also be severe and lasting. The costs associated with these types of accidents could be extremely high and, as these types of costs (potential benefits) have not been calculated in this analysis, the benefit estimations are extremely conservative. For cost/benefit analyses to serve their purpose well, all reasonably foreseeable damages should be accounted for, not merely those that have already chanced to occur.

Evaluation of Risk and Requirements to Equip Trains

The FRA recognizes that the base case economic analysis for this rulemaking suggests caution. Nevertheless, the FRA has determined that exceptions to the requirement for two-way EOTs should be drawn with great care, respecting the intent of the statutory exceptions without creating potential loopholes that could seriously erode the beneficial safety impacts intended by the Congress. In doing so, FRA has been mindful of the need to ensure impacts on small entities are limited to the extent possible given the specific commands of the congressional mandate. These choices have caused FRA to focus on train speed, grade, and tonnage as critical factors in determining what trains should be equipped with two-way EOTs and in determining the appropriate response when this equipment fails en route. FRA has proceeded in this manner both because the agency wished to be faithful to the level of safety determined by the statute to be appropriate in this context and because a common sense approach to analysis of the appropriate risks indicates the need to act decisively. This approach recognizes the role of accident frequency, accident causation, and accident severity.

In addition to performing an economic analysis employing historic accident patterns to project future risk (and thus prospective benefits), FRA has considered the potential volatility of the future risk associated with absence of two-way EOTs. When the Congress began hearings on the legislation that underlies this rulemaking in 1991, advocates of the technology were hard-pressed to cite specific and sustainable examples of accidents potentially preventable through use of two-way telemetry. A decade had just closed during which cabooses had been removed from trains, and initial experience had been relatively favorable. From the perspective of 1996, the need for this technology is much more evident, with the frequency of preventable events having proven higher than would have been expected. Accidents preventable by this technology *but involving trains not utilizing the technology* have continued into the current year, notwithstanding the fact that railroads have, in fact, made strides toward full compliance with two-way EOT requirements by the outside statutory deadline of December 31, 1997 (an effort recently accelerated to meet earlier voluntary deadlines).

The consequences of an accident depend on many factors which may not be related to the cause of the accident, such as the location of the train or the lading it transports. In either a densely populated or environmentally sensitive area, the consequences of an accident may be more severe than an accident in a less critical location. Likewise, a hazardous materials release is much more likely to have more severe effects (such as death, explosions, or environmental damage) than a grain spill in the same location. When considering the potential benefits which may be produced by avoiding the type of brake-related accidents targeted by this rule, it is therefore not sufficient to look only at the consequences of past accidents with similar causes. One should also look for indications in those past accidents for the reasonable potential for greater catastrophe. In this context, accidents caused by loss of braking control on freight trains (as can occur, among other reasons, due to brake pipe obstructions) tend to have a rather high potential for casualties, very substantial property damage, and considerable risk of environmental damage when hazardous materials are in the consist. Because derailment or collision will often occur due to overturning on curves or entering congested areas, third party casualties and property damage can also be substantial.

An example of the potential severity of an accident caused by loss of braking control, other than those noted above, may be illustrated by the circumstances surrounding the accident occurring on May 12, 1989 in which a Southern Pacific Transportation Company train accelerated out of control descending a 2.2 percent grade into San Bernardino, California. Two employees were killed and three injured. The accident destroyed seven residences adjacent to the right-of-way, killing two residents and injuring a third. A 14-inch gasoline pipeline which may have been damaged in either the accident or ensuing clean-up, ruptured 13 days later, resulting in the death of two additional residents, serious injuries to two residents, and minor injuries to 16 others. Eleven additional homes were destroyed, along with 21 motor vehicles. Total property damages in the derailment and pipeline rupture exceeded $14 million. While this accident was not preventable through use of a two-way EOT system, exactly the same consequences could result from a loss of control that would be preventable by this technology.

Another example would be the accident that occurred at Helena, Montana, on February 2, 1989, in which freight cars from a Montana Rail Link train rolled eastward down a mountain grade and struck a helper locomotive consist, slightly injuring two crew members. Hazardous materials in the consist included hydrogen peroxide, isopropyl alcohol, and acetone. Release of these hazardous materials later resulted in a fire and explosions, necessitating the evacuation of approximately 3,500 residents of Helena for over two days. According to the National Transportation Safety Board, railroad and other property damage exceeded $6 million, and all of the buildings of Carroll College sustained damage. The City of Helena received 154 reports of property damage from residents within a three-mile radius of the accident. As a result of this accident, the Board recommended that FRA ''require the use of two-way end-of-train telemetry devices on all cabooseless trains for the safety of railroad operations.'' (NTSB Report RAR–89/05 at 19–20, 76.) Although in FRA's judgment it is unlikely that the Helena accident would, in fact, have been prevented by a two-way EOT system due to the prior gradual leakage of brake pipe pressure from the train line, other potential accidents with similar or even more serious consequences certainly could be prevented.

Consequently, based on the potential for catastrophic results of an accident of this type, FRA cannot make the finding that a less restrictive rule would be consistent with safety. A train without the ability to properly control its speed and stop due to brake problems represents an unacceptable risk to tolerate, given the availability of relatively inexpensive and highly reliable technology that can greatly reduce or even eliminate that risk. Existing types of automatic train brakes generally fail safe, but not when there is an obstruction of the train line. As noted above, train line obstructions are known to occur. The technology mandated by this rule addresses this need, and use of the technology will provide a high level of confidence that the failure mode will not permit a catastrophe. That is, it is not necessary to speculate regarding the

existence of an unacceptable hazard nor the effectiveness of the countermeasure. As affirmed by the 1992 congressional mandate, it would be irresponsible public policy to withhold action until the occurrence of an accident or accidents of sufficient magnitude to permit completion of an economic analysis showing a positive benefit-to-cost ratio for the primary case.

FRA believes this legislatively mandated rule balances the need to reduce the risk of a truly catastrophic event with the need to minimize costs to freight railroad operations. FRA has not been able to identify additional exceptions to the requirement for two-way EOTs that could be considered to be consistent with safety, given the hazard addressed by the statutory mandate and the realities of railroad operations.

Regulatory Flexibility Act

The Regulatory Flexibility Act of 1980 (5 U.S.C. 601 *et seq.*) requires an assessment of the impacts of proposed rules on small entities, unless the Secretary certifies that the rule will not have a significant economic impact on a substantial number of small entities.

The Small Business Administration (SBA) uses an industry wide definition of small business based on employment. Railroads are considered small by SBA definition if they employ fewer than 1,500 people. FRA typically employs the classification system of the Surface Transportation Board (STB), which is based on operating revenue, where a Class II railroad has operating revenue greater or equal to $40 million dollars but less than $253.7 million and a Class III railroad has operating revenue below $39 million. This proposed rule affects many of the larger regional railroads and some of the larger short line railroads (i.e, Class II and III railroads). After consulting with the Office of Advocacy of the SBA, the STB/FRA classification system was used in this analysis.

Most short line railroads (Class III) will not be required to purchase or use two-way EOTs, and thus, will not be affected by the provisions of this final rule. The American Short Line Railroad Association (ASLRA), an organization that represents short line railroads, submitted comments to FRA Docket No. PB–9 subsequent to the public regulatory conference conducted in March of 1996 which referenced the results of a survey they had conducted of their member railroads. Their survey results indicated that out of a total of 287 railroads that responded to the survey, only 32 railroads operate at speeds in excess of 30 mph and only 21 of the railroads operate in heavy grades of two percent over two miles. Of the 21 railroads operating in these heavy grades 17 of them operate trains with an average tonnage of less than 4,000 trailing tons. The ASLRA recommended that lower tonnage trains be excluded from any definition of heavy grade. After reviewing the accident data, FRA has adopted a definition of heavy grade based on a two-tier approach which permits trains operating with 4,000 trailing tons or less to operate over certain heavy grades (less than 2% over 2 miles) without being equipped with a two-way EOT.

Although the ASLRA did not have an opportunity to comment on the definition of heavy grade for heavier trains, conversations with ASLRA representatives and FRA track experts indicate that between 50 and 70 percent of short line railroads operate trains in territory where an average grade of one percent over three miles would be encountered. However, most of these railroads do not operate at speeds greater than 30 mph, nor do they have average train tonnage in excess of 4,000 trailing tons. It is believed that the rule will primarily impact only those short line railroads which operate in heavy grades of two percent or greater over a distance of two miles. The ASLRA estimated that its member railroads would need to acquire approximately 1,100 two-way EOTs to comply the proposal submitted by the AAR. In the regulatory impact analysis FRA estimated the number of devices required by short line railroads to be 1,146 in order to comply with the final rule.

In reviewing the economic impact of the rule, FRA has concluded that it will have a small economic impact on small entities. Therefore, it is certified that this rule will not have a significant economic impact on a substantial number of small entities under the provisions of the Regulatory Flexibility Act.

FRA has prepared a regulatory flexibility assessment addressing the impact of the final rule on small entities. The regulatory flexibility assessment has been placed in the docket and is available for public inspection and coping during normal business hours in on the Seventh Floor, Office of Chief Counsel, FRA, 1120 Vermont Avenue, N.W., Washington, D.C. Copies may also be obtained by submitting a written request to the FRA Docket Clerk at Room 8201, 400 Seventh Street, S.W., Washington, D.C. 20590.

Paperwork Reduction Act

This final rule contains information collection requirements. Because the policy of the Federal Government is to minimize the regulatory record keeping burden placed on private industry, a separate analysis of the record keeping burden resulting from the final rule was performed.

FRA will submit these information collection requirements to the Office of Management and Budget (OMB) for approval under the provisions of the Paperwork Reduction Act of 1980, 44 U.S.C. 3501 *et seq.* Persons desiring to comment regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, should submit their views in writing to: Ms. Gloria Swanson, Office of Safety, RRS–21, Federal Railroad Administration, 400 Seventh Street, S.W., Room 8314, Washington, D.C. 20590; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, ATTN: Desk Officer for FRA (OMB No. 2130-New), New Executive Office Building, 726 Jackson Place, N.W., Room 3201, Washington, D.C. 20503. Copies of any such comments should also be submitted to the Docket Clerk, Office of Chief Counsel, Federal Railroad Administration, 400 Seventh Street, S.W., Room 8201, Washington, D.C. 20590.

OMB is required to make a decision concerning the collection of information requirements contained in this final rule between 30 and 60 days after publication of this document in the Federal Register. Therefore, a comment to OMB is best assured of having its full effect if OMB receives it within 30 days of publication.

FRA cannot impose a penalty on persons for violating information collection requirements when they do not display a current OMB control number, if required. FRA intends to obtain current OMB control numbers for any new or revised information collection requirements resulting from this rulemaking action prior to the effective date of this final rule. The OMB control number, when assigned, will be announced by separate notice in the Federal Register.

Environmental Impact

FRA has evaluated this final rule in accordance with its procedures for ensuring full consideration of the environmental impact of FRA actions, as required by the National Environmental Policy Act (42 U.S.C. 4321 *et seq.*), other environmental statutes, Executive Orders, and DOT Order 5610.1c. It has been determined that this final rule will not have any effect on the quality of the environment.

Federalism Implications

This final rule will not have a substantial effect on the States, on the relationship between the national government on the States, or on the distribution of power and responsibilities among the various levels of government. Thus, in accordance with Executive Order 12612, preparation of a Federalism Assessment is not warranted.

List of Subjects

49 CFR Part 232

Railroad safety, Railroad power brakes, Two-way end-of-train devices.

The Rule

In consideration of the foregoing, FRA amends chapter II, subtitle B of title 49, Code of Federal Regulations as follows:

PART 232—RAILROAD POWER BRAKES AND DRAWBARS

1. The authority citation for part 232 is revised to read as follows:

Authority: 49 U.S.C. 20102, 20103, 20107, 20108, 20110-20112, 20114, 20133, 20301–20304, 20701–20703, 21301, 21302, 21304, and 21311; Pub. L. 103–272 (1994); and 49 CFR 1.49 (c), (g), and (m).

2. Section 232.19 is amended by removing paragraph (h), by revising the section heading and by revising paragraph (a) to read as follows:

§232.19 Design standards for one-way end-of-train devices.

(a) A one-way 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 unit (front unit) located in the cab of the locomotive controlling the train.

* * * * *

3. Sections 232.21, 232.23, and 232.25 are added to read as follows:

§232.21 Design and performance standards for two-way end-of-train devices.

Two-way end-of-train devices shall be designed and perform with the features applicable to one-way end-of-train devices described in §232.19, except those included in §232.19(b)(3). In addition, a two-way end-of-train device shall be designed and perform with the following features:

(a) An emergency brake application command from the front unit of the device shall activate the emergency air valve at the rear of the train within one second.

(b) The rear unit of the device shall send an acknowledgment message to the front unit immediately upon receipt of an emergency brake application command. The front unit shall listen for this acknowledgment and repeat the brake application command if the acknowledgment is not correctly received.

(c) The rear unit, on receipt of a properly coded command, shall open a valve in the brake line and hold it open for a minimum of 15 seconds. This opening of the valve shall cause the brake line to vent to the exterior.

(d) The valve opening and hose shall have a minimum diameter of ¾ inch to effect an emergency brake application.

(e) The front unit shall have a manually operated switch which, when activated, shall initiate an emergency brake transmission command to the rear unit. The switch shall be labeled ''Emergency'' and shall be protected so that there will exist no possibility of accidental activation.

(f) The availability of the front-to-rear communications link shall be checked automatically at least every 10 minutes.

(g) Means shall be provided to confirm the availability and proper functioning of the emergency valve.

(h) Means shall be provided to arm the front and rear units to ensure the rear unit responds to an emergency command only from a properly associated front unit.

§232.23 Operations requiring use of two-way end-of-train devices; prohibition on purchase of nonconforming devices.

(a) The following definitions are intended solely for the purpose of identifying those operations subject to the requirements for the use of two-way end-of-train devices.

(1) *Heavy grade* means:

(i) For a train operating with 4,000 trailing tons or less, a section of track with an average grade of two percent or greater over a distance of two continuous miles; and

(ii) For a train operating with greater than 4,000 trailing tons, a section of track with an average grade of one percent or greater over a distance of three continuous miles.

(2) *Train* means one or more locomotives coupled with one or more rail cars, except during switching operations or where the operation is that of classifying cars within a railroad yard for the purpose of making or breaking up trains.

(3) *Local train* means a train assigned to perform switching en route which operates with 4,000 trailing tons or less and travels between a point of origin and a point of final destination, for a distance that is no greater than that which can normally be operated by a single crew in a single tour of duty.

(4) *Work train* means a non-revenue service train of 4,000 trailing tons or less used for the administration and upkeep service of the railroad.

(5) *Trailing tons* means the sum of the gross weights—expressed in tons—of the cars and the locomotives in a train that are not providing propelling power to the train.

(b) All trains not specifically excepted in paragraph (e) of this section shall be equipped with and shall use either a two-way end-of-train device meeting the design and performance requirements contained in § 232.21 or a device using an alternative technology to perform the same function.

(c) Each newly manufactured end-of-train device purchased by a railroad after (one year from date of publication) shall be a two-way end-of-train device meeting the design and performance requirements contained in § 232.21 or a device using an alternative technology to perform the same function.

(d) Each two-way end-of-train device purchased by any person prior to promulgation of these regulations shall be deemed to meet the design and performance requirements contained in § 232.21.

(e) The following types of trains are excepted from the requirement for the use of a two-way end-of-train device:

(1) Trains with a locomotive capable of making an emergency brake application, through a command effected by telemetry or by a crew member in radio contact with the lead (controlling) locomotive, located in the rear third of the train length;

(2) Trains operating in the push mode with the ability to effectuate an emergency brake application from the rear of the train;

(3) Trains with an operational caboose placed at the rear of the train, carrying one or more crew members, that is equipped with an emergency brake valve;

(4) Trains operating with a secondary, fully independent braking system capable of safely stopping the train in the event of failure of the primary system;

(5) Trains that do not operate over heavy grades and do not exceed 30 mph;

(6) Local trains as defined in paragraph (a)(3) of this section that do not operate over heavy grades;

(7) Work trains as defined in paragraph (a)(4) of this section that do not operate over heavy grades;

(8) Trains that operate exclusively on track that is not part of the general railroad system; and

(9) Passenger trains with emergency brakes.

(f) If a train is required to use a two-way end-of-train device:

(1) That device shall be armed and operable from the time a train departs

from the point where the device is installed until the train reaches its destination.

(2) The rear unit batteries shall be sufficiently charged at the initial terminal or other point where the device is installed and throughout the train's trip to ensure that the end-of train-device will remain operative until the train reaches its destination.

(g) If a two-way end-of-train device or equivalent device fails en route (i.e., is unable to initiate an emergency brake application from the rear of the train due to certain losses of communication or due to other reasons), the speed of the train on which it is installed shall be limited to 30 mph until the ability of the device to initiate an emergency brake application from the rear of the train is restored. This limitation shall apply to a train using any device that uses an alternative technology to serve the purpose of a two-way end-of-train device. With regard to two-way end-of-train devices, a loss of communication between the front and rear units will be considered an en route failure only if the loss of communication is for a period greater than 16 minutes and 30 seconds.

(1) If a two-way end-of-train device fails en route, the train on which it is installed, in addition to observing the 30-mph speed limitation, shall not operate over a section of track with an average grade of two percent or greater over a distance of two continuous miles, unless one of the following alternative measures is provided:

(i) Use of an occupied helper locomotive at the end of the train. This alternative may be used only if the following requirements are met:

(A) The helper locomotive engineer will initiate and maintain two-way voice radio communication with the engineer on the head end of the train; this contact shall be verified just prior to passing the crest the grade.

(B) If there is a loss of communication prior to passing the crest of the grade, the helper locomotive engineer and the head-end engineer shall act immediately to stop the train until voice communication is resumed, if this can be done safely.

(C) If there is a loss of communication once the descent has begun, the helper locomotive engineer and the head-end engineer shall act to stop the train if the train has reached a predetermined rate of speed that indicates the need for emergency braking.

(D) The brake pipe of the helper locomotive shall be connected and cut into the train line and tested to ensure operation.

(ii) Use of an occupied caboose at the end of the train with a tested, functioning brake valve capable of initiating an emergency brake application from the caboose. This alternative may be used only if the train service employee in the caboose and the engineer on the head end of the train establish and maintain two-way voice radio communication and respond appropriately to the loss of such communication in the same manner as prescribed for helper locomotives in paragraph (g)(1)(i) of this section.

(iii) Use of a radio-controlled locomotive in the rear third of the train under continuous control of the engineer in the head end by means of telemetry, but only if such radio-controlled locomotive is capable of initiating an emergency application on command from the lead (controlling) locomotive.

§ 232.25 Inspection and testing of end-of-train devices.

(a) After each installation of either the front or rear unit of an end-of-train device, or both, on a train and before the train departs, the railroad shall determine that the identification code entered into the front unit is identical to the unique identification code on the rear-of-train unit.

(b) After each installation of either the front or rear unit of an end-of-train device, or both, the functional capability of the device shall be determined, 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 a properly calibrated air gauge. The end-of-train device shall not be used if the difference between the two readings exceeds three pounds per square inch.

(c) A two-way end-of-train device shall be tested at the initial terminal or other point of installation to ensure that the device is capable of initiating an emergency power brake application from the rear of the train. If this test is conducted by a person other than a member of the train crew, the locomotive engineer shall be informed that the test was performed.

(d) The telemetry equipment shall be calibrated for accuracy according to the manufacturer's specifications at least every 365 days. The date of the last calibration, the location where the calibration was made, and the name of the person doing the calibration shall be legibly displayed on a weather-resistant sticker or other marking device affixed to the outside of both the front unit and the rear unit.

4. Appendix A to Part 232—''Schedule of Civil Penalties'' is amended by removing the entry for § 232.19(h) and by adding entries for §§ 232.21, 232.23, and 232.25 to read as follows:

Appendix A to Part 232—Schedule of Civil Penalties

* * * * *

Section	Violation	Willful violation
* * * * * * *		
232.21 Two-way EOTs:		
(a)-(h) Design Standards	2,500	5,000
232.23 Operating Standards:		
(b) Failure to equip	5,000	7,500
(c) Purchases	2,500	5,000
(f)(1) Device not armed or operable	5,000	7,500
(2) Insufficient battery charge	2,500	5,000
(g) En route failures	5,000	7,500
232.25 Inspection and Testing:		
(a) Unique code	2,500	5,000
(b) Comparing values	2,500	5,000
(c) Test of emergency capability	5,000	7,500
(d) Calibration	2,500	5,000

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S. Mark Lindsey,

Acting Administrator.

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