

**DEPARTMENT OF TRANSPORTATION****Federal Railroad Administration****49 CFR Parts 227 and 229**

[Docket No. FRA 2002–12357, Notice No. 1]

RIN 2130–AB56

**Occupational Noise Exposure for Railroad Operating Employees**

**AGENCY:** Federal Railroad Administration (FRA), Department of Transportation (DOT).

**ACTION:** Notice of proposed rulemaking (NPRM).

**SUMMARY:** FRA is proposing to amend its occupational noise standards for railroad employees whose predominant noise exposure occurs in the locomotive cab. FRA's existing standard (issued in 1980) limits cab employee noise exposure to certain levels based on the duration of their exposure. This proposed rule modifies that standard and also sets out additional requirements.

The NPRM proposes to require railroads to conduct noise monitoring and to implement a hearing conservation program for railroad operating employees whose noise exposure equals or exceeds an 8-hour time-weighted average of 85 decibels. The NPRM also proposes design, build, and maintenance standards for new locomotives and maintenance requirements for existing locomotives. FRA expects that this proposed rule will reduce the likelihood of noise-induced hearing loss for railroad operating employees.

**DATES:** (1) *Written Comments:* Written comments must be received on or before September 21, 2004. Comments received after that date will be considered to the extent possible without incurring additional expense or delay.

(2) *Public Hearing:* Requests for a public hearing must be in writing and must be submitted to the Department of Transportation Docket Management System at the address below on or before August 9, 2004. If a public hearing is requested and scheduled, FRA will announce the date, location, and additional details concerning the hearing by separate notice in the **Federal Register**.

**ADDRESSES:** You may submit comments (identified by DOT DMS Docket Number FRA–2002–12357) by any of the following methods:

• Web site: <http://dms.dot.gov>. Follow the instructions for submitting

comments on the DOT electronic docket site.

• Fax: 202–493–2251.  
• Mail: Docket Management Facility; U.S. Department of Transportation, 400 Seventh Street, SW., Nassif Building, Room PL–401, Washington, DC 20590–001.

• Hand Delivery: Room PL–401 on the plaza level of the Nassif Building, 400 Seventh Street, SW., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

• Federal eRulemaking Portal: Go to <http://www.regulations.gov>. Follow the online instructions for submitting comments.

*Instructions:* All submissions must include the agency name and docket number or Regulatory Identification Number (RIN) for this rulemaking. Note that all comments received will be posted without change to <http://dms.dot.gov>, including any personal information provided. Please see the Privacy Act heading under Regulatory Notices.

*Docket:* For access to the docket to read background documents or comments received, go to <http://dms.dot.gov> at any time or to Room PL–401 on the plaza level of the Nassif Building, 400 Seventh Street, SW., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

**FOR FURTHER INFORMATION CONTACT:** Jeffrey Horn, Economist, Office of Safety, Federal Railroad Administration, 1120 Vermont Avenue, NW., Mail Stop 25, Washington, DC 20590 (em-mail: [Jeffrey.Horn@fra.dot.gov](mailto:Jeffrey.Horn@fra.dot.gov) and telephone: 202–493–6283); or Christina McDonald, Trial Attorney, Office of Chief Counsel, Federal Railroad Administration, 1120 Vermont Avenue, NW., Mail Stop 10, Washington, DC 20590 (e-mail: [Christina.McDonald@fra.dot.gov](mailto:Christina.McDonald@fra.dot.gov) and telephone: 202–493–6032).

**SUPPLEMENTARY INFORMATION:** Note that for brevity, all references to CFR parts will be to parts in 49 CFR, unless otherwise noted.

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**I. Statutory and Regulatory Framework****A. Railroad Safety, in General**

FRA has broad statutory authority to regulate railroad safety. The Locomotive Inspection Act (“LIA”) (formerly 45 U.S.C. 22–34, now 49 U.S.C. 20701–20703) was enacted in 1911. It prohibits the use of unsafe locomotives and authorizes FRA to issue standards for locomotive maintenance and testing. In order to further FRA's ability to respond effectively to contemporary safety problems and hazards as they arise in the railroad industry, Congress enacted the Federal Railroad Safety Act of 1970 (“Safety Act”) (formerly 45 U.S.C. 421, 431 *et seq.*, now found primarily in chapter 201 of Title 49). The Safety Act grants the Secretary of Transportation rulemaking authority over all areas of railroad safety (49 U.S.C. 20103(a)) and confers all powers necessary to detect and penalize violations of any rail safety law. This authority was subsequently delegated to the FRA Administrator (49 CFR 1.49). (Until July 5, 1994, the Federal railroad safety statutes existed as separate acts found primarily in Title 45 of the United States Code. On that date, all of the acts were repealed, and their provisions were recodified into Title 49.)

The term “railroad” is defined in the Safety Act to include:

All forms of non-highway ground transportation that runs on rails or electromagnetic guideways, \* \* \* other than rapid transit operations within an urban area that are not connected to the general railroad system of transportation.

This definition makes clear that FRA has jurisdiction over (1) rapid transit operations within an urban area that are connected to the general railroad system of transportation, and (2) all freight, intercity, passenger, and commuter rail passenger operations regardless of their connection to the general railroad system of transportation or their status as a common carrier engaged in interstate commerce. FRA has issued a policy statement describing how it determines whether particular rail passenger operations are subject to FRA's jurisdiction (65 FR 42529 (July 2, 2000)). The policy statement is located in Appendix A to parts 209 and 211.

Pursuant to its statutory authority, FRA promulgates and enforces a comprehensive regulatory program to address railroad track, signal systems, railroad communications, rolling stock, rear-end marking devices, safety glazing, railroad accident/incident reporting, locational requirements for dispatching of U.S. rail operations, safety integration plans governing railroad consolidations, merger and acquisitions of control, operating practices, passenger train emergency preparedness, alcohol and drug testing, locomotive engineer certification, and workplace safety. In the area of workplace safety, the agency has issued a variety of standards designed to protect the health and safety of railroad employees. For instance, FRA requires ladders and handholds to be installed on rail equipment in order to prevent employee falls (part 231). FRA requires locomotive cab floors and passageways to remain clear of debris and oil in order to prevent employee slips, trips, and falls (§ 229.119). FRA requires blue signal protection in order to protect employees working on railroad equipment from injuries due to the unexpected movement of the equipment (part 218). FRA has rules that provide for the protection of railroad employees working on or near railroad tracks in order to decrease the risk of employees falling from railroad bridges and of being struck by moving trains (part 214).

#### B. FRA-OSHA Jurisdiction for Occupational Safety and Health Issues

FRA and the U.S. Occupational Safety and Health Administration<sup>1</sup> (OSHA) have a complementary relationship and overlapping jurisdiction with respect to occupational safety and health issues in the railroad industry. OSHA regulates

conditions and hazards affecting the health and safety of employees in the workplace. OSHA's jurisdiction extends to all types of employment, except where another Federal agency exercises statutory authority and displaces OSHA pursuant to section 4(b)(1) of the Occupational Safety and Health Act of 1970.<sup>2</sup> Section 4(b)(1) permits Federal agencies to oust OSHA's regulatory and enforcement authority where that agency pronounces its own regulations or standards or articulates a formal position that a particular working condition should go unregulated.

In 1978, FRA issued a Statement of Policy setting out the respective areas of jurisdiction between FRA and OSHA in the railroad industry.<sup>3</sup> In that Policy Statement, FRA drew the jurisdictional line between "occupational safety and health" issues in the railroad industry and work related to "railroad operations," with FRA exercising authority over railroad operations and OSHA over occupational safety and health issues. Further, the Policy Statement pointed to FRA's "proper role" as concentrating its "limited resources in addressing hazardous working conditions in those traditional areas of railroad operations" (*i.e.*, movement of equipment over the rails") in which FRA has special competence and expertise. (43 FR 10585). Often, railroad working conditions are so unique that a regulatory body other than FRA would not possess the requisite expertise to determine appropriate safety standards.

As a general rule, FRA exercises its statutory jurisdiction over railroad employee working conditions where employees are engaged in duties that are intrinsic to "railroad operations," where the identical conditions generally do not occur in typical industrial settings, and where the hazard falls within the scope of FRA's expertise. Historically, the concept of "railroad safety" has included the health and safety of employees when they are engaged in railroad operations. In its 1978 Statement concerning employee workplace safety, FRA stated:

The term 'safety' includes health-related aspects of railroad safety to the extent such considerations are integrally related to operational safety hazards or measures taken to abate such hazards. 43 FR 10585.

Hazards that impact the health of railroad employees engaged in railroad

operations may also result in adverse impacts on railroad safety, and so there is often a clear nexus between railroad safety and employee health. An example of this jurisdiction is seen in FRA's issuance of locomotive sanitation standards.<sup>4</sup> There, FRA promulgated regulations that address toilet and washing facilities for employees who work in locomotive cabs. 49 CFR 229.137-139.

FRA has also exercised this jurisdiction with regard to occupational noise in the locomotive cab. FRA issued its current standard for locomotive standard in 1980. While OSHA, in general, regulates occupational noise in the workplace,<sup>5</sup> FRA is the more appropriate entity to regulate noise in the locomotive cab, because the locomotive cab is so much a part of "railroad operations." With respect to noise in the locomotive cab, FRA wrote, in its Policy Statement, that:

FRA views the question of occupational noise exposure of employees engaged in railroad operations, during their involvement in such operations, as a matter comprehended by the regulatory fields over which FRA has exercised its statutory jurisdiction. FRA is therefore responsible for determining what exposure levels are permissible, what further regulatory steps may be necessary in this area, if any, and what remedial measures are feasible when evaluated in light of overall safety considerations. 43 FR 10588.

#### C. Federal Occupational Noise Standards

OSHA's occupational noise standard was promulgated under the Walsh-Healey Public Contracts Act of 1969<sup>6</sup> for the purpose of protecting employees from workplace exposure to damaging noise levels. The Walsh-Healey Act contained very limited provisions. Its noise standard allowed for a permissible exposure level of 90 dB(A), a 5 dB exchange rate, and a 90 dB(A) threshold. Pursuant to section 6(a) of the OSH Act, OSHA adopted the Walsh-Healey standard.

In January 1981, OSHA promulgated a Hearing Conservation Amendment to its occupational noise exposure standard. The amendment consisted of requirements for noise measurements, audiometric testing, the use and care of hearing protectors, employee training, employee education, and recordkeeping. See 46 FR 4078 (1981). Portions of the amendment were subsequently stayed for reconsideration and clarification. In 1983, OSHA finalized the provisions of

<sup>1</sup> OSHA is an agency within the U.S. Department of Labor. Congress created OSHA with the Occupational Safety and Health Act of 1970 ("OSH Act"). Pursuant to the OSH Act, employers have a duty to protect workers from all kinds of hazards, including noise.

<sup>2</sup> See 29 U.S.C. 653(b)(1). This section provides:

Nothing in this Act shall apply to the working conditions of employees with respect to which other Federal agencies \* \* \* exercise statutory authority to prescribe or enforce standards or regulations affecting occupational safety or health.

<sup>3</sup> See 43 FR 10583 (March 14, 1978).

<sup>4</sup> See 67 FR 16032 (April 4, 2002).

<sup>5</sup> See 29 CFR 1910.95 and 29 CFR 1926.52 ("Occupational Noise Exposure").

<sup>6</sup> 41 U.S.C. 35, *et seq.*

its Hearing Conservation Amendment by revoking various stayed provisions, lifting the stay on other provisions, and making other technical corrections. OSHA's revised regulation included a detailed hearing conservation program. See 48 FR 9738 (1983). OSHA's occupational noise standard applies, for the most part, to all industry engaged in interstate commerce.<sup>7</sup> OSHA's noise standard can be found at 29 CFR 1910.95. As will be discussed in subsequent sections, FRA's proposed standard is quite similar to OSHA's standard.

While OSHA is the primary regulator of noise in the workplace, other federal agencies regulate specific occupational settings. FRA regulates the occupational noise exposure of railroad operating employees in the locomotive cab. The U.S. Air Force regulates the noise environment of Air Force personnel.<sup>8</sup> The Mine Safety and Health Administration (MSHA) regulates the occupational noise exposure of miners.

In 1999, MSHA issued a comprehensive rule that establishes uniform requirements for all miners.<sup>9</sup> In that rule, MSHA adopted a permissible exposure level of 90 dB(A) as an 8-hour TWA. MSHA also requires employers to use all feasible engineering and administrative controls in order to reduce a miner's noise exposure to the permissible exposure level. Where a mine operator is unable to reduce the noise exposure to the permissible level, the mine operator must provide the miner with hearing protectors (HP) and is required to ensure that the miner uses them. In addition, where a miner is exposed at or above a TWA of 85 dB(A), the employer must place the miner in a hearing conservation program. The program must include exposure monitoring, the use of hearing protectors, audiometric testing, training, and recordkeeping. See 64 FR 49548, 49550 (1999).

## II. History of FRA's Treatment of Occupational Noise

### A. FRA's Noise Standard

In part 229, FRA establishes minimum federal safety standards for locomotives. These regulations prescribe inspection and testing requirements for locomotive

components and systems. They also prescribe minimum locomotive cab safety requirements. In 1980, FRA issued standards for acceptable noise levels aboard a locomotive (§ 229.121).<sup>10</sup>

Section 229.121 was promulgated to protect the hearing and health of cab employees and to facilitate crew communication. It provides that noise level exposure in the cab may not exceed specific prescribed levels. The provision limits employee noise exposure to an eight-hour time-weighted average (TWA) of 90 dB(A) with a doubling rate of 5dB(A). It also provides for an absolute upper noise limit of 115 dB(A). In addition, it establishes procedures for noise testing.

At the time of the promulgation of the rule, there was discussion as to the proposed noise exposure limits. One commenter to the proposed rule took exception to the proposed 90 dB(A) 8-hour time limit and suggested that 85 dB(A) was more appropriate. FRA explained that, in selecting the proposed noise exposure limits, it attempted to "strike a balance between that which is most desirable and that which is feasible."<sup>11</sup> FRA acknowledged that more crew members would be at a lower risk at 85 dB(A), but also acknowledged that there would be problems with the technical feasibility of, and economic impact associated with, an 85 dB(A) requirement. Based on the information available and technology of the time, FRA determined that the 90 dB(A) 8-hour noise exposure limit would "provide adequate protection for the hearing, communication, and comfort of locomotive crews under presently accepted standards."<sup>12</sup>

Section 229.121 does not address hearing conservation for locomotive cab employees, including the use of personal protective equipment, ongoing hearing testing, employee training on the cause and prevention of hearing loss, and periodic noise monitoring in the workplace. These are standard components of an occupational hearing conservation program, and OSHA requires them of other industries.

In 1992, Congress enacted Section 10 of The Rail Safety Enforcement and Review Act (RSERA) (Public Law 102-365, September 3, 1992; codified at 49 U.S.C. 20103, note) in response to concerns raised by employee organizations, Congressional members, and recommendations of the National

Transportation Safety Board (NTSB) concerning crashworthiness of and working conditions in locomotive cabs. Section 10 of RSERA, entitled *Locomotive Crashworthiness and Working Conditions*, required FRA "to consider prescribing regulations to improve the safety and working conditions of locomotive cabs' throughout the railroad industry. In order to determine whether regulations would be necessary, Congress asked FRA to assess "the extent to which environmental, sanitary, and other working conditions in locomotive cabs affect productivity, health, and the safe operation of locomotives."

In response to the Congressional mandate set forth in Section 10 of RSERA, FRA undertook steps to determine the health and safety effects of locomotive cab working conditions. FRA studied a variety of working conditions in locomotive cabs, including sanitation, noise, temperature, air quality, ergonomics, and vibration. FRA prepared the *Locomotive Crashworthiness and Cab Working Conditions Report to Congress* ("Report"), dated September 1996, which outlines the results of these studies. A copy of the Report is included in the docket. With respect to noise, FRA conducted a comprehensive survey, reviewed historical data on noise-related incidents and investigations, and gathered information on hearing protection programs.

### B. Studies on Noise

FRA first considered the sound environment in the locomotive cab in 1971 as part of a study on highway-rail grade crossings.<sup>13</sup> The study examined the visibility and audibility of trains approaching rail and highway grade crossings. An addendum to the study, authored by John Aurelius, examined the sound environment in locomotive cabs.<sup>14</sup> Observing two different test runs made under diverse conditions, Aurelius recorded the sounds inside cabs operating in regular service. Aurelius concluded that the noise level in a typical locomotive cab approached 90 dB(A), which is the limit allowed by the Walsh-Healey Public Contracts Act.<sup>15</sup> Given that conclusion, Aurelius recommended that a more detailed survey be conducted to determine whether the exposures exceeded the

<sup>7</sup> OSHA has a general exclusion for the agriculture industry. See 29 CFR 1928.21(b). OSHA exempts oil and gas well drilling and servicing operations in its Hearing Conservation Amendment. See 29 CFR 1910.95(o). OSHA has a separate occupational noise regulation that applies to the construction industry. See 29 CFR 1926.52.

<sup>8</sup> See Air Force Occupational Safety and Health Standard 48-20, "Hearing Conservation Program."

<sup>9</sup> See 64 FR 49548 (September 13, 1999).

<sup>10</sup> For the Final Rule, see 45 FR 21092, 21105 and 21117 (March 31, 1980). For the Notice of Proposed Rulemaking, see 44 FR 29604, 29618 and 29627 (May 21, 1979).

<sup>11</sup> 45 FR 21092, 21106 (March 31, 1980).

<sup>12</sup> 45 FR 21092, 21106 (March 31, 1980).

<sup>13</sup> John Aurelius and Norman Korebor, "The Visibility and Audibility of Trains Approaching Rail—Highway Grade Crossings," Report No. FRA-RP-71-2, May 1971.

<sup>14</sup> John P. Aurelius, "The Sound Environment in Locomotive Cabs," Report No. FRA-RP-71-2A, July 1971.

<sup>15</sup> See 41 U.S.C. 35.

legal limits and if so, under what conditions.

In 1980, Roger Kilmer, under the auspices of the National Bureau of Standards, conducted an extensive study on the noise environment in locomotive cabs.<sup>16</sup> Kilmer selected eighteen test runs that covered a wide range of operational conditions, trip lengths, and geographical conditions. In general, Kilmer concluded that “based on the group of locomotives tested, it does not appear that overexposure to noise is a widespread problem for locomotive crews under the current OSHA standard.”<sup>17</sup> Kilmer explained that noise exposure was within acceptable limits for two reasons: (1) locomotives operate in such a way that the sources which generate high sound levels (*i.e.*, horn and brakes) operate for only short periods of time, and (2) locomotives spend a great deal of time in idle, which involves sound levels below 90 dB. However, the report also recognized that overexposure can, and does, occur. The report explained that the level of overexposure depends on the type of locomotive and the nature of the run. The next step, according to Kilmer, was to determine the type of monitoring that should be used to identify the cases where overexposure may occur. Kilmer advocated a simplified test procedure to screen locomotives.

#### C. FRA's Report to Congress

FRA conducted an extensive noise survey of actual noise levels in locomotive cabs. The survey sought to determine whether cab working conditions impaired a crew's ability to safely operate a locomotive. FRA field inspectors traveled aboard locomotives while the crew operated the locomotive in a “normal” fashion (*i.e.*, as though FRA personnel were not present). The inspectors measured cab noise with a Metrosonics Db-3100 Metrologger. The inspectors conducted a total of 350 noise measurements, all between 1992 and 1994. FRA had intended to run the noise tests over 8-hour time periods, but that was not possible due to the varying lengths of the train routes. Tests performed on the eastern routes tended to be shorter in length, and tests on the western routes tended to be longer in length. The noise tests were run, on average, for approximately 6.5 hours.

The 350 measurements included 234 measurements from winter/summer tests and 116 measurements evaluated

in response to inquiries and complaints. Both the complaint-based investigations and the hot summer tests (often conducted with windows open) represent railroad operations that are more likely to present unacceptable noise environments. As a result, the Report pointed out that measurements used in this survey did not constitute a random sample of locomotives or locomotive operating conditions. The Report directed the reader to exercise caution in characterizing the significance of the findings.

FRA inspectors identified several factors as major contributors to high average cab noise levels and to significant peak readings of 95 dB(A) or higher. Those major contributors were: radios; audible warning devices; diesel engines; tunnels, sheds, and bridges; close embankments; open windows; dynamic braking; loose cab sheet metal; loose side windows; and miscellaneous loose and/or poorly fitted cab equipment. While collecting the survey data, inspectors also noted the use of hearing protection by train crews. FRA observed that, in most cases, crews wore hearing protection in noise environments that exceeded the FRA standard.

FRA reviewed several sources of data and information in the Report. FRA reviewed historical data for noise-related incidents and investigations. Using its accident/incident database, FRA compiled data on locomotive cab member injuries and illnesses attributable to excessive noise levels. Railroads had reported no incidents prior to 1992, 23 incidents in 1992, and 18 incidents in 1993. FRA also reviewed complaints of alleged noise violations received by FRA from crew members or their labor organizations. In addition, FRA gathered information on the hearing conservation programs of several Class I railroads by contacting the railroads' industrial hygienists. All railroads stated that they had comprehensive hearing conservation programs, that they were conducting audiometric exams, and that they were providing hearing conservation training to both locomotive crews and ground crews that work in excessively noisy areas. Finally, FRA described the changing working conditions in the railroad industry, *i.e.*, the various measures that had been taken to reduce the effects of noise in the cab. These steps included the introduction of new locomotives with advanced sound reduction technology, as well as the establishment of hearing conservation programs and the extensive use of personal protective equipment.

Based on its findings, FRA concluded, among other things, that certain locomotive crew assignments expose crews to increased noise levels, thereby raising concerns of possible hearing loss and of impaired communication. FRA also concluded that many factors, including the sounding of the horn, engine noise, and radio volume, contribute to noise levels that are equal to or exceed 85 dB(A) for a group of locomotive assignments. In addition, FRA noted that human factors literature suggests that excessive noise levels can impair mental processes, increase fatigue, and increase the number of errors, while simultaneously decreasing vigilance.

FRA then recommended several measures that, if implemented, might reduce the exposure of operating crews to excessive noise levels. After noting that several railroads have hearing conservation programs and that FRA's current noise regulation lacks a hearing conservation approach, FRA encouraged railroads without such programs to seriously consider the development and implementation of such programs. In addition, FRA stated that railroads should evaluate the use of sound-insulated headsets with microphones in order to provide hearing protection, to help ensure effective radio communications, and to facilitate intra-crew communication.<sup>18</sup> FRA also recommended that railroads implement several administrative and engineering controls (*i.e.*, measures that reduce noise levels and minimize noise exposure in locomotive cabs).

#### D. Wyle Report

The American Association of Railroads (AAR) commissioned Wyle Laboratories to review the noise and vibration sections of FRA's Report to Congress, as well as the 350 in-cab locomotive noise measurements referenced in the Report. In December 1996, Wyle Laboratories produced a Report entitled “A Review of the Noise and Vibration Sections of the Federal Railroad Administration's Report to Congress Entitled ‘Locomotive Crashworthiness and Cab Working Conditions’” (“Wyle Report.”)<sup>19</sup> A copy of the Wyle Report is included in the docket. The Wyle Report reviewed Chapter 6 “Locomotive Cab Noise” and Chapter 10 “Other Factors Affecting Locomotive Cab Working Conditions” of FRA's Report but focused most of its comments on Chapter 6. The Wyle

<sup>16</sup> Roger D. Kilmer, “Assessment of Locomotive Crew In-Cab Occupational Noise Exposure,” National Bureau of Standards. Report No. FRA-ORD-80/91, December 1980.

<sup>17</sup> Kilmer at 113-114.

<sup>18</sup> See 227.115(d) and accompanying preamble language for a further discussion of electronic communication devices.

<sup>19</sup> Wyle Report, WR 96-37, was prepared by Eric Stusnick, Ph.D.

Report acknowledged that FRA's noise measurements were, at that time, the largest set of publicly available locomotive cab noise data and were a valuable resource in analyzing and understanding the in-cab noise environment. The Wyle Report disagreed with the two general conclusions that FRA reached in Chapter 6.

The Wyle Report disagreed with FRA's conclusion that "[a] significant minority of locomotive cabs had noise levels high enough to contribute to long-term hearing loss after long-term repetitive exposure, and in absence of personal protective equipment."<sup>20</sup> It stated that FRA's statistical analyses of locomotive cab noise exposure measurements was flawed for three reasons.<sup>21</sup> First, FRA compared its 8-hour TWA measurements from the Report to Congress with the 12-hour TWA standard that is specified in 49 CFR 229.121. Second, FRA used a definition of noise dose (in its analysis for the Report to Congress) that had no lower sound level threshold, whereas 49 CFR 229.121 provides a definition of noise dose that uses a lower threshold of 87 dB. Third, FRA measured a sample of locomotive trips that was not random and thus not an accurate representation of the total population of trips. The Wyle report concluded that "the result of these errors is that the calculated TWA values are larger than would have been obtained if the proper analysis were done on a properly stratified random-sample of locomotive trips."<sup>22</sup>

The Wyle Report also disagreed with FRA's conclusion that "the noise level in many locomotives was sufficiently high to interfere with normal voice communication."<sup>23</sup> The Wyle Report explained that FRA's assertion was based on its statistical analysis that showed that thirteen percent of the measured TWAs exceeded 88 dB. Earlier in the Report, FRA had identified a sound level of 88 dB as the sustained verbal communication limit. From that, FRA inferred that, where there was a background sound level of 88 dB or more, crew members would need to use a voice sound level equal to or greater than 88 dB (*i.e.*, the maximum that can be sustained to maintain verbal communication) in order to communicate in the cab.

The Wyle Report disagreed with that inference for three reasons. First, the Wyle Report explained that a given TWA does not represent the background

sound level at any given time, because the TWA is an average over a measurement period of all the sound levels that occurred. A measured TWA of 88 dB does not mean that the sound level in the cab was 88 dB for the entire trip; that TWA might result from a few very loud sound levels and from the remainder at sound levels lower than 88 dB—during which the crew could successfully communicate. Second, the Wyle Report asserted that it is not necessary for the speech sound level to be greater than or equal to the background sound level (in order for the speech to be understood), because the ear can distinguish communication from background noise based on its sound level and its frequency content. Third, the Wyle Report asserted that the sound level of radio messages usually contribute a great deal to the TWA value and they are communication. Thus, it is inappropriate to consider sound levels due to radio messages as part of the background noise. In addition, the Wyle Report did note that "voice communication is certainly difficult" when the horn is being sounded or the brake systems are being exhausted.

#### *E. FRA's Follow-Up to the Report to Congress and Wyle Report*

FRA hired a contractor to review FRA's Report to Congress, the accompanying data, and the Wyle Report. In June 1997, consultants with Harris Miller, Miller & Hanson, Inc. prepared a Technical Memorandum "Comments on AAR Review of Chapter 6, FRA Report to Congress 'Locomotive Crashworthiness and Cab Working Conditions.'" A copy of the Technical Memorandum is included in the docket. The Technical Memorandum discussed each of the major points brought up in the AAR's Review (*i.e.*, the Wyle Report).

Harris Miller concluded that although FRA's noise measurements were not part of a random sample and although FRA's analysis was not the most rigorous, the data set used by FRA in the Report to Congress still provided a valuable assessment of the noise levels in locomotive cabs. Harris Miller also concluded that the data supported a "general conclusion that hearing conservation programs are warranted for some locomotive crew assignments." In addition, while acknowledging that the data could not be used to make statistical inferences, Harris Miller explained that the data still did show that "noise inside a small percentage of locomotives exceeds the FRA and

OSHA permissible noise exposure limits."<sup>24</sup>

In the area of voice communication, Harris Miller found that FRA's conclusion that "frequent high in-cab noise levels make speech communication difficult between crew members over two-way radios" was appropriate, even if FRA's analysis of the pertinent data was not rigorous. In addition, Harris Miller stated that the normal background noise level inside locomotive cabs is high enough to make voice communication difficult. Harris Miller further explained that "even accounting for locomotive noise being weighted toward low frequencies, with a background sound level of 88 dBA, crew members will need to shout if they are to be understood by others in the cab." Thus, they concluded that for some locomotive crew assignments, communication could be categorized as "difficult."<sup>25</sup>

#### *F. FRA's Administrator's Roundtable Discussion on Noise*

On April 3, 1997, FRA hosted a roundtable discussion on noise. The transcript from the roundtable discussion is included in the docket. There were 32 participants, including representatives from FRA, other federal agencies, railroads, labor organizations, locomotive manufacturers, and trade associations. The meeting provided an opportunity to discuss the effects of occupational noise exposure on railroad workers and on the industry as a whole. FRA also explained that the roundtable was an opportunity to understand best practices, to exchange information about railroad industry conservation programs, and to learn about educational hearing initiatives.<sup>26</sup>

Several individuals made presentations to the group. A physician provided some historical background on hearing loss.<sup>27</sup> He explained that hearing loss had been "substantially neglected" for years.<sup>28</sup> Then, in the late 1970s, government policy makers realized that the emphasis should be placed on prevention, rather than treatment and care, and that the industry was in a position to educate its workforce and implement preventative measures that produce a healthier workforce. As a result of that sentiment, OSHA wrote and issued its noise regulation.

<sup>24</sup> Technical Memorandum from Hugh J. Saurenman and Lance D. Meister of Harris, Miller, & Hanson (June 18, 1997), 1.

<sup>25</sup> Technical Memorandum at 5.

<sup>26</sup> Transcript at 13-14.

<sup>27</sup> Transcript at 25-29.

<sup>28</sup> Transcript at 26-27.

<sup>20</sup> Wyle Report at 2-1.

<sup>21</sup> Wyle Report at 2-2.

<sup>22</sup> Wyle Report at 2-2.

<sup>23</sup> Wyle Report at 2-12.

A union representative provided some input from the employee's perspective.<sup>29</sup> He explained that conditions on a locomotive can be extremely noisy and that those noisy conditions can lead to pain, discomfort, and bad decisions. He acknowledged that some technological progress has been made on locomotives, but that a difficult situation remained ahead.

A carrier representative spoke about the carrier's perspective and about some of the initiatives that his particular railroad had undertaken.<sup>30</sup> He discussed the elements of a hearing conservation program. He also spoke about his railroad's comprehensive mobile medical service that traveled throughout the country and about his railroad's extensive training program that covers hazard communication in addition to the traditional audiometric testing training. In addition, he mentioned that his railroad uses communication tools, such as newsletters, pamphlets, and daily job briefings, to increase employee awareness about noise issues. Finally, he briefly addressed control measures that his railroad uses, including hearing protection, equipment specifications, and alterations to track equipment.

Next, FRA presented its Report to Congress, summarizing the contents and noting that the Report was now a "launching pad" and "baseline" from which to move forward.<sup>31</sup> In addition, the New York League for the Hard of Hearing spoke to the group.<sup>32</sup> The Executive Director addressed the importance of prevention and treatment of hearing loss. He also stressed the need for programs that educate people about the dangers of excessive noise exposure. The roundtable participants subsequently discussed a wide range of topics, including: the available scientific data related to occupational noise exposure and hearing loss in the railroad industry;<sup>33</sup> the identification of the appropriate noise exposure threshold at which noise adversely affects railroad workers' health and job performance; a review of voluntary noise reduction and conservation programs that industry participants had already implemented;<sup>34</sup> and an assessment of what remained to be done in addressing the noise issue.

Participants generally agreed that exposure to high levels of noise adversely affects workers and the industry; however, participants did not

agree on the threshold level of noise exposure at which these effects occur.<sup>35</sup> One individual asked what the proper damage risk criteria should be and what is safe noise versus unsafe noise.<sup>36</sup> Another individual noted that there is controversy between scientists and regulators as to what level of protection is necessary to protect individuals from hearing loss.<sup>37</sup>

As well, the potential damaging effects of noise on railroad workers arose on several occasions. In addition to noting the obvious damaging effects of noise on railroad workers' hearing abilities, many participants pointed out that there were several other potential damaging effects of noise exposure. One participant noted that it is more than just one's ears that respond to noise; bodies also respond to noise, for example, in the form of hypertension, anxiety, nausea, or other medical ailments.<sup>38</sup> Another participant noted that there had been little discussion about the impact of noise on fatigue.<sup>39</sup> Several participants also noted that they lacked full understanding of the effects of noise on railroad worker job performance.<sup>40</sup>

During the course of the discussions, the participants acknowledged the positive steps taken thus far, that is, that industry participants have implemented many voluntary noise reduction and hearing conservation programs. Participants also acknowledged that there have been technological advances that have led to the manufacture of quieter locomotives.<sup>41</sup> Participants concluded by identifying the need for more current research and data on noise in the rail industry.<sup>42</sup>

### III. The Railroad Safety Advisory Committee (RSAC) Process

#### A. RSAC

In March 1996, FRA established the RSAC, which provides a forum for developing consensus recommendations on rulemakings and other safety program issues. The Committee includes representation from all of the agency's major customer groups, including railroad carriers, labor organizations, suppliers, manufacturers, and other interested parties. A list of member groups follows:

American Association of Private Railroad Car Owners (AARPCO)

American Association of State Highway & Transportation Officials (AASHTO)  
 American Public Transportation Association (APTA)  
 American Short Line and Regional Railroad Association (ASLRRA)  
 American Train Dispatchers Department/BLE (ATDD/BLE)  
 AMTRAK  
 Association of American Railroads  
 Association of Railway Museums (ARM)  
 Association of State Rail Safety Managers (ASRSM)  
 Brotherhood of Locomotive Engineers (BLE)  
 Brotherhood of Maintenance of Way Employees (BMWE)  
 Brotherhood of Railroad Signalmen (BRS)  
 Federal Transit Administration (FTA)\*  
 High Speed Ground Transportation Association  
 Hotel Employees & Restaurant Employees International Union  
 International Association of Machinists and Aerospace Workers  
 International Brotherhood of Boilermakers and Blacksmiths  
 International Brotherhood of Electrical Workers (IBEW)  
 Labor Council for Latin American Advancement (LCLAA)\*  
 League of Railway Industry Women\*  
 National Association of Railroad Passengers (NARP)  
 National Association of Railway Business Women\*  
 National Conference of Firemen & Oilers  
 National Railroad Construction and Maintenance Association  
 National Transportation Safety Board (NTSB)\*  
 Railway Progress Institute (RPI)  
 Safe Travel America  
 Secretaria de Comunicaciones y Transporte\*  
 Sheet Metal Workers International Association (SMWIA)  
 Tourist Railway Association Inc.  
 Transport Canada\*  
 Transport Workers Union of America (TWUA)  
 Transportation Communications International Union/BRC (TCIU/BRC)  
 United Transportation Union (UTU)  
 \*Indicates associate membership.

Where appropriate, FRA assigns a task to the RSAC, and after consideration and debate, the RSAC may accept or reject the task. If the task is accepted, the RSAC establishes a working group that possesses the appropriate expertise and representation of interests to develop recommendations to FRA for action on the task. The working group develops the recommendations by consensus. The working group may establish one or more task forces to

<sup>29</sup> Transcript at 29–33.

<sup>30</sup> Transcript at 33–44.

<sup>31</sup> Transcript at 10, 13, 23, 50–57.

<sup>32</sup> Transcript at 69–82.

<sup>33</sup> Transcript at 92–94.

<sup>34</sup> Transcript at 33, 88–89.

<sup>35</sup> Transcript at 96–97.

<sup>36</sup> Transcript at 111.

<sup>37</sup> Transcript at 42–43.

<sup>38</sup> Transcript at 93.

<sup>39</sup> Transcript at 83.

<sup>40</sup> Transcript at 100–102.

<sup>41</sup> Transcript at 115–118.

<sup>42</sup> Transcript at 98–99.

develop the facts and options on a particular aspect of a given task. The task force reports to the working group. If a working group reaches unanimous consensus on recommendations for action, the working group presents the package to the RSAC for a vote. If a simple majority of the RSAC accepts the proposal, the RSAC formally recommends the proposal to FRA.

FRA then determines what action to take on the recommendation. Because FRA staff has played an active role at the working group level in discussing the issues and options and in drafting the language of the consensus proposal, and because the RSAC recommendation constitutes the consensus of some of the industry's leading experts on a given subject, FRA is often favorably inclined toward the RSAC recommendation.

However, FRA is in no way bound to follow the recommendation, and the agency exercises its independent judgement on whether the recommended rule achieves the agency's regulatory goal, is soundly supported, and is in accordance with policy and legal requirements. Often, FRA varies in some respects from the RSAC recommendation in developing the actual regulatory proposal. If the working group or the RSAC is unable to reach consensus on recommendations for action, FRA moves ahead to resolve the issue through traditional rulemaking proceedings.

On June 24, 1997, FRA presented the subject of locomotive cab working conditions to RSAC. The purpose of this task was defined as follows: "To safeguard the health of locomotive crews and to promote the safe operation of trains." The RSAC accepted this task (No. 97-2) and formed a Locomotive Cab Working Conditions Working Group ("Working Group").

#### B. Working Group

Task 97-2 addressed several issues, one of which was noise exposure. With respect to noise exposure, RSAC asked the Working Group to complete two items: (1) Revise existing cab noise limits to take into account current requirements of the OSHA standard, specifically as it relates to hearing conservation programs, and (2) Continue efforts to evaluate engineering controls and other measures used to minimize noise exposure in locomotive cabs.

The Working Group consisted of representatives of the following organizations, in addition to FRA:

AASHTO  
APTA  
ASLRRRA  
AAR

BLE  
BMWWE\*  
IBEW  
Amtrak  
RPI  
SMWIA  
TWUA  
UTU

\*Indicates associate membership

The Working Group's goal was to produce recommendations for locomotive cab noise exposure standards warranted by an assessment of available information on hearing loss, hearing conservation programs, existing federal standards, and occupational injury data. The Working Group decided that specific expertise would be needed to analyze pertinent information and so it formed the Noise Task Force.

The Noise Task Force, which was established in September 1997, was made up of industrial hygiene, safety, engineering, and medical staff from carriers, labor organizations, and FRA. The Noise Task Force met regularly over a period of several years to discuss several topics, including hearing loss and noise exposure among locomotive cab employees; existing railroad hearing loss prevention programs; OSHA's occupational noise standards; equipment changes and procedures that improve noise levels in the cab; hearing testing and training programs; and noise monitoring.

The Task Force concluded that OSHA's standard for noise was an appropriate framework and starting point for an update and revision to FRA's existing noise regulation. The Task Force also identified several areas where OSHA's regulation might be modified to create a FRA regulation that could better address the occupational noise exposure of the rail industry. The Task Force forwarded these findings to the Working Group.

The Working Group conducted a number of meetings and discussed each of the matters proposed in the NPRM. FRA has placed the minutes of these meetings in the docket for this proceeding. Throughout this preamble, we frequently discuss issues that were raised and views that were expressed at the task force and working group levels. We discuss these points to show the origin of certain important issues and the course of discussion on these issues at the task force and working group levels. FRA believes that this helps illuminate the facts FRA has weighed in making its regulatory decisions and the logic behind those decisions. The reader should keep in mind, of course, that only the full RSAC makes recommendations to FRA, and it is the

consensus recommendation of the full RSAC on which FRA is acting.

The Working Group, using the preliminary findings of the Task Force, developed recommendations for reducing the likelihood of hearing loss for cab employees. The Working Group reached full consensus in June 2003 and forwarded these recommendations to the RSAC. The RSAC accepted these recommendations and on June 27, 2003, the RSAC voted to forward these recommendations to FRA for rulemaking action. In large part, this NPRM incorporates the RSAC's recommendations.

FRA has worked closely with the RSAC in the development of its recommendations and believes that the RSAC effectively addressed occupational noise exposure for cab employees. FRA has greatly benefitted from the open, informed exchange of information that has taken place during meetings. There is general consensus among labor, management, and manufacturers concerning the primary principles FRA sets forth in this NPRM. FRA believes that the expertise possessed by the RSAC representatives enhances the value of the recommendations, and FRA has made every effort to incorporate them in this proposal.

The Working Group will reassemble after the comment period for this NPRM closes and will consider all comments received. Based on any recommendations RSAC receives from the Working Group, RSAC will then be in a position to make recommendations to FRA concerning the development of a final standard.

## IV. Fundamental Principles of Sound

### A. Sound

Sound is a physical phenomenon brought about by oscillations in pressure. Oscillations or vibrations cause pressure changes in a medium, such as air. These pressure changes produce waves that emanate away from the oscillating or vibrating source. If a listener is present, the listener will experience these waves as an auditory sensation. The effect of sound on a listener depends on three physical characteristics of sound: amplitude, frequency, and duration.

The amplitude (*i.e.*, the magnitude or intensity) of the pressure change is measured in sound pressure level (SPL) and is perceived by the listener as loudness. Sound pressure level, which is expressed in decibels (dB), is a logarithmic measure. Because of the logarithmic scale, a small increase in decibels represents a large increase in

sound energy. Technically speaking, each increase of 3 dB represents a doubling of sound energy; an increase of 10 dB represents a tenfold increase in sound energy, and an increase of 20 dB represents a 100-fold increase. Frequency is an objective measurement of the physical number of oscillations in a wave per unit of time. It is expressed in hertz (Hz) and is perceived by listeners as pitch. Duration usually refers to the amount of time per day to which an individual is exposed to noise. Noise exposure durations can be broadly classified into continuous-type noises (*i.e.*, continuing, varying, and intermittent) and impulsive noises (*i.e.*, there is a steep rise in the sound level to a high peak, followed by a rapid decay).

### B. Hearing and Hearing Loss

The ear is the sense organ that detects sound waves and sends those signals to the brain for processing. The human ear has three primary components—outer ear, middle ear, and inner ear. The outer ear directs sound into the ear, the middle ear mechanically transmits the sound waves from the air to the fluid-filled inner ear, and the inner ear changes the sound waves from mechanical energy into nerve impulses. This last process is completed in a small organ known as the cochlea. In the cochlea, sensory cells respond to the mechanical vibrations, change the vibrations into electrical energy, and transmit a message to the brain via the auditory nerve.

Noise is essentially any unwanted or undesirable sound. Exposure to high levels or extended durations of noise can cause hearing loss. Noise-induced hearing loss (NIHL) can be temporary or permanent. Temporary hearing loss, also called a temporary threshold shift, results from short-term exposures to noise; hearing generally returns to its former level after a period of rest. Permanent hearing loss, also called a noise-induced permanent threshold shift, can result from prolonged exposure to high noise levels over an extended period of time. The extent of the damage depends on several factors: the overall decibel level of the sound, the duration of the noise exposure, the frequency spectrum of the noise source, and an individual's personal susceptibility to noise damage.

A noise-induced permanent threshold shift is not reversible and cannot be treated medically. Once it has occurred, the only course of action is to prevent the further progression of hearing loss. Noise-induced hearing loss causes difficulty in interpreting sounds and in perceiving the loudness and pitch of

sounds. Even when sounds are amplified (*e.g.*, with a hearing aid), the sounds may still remain indistinct.

Noise induced hearing loss typically starts with threshold shifts in the higher frequencies. The loss usually appears first at 3000 Hz, 4000 Hz, or 6000 Hz. If damaging noise exposure continues, the loss spreads to the lower frequencies (*i.e.*, between 500 Hz and 3000 Hz.) The human voice ranges from 200 Hz to 4000 Hz, so these frequencies are critical to human conversation. The loss of these frequencies is detrimental to an individual's ability to understand speech.

### C. Instrumentation

#### 1. Measuring Hearing Levels

An individual's hearing level (or hearing acuity) can be measured through the use of an audiometer. An audiometer measures an individual's hearing level by testing an individual's ability to hear various frequencies in each ear. The audiogram is a graphic representation of an individual's hearing and it indicates how intense or loud a sound must be at a given frequency before it can be detected by a listener.<sup>43</sup>

There are several different types of audiometers, including manual, self-recording, microprocessor, and computer-controlled. To administer manual audiometers, examiners operate the frequency dial (to select the stimulus tone, *e.g.*, 500 Hz or 1000 Hz), the presentation level dial (with levels in increments of 5 dB), and the signal presentation switch (to turn the stimulus on or off). Then the examiner must identify and document the hearing levels that qualify as thresholds. With self-recording audiometers, a pen traces a subject's response to test signals on a response card; a subject indicates his or her response by operating a hand switch. Microprocessor audiometers contain a computer chip that controls the audiometer. A related type, a computer-controlled audiometer, has software in a personal computer that drives the audiometer.<sup>44</sup>

#### 2. Measuring Noise Exposures

This regulation specifies two different types of instruments that can be used to measure noise exposures: Sound level meters (SLM) and noise dosimeters. Sound level meters and noise dosimeters are small instruments used

to measure, among other things, sound metrics and/or sound pressure levels. These instruments are usually equipped with weighting networks that adjust the instrument frequency response to predetermined frequency spectra of the measured sounds. The A-weighting network, one type of weighting network, is designed to adjust the instrument frequency to that which approximates the frequency response of human hearing.

A SLM is a hand-held device that records the sound pressure level (logarithm of the ratio of the sound pressure to a reference point) at a given moment in time at a particular location. It consists of a microphone, preamplifier, electronic circuits, and a readout display. The microphone detects the small air pressure variations associated with the sound and changes them into electronic signals. These signals are then processed by the electric circuitry of the instrument. The readout displays the sound level in decibels (dB). Since SLMs provide a measure of sound pressure at only one point in time, it is generally necessary to take several measurements at many different times during the day to estimate noise exposure over a workday. SLMs are useful for measuring the noise attributable to a given process or for instantaneous (or spot) sound pressure level measurements.

An integrating sound level meter (iSLM) is a specific type of SLM. It can be used to determine equivalent sound levels, which are the energy-averaged sound pressure levels over a given measurement period. An iSLM with data storage capabilities is useful in a noise monitoring program, because it records sound level data, which can be thoroughly analyzed later. This can be particularly useful when distinguishing artifactual noise measurements from actual noise exposure.

Noise dosimeters are primarily used to assess individual noise exposure. A noise dosimeter measures an employee's total noise dose for the duration of a sampling period. A noise dosimeter stores sound level measurements and integrates these measurements over time, providing an average noise exposure reading for a given period of time (*e.g.*, an 8-hour workday). The noise dosimeter is designed to be worn by an employee and should be placed in a location that measures the employee's noise exposure but does not interfere with the employee's work. For noise dosimeter results to be meaningful, the person conducting the survey should maintain a log of the employee's activities and correlate the exposure data with different locations and

<sup>43</sup> 46 FR 4078 (1981).

<sup>44</sup> Royster, Julia Doswell. (2000). "Audiometric Monitoring Phase of the HCP" in *The Noise Manual*, edited by Elliott H. Berger, Larry H. Royster, Dennis P. Driscoll, Julia Doswell Royster, and Martha Lane, American Industrial Hygiene Association, 470-473.

activities. This allows the person conducting the survey to identify noise sources.

The use and design of SLMs and dosimeters vary. SLMs are used for measuring all types of sounds and noise, whereas noise dosimeters are typically used only for personal monitoring. SLMs are designed to be handheld or tripod-mounted instruments, whereas most noise dosimeters are designed to be worn by the individual that is being monitored. Also, the SLMs used in the industrial and scientific communities tend to be Type 1 and Type 2,<sup>45</sup> while noise dosimeters are typically Type 2 instruments.

### 3. Instrument Calibration

There are two types of instrument calibration that should be performed on SLMs and noise dosimeters: Field system (routine) and laboratory instrument (comprehensive). Field system calibration on a noise dosimeter or SLM should be conducted on the instrument before and after taking measurements. Field system calibration is necessary to ensure that the instruments provide accurate measurements and to establish the measurement system's sensitivity. Laboratory instrument calibration should be conducted according to manufacturer's recommendations (typically on an annual or biannual basis) and is traceable to a national standards laboratory. In addition, laboratory instrument calibration should be conducted after an instrument has been repaired or has experienced problems during field calibrations.

Users should keep instruments well-maintained and should follow the manufacturer's instructions for maintenance. If an instrument is used often or is inadvertently bumped or dropped, it should be calibrated more frequently. In addition, if an instrument is frequently or extensively adjusted as a result of field calibration, it should be calibrated more often.

<sup>45</sup> There are four grades of SLMs (types 0, 1, 2, and S), and there are design tolerances associated with each grade. Type 0 SLMs are used for laboratory purposes only, and type S SLMs are used for special purposes. Type 1 SLMs are precision instruments intended for noise measurements in the field and laboratory. On average, measurements with a Type 1 SLM will have errors not exceeding plus or minus 1 dB.

Type 2 SLMs are general purpose instruments intended for general field use. Type 2 SLMs have design tolerances that are greater than Type 1 and tend to be used where high-frequency (over 10 kHz) sound components do not dominate. On average, measurements with a Type 2 SLM will have errors not exceeding plus or minus 2 dB.

## V. Occupational Noise in the Railroad Industry

Noise is one of the most pervasive hazardous agents in the American workplace. In the 1980's, the National Institute for Occupational Safety and Health (NIOSH) identified noise-induced hearing loss (NIHL) as one of the ten leading work-related diseases and injuries.<sup>46</sup> In the 1990's, NIOSH listed noise-induced hearing loss as one of the eight most critical occupational diseases and injuries requiring research and development activities within the framework of the National Occupational Research Agenda.<sup>47</sup> Noise is also one of the most intrusive aspects of locomotive operations.<sup>48</sup>

There are many noise sources in a locomotive cab. The primary noise sources are engine noise, locomotive horns, and brake noise. The nature and level of noise generated by each source varies greatly. Diesel engine noise is continuous, but it varies according to the engine load and engine speed. The noise from locomotive horns (and other audible warning devices) is sporadic but can be very loud if the window is open and can be very frequent if there are many highway-rail grade crossings.

Brake noise results from the air exhaust that comes from the brake valves when the brakes are released. Air brake exhaust is a high frequency sound and can be very intense. In the past, air brake exhaust vented directly into the locomotive cab. By 1980, locomotive manufacturers, maintenance facilities, and railroads had begun venting the exhaust below the cab floor. FRA noted that change in its 1980 locomotive cab noise rule.<sup>49</sup> FRA recognized the effectiveness of this redesign, noting that it reduced the cab occupant's noise dose by an estimated 15 to 20 percent while still providing an audible indication of brake performance.<sup>50</sup> Manufacturers continued to re-design locomotives accordingly, and today the vast majority of locomotive air brakes are vented below the floor and away from the crew. There are some older locomotives, though (such as the ones used by some short lines), which still

<sup>46</sup> National Institute for Occupational Safety and Health (NIOSH), "Criteria for a Recommended Standard: Occupational Noise Exposure, Revised Criteria 1998," National Institute for Occupational Safety and Health, DHHS (NIOSH) Pub. No. 98-126, Cincinnati, OH (1998).

<sup>47</sup> NIOSH, "National Occupational Research Agenda," National Institute for Occupational Safety and Health, DHHS (NIOSH), Pub. 96-115, Cincinnati, OH (1996).

<sup>48</sup> Human Factors Guidelines for Locomotive Cabs, DOT/FRA/ORD-93/03 (November 1998).

<sup>49</sup> 45 FR 21092 (March 31, 1980).

<sup>50</sup> 45 FR 21092, 21015 (March 31, 1980).

use the older equipment that vents air brake exhaust into the cab.

Another noise source comes from vibrations which loosen cab components—such as loose cab sheet metal, loose cab side windows, and miscellaneous loose and/or poorly fitted cab equipment—and cause them to resonate. Other potential noise sources include fans on dynamic brake systems; alerters; wheel/rail contact at cruising speed; rooftop or retrofitted air conditioning/cooling units; bells that are sounded to indicate that the train is about to move; and radios that are used for crew communication. Noise can also result from the cab structure, depending on the particular design of the locomotive as it pertains to noise or vibration isolation. Maintenance, or the lack thereof, can also impact noise. Engines in less than ideal condition will run rougher and noisier. Mountings can wear and loosen, which can create new vibrations or decrease vibration damping. Also, worn engine components (e.g., bearings) can create noise.

The locomotive is also subject to several external noise sources. Since the locomotive cab is a mobile workplace, the level of noise exposure varies greatly by the route traveled. Noise results from the sound that is reflected into the cab (especially if through open windows) from reflective surfaces such as tunnels, bridges, sheds, and close embankments. Other conditions that can also impact noise include the topography and grade of the work assignment and the use of locomotive horns to provide notice at highway-rail grade crossings.

Predicting and addressing noise exposures in the locomotive cab is difficult not only because of the wide variety of possible conditions, but because of the mobile railroad workforce. It is a challenge to create and implement effective training and testing programs, because locomotive crews are not on the same run or same locomotive from one day to the next. In addition, locomotive crews can work shifts that last up to twelve hours.

## VI. FRA's Approach to Cab Noise

As OSHA governs workplace safety, and OSHA has already issued regulations in the area of occupational noise, FRA used OSHA's standard as a foundation for its own standard. However, there are many areas in which the OSHA standard differs from the FRA standard. The purpose of this rulemaking is to adapt the OSHA rule to the unique circumstances of the railroad environment. The working environment for railroad cab employees is quite different than that of the typical

American worker. Also, the noise exposure of railroad employees is not uniform throughout the industry. Railroad employees may work in a different location each day, *i.e.*, a different locomotive and/or a different route. Employee assignments and actual time in the cab may vary significantly during a typical week. The level of noise in any individual locomotive cab will vary greatly, depending on the locomotive model, locomotive age, condition of the locomotive, length of the route, traffic on the route, number of highway-rail grade crossings on the route, physical characteristics of the route, weather conditions during the run, and any one or more of several other factors. FRA's proposed rule has taken into account these unique characteristics of the railroad operating environment and has modified OSHA's standard to suit the railroad industry.

Since FRA's proposed rule is based on OSHA's rule, it is helpful to review OSHA's standard before explaining FRA's proposed standard. OSHA's noise standard limits employee noise exposure to an 8-hour TWA of 90 dB(A). OSHA identifies a hierarchy of controls that should be used to limit noise exposure. If employee noise exposure exceeds the permissible exposure level, the employer must reduce the exposure (so that it is within permissible exposure limits) through the use of feasible engineering controls, administrative controls, or a combination of both. Where such controls cannot reduce employee exposure to permissible limits, employers are to supplement the engineering and administrative controls with hearing protection. The OSHA noise standard also requires that the employer administer a continuing effective hearing conservation program for employees who are exposed to levels that equal or exceed an 8-hour TWA of 85 dB(A).

OSHA's regulation has placed engineering controls, and then administrative controls, at the top of its hierarchy and takes the position that these controls are the best method for controlling noise exposure. These controls reduce employee exposure to hazardous noise levels by eliminating (or at least reducing) the noise source, by modifying the noise path or by decreasing employee exposure time to the noise source. Engineering controls are generally understood to be the modification or replacement of equipment or any other related physical change at the noise source or along the transmission path that reduces the noise level at the employee's ear (not including hearing protectors). They

include such changes as the re-design of machinery or the use of different tools. Administrative controls involve efforts to limit worker noise exposure by modifying work schedules, work locations, or the operating schedule of noisy machinery. Administrative controls include, for example, the rotation of schedules for tasks that are near noisy machinery or the use of quiet areas that provide employees with an opportunity to recover from temporary threshold shifts.

FRA's proposed standard on locomotive cab noise is based very heavily on OSHA's standard. In part 227, FRA requires railroads to limit employee noise exposure to an 8-hour TWA of 90 dB(A).<sup>51</sup> Also, FRA requires railroads to implement a hearing conservation program for those employees who are exposed to noise levels that equal or exceed an 8-hour TWA of 85 dB(A).

FRA's doubling, or exchange, rate is 5 dB(A). FRA's decision to use a 5 dB doubling rate is notable, because a 5 dB doubling rate is different than the scientific principle for a doubling rate. Technically, a increase of 3 dB represents a doubling of sound energy.<sup>52</sup> In making its decision, FRA considered a doubling rate of 3 dB, 4 dB, and 5 dB. FRA ultimately decided on a 5 dB doubling rate. NIOSH recommends a 3 dB doubling rate, the Air Force uses a 3 dB doubling rate, and OSHA and MSHA use a 5 dB doubling rate.

In its 1999 rulemaking on occupational noise for miners, MSHA faced a similar decision, choosing between a 3 dB or 5 dB exchange rate. MSHA conducted a study and found that the exchange rate substantially affects the measured noise exposure; nonetheless, MSHA retained the 5 dB exchange rate because of feasibility concerns.<sup>53</sup> In its final rule, MSHA concluded that:

It would be extremely difficult and prohibitively expensive for the mining industry to comply with the existing permissible exposure level with a 3 dB exchange rate, using currently available engineering and administrative noise controls. MSHA therefore cannot demonstrate that implementation of such an exchange rate would be feasible. However, [MSHA] will continue to monitor the

<sup>51</sup> For a complete list of the permissible noise exposures, see Table 1 in § 227.103. According to Table 1, railroads must limit employee noise exposure to 85 dB(A) as a 16-hour TWA, 87 dB(A) as a 12-hour TWA, 90 dB(A) as an 8-hour TWA, and so on.

<sup>52</sup> See discussion in § IV(A) of the background section.

<sup>53</sup> 64 FR 49548, 49588–49589 (September 13, 1999).

feasibility of adopting a 3 dB exchange rate. 64 FR 49548, 49589 (September 13, 1999).

FRA, like MSHA, recognizes that the cost and feasibility of a 3 dB exchange rate is prohibitive. Furthermore, there was a consensus decision of the RSAC that 5 dB is most appropriate. Taking all of those factors into account, FRA proposes to use a doubling rate of 5 dB. Thus, a 5 dB increase in level is permitted each time the exposure duration is decreased by half.

FRA recognizes the same controls as OSHA (*i.e.*, engineering controls, administrative controls, and hearing protection); however, FRA uses different terms to describe some of those controls. OSHA uses the term, "administrative controls," while FRA uses the term "noise operational controls." These two terms are the functional equivalent. Also, OSHA uses the term "engineering controls," while FRA uses no equivalent term—FRA instead describes the specific actions which it would like railroads to take.

FRA's overall approach toward controls differs from that of OSHA. FRA does not adopt OSHA's hierarchy of controls. As explained above, OSHA places controls in a hierarchy and mandates their use according to that hierarchy. FRA has no such hierarchy. Rather, FRA has specific requirements that railroads must satisfy. FRA requires railroads to design and maintain locomotives according to the standards in § 229.121. (OSHA's equivalent of "engineering controls"). FRA requires railroads to use hearing protectors (HP) when employees are exposed to noise levels that exceed an 8 hour-TWA of 90 dB(A). (OSHA's equivalent of HP). And, FRA gives railroads the *option* of using noise operational controls when employees are exposed to noise levels that exceed 90 dB(A) as an 8 hour-TWA. (OSHA's equivalent of administrative controls). It is very important to note that FRA does *not* require the use of noise operational controls. Thus, when a railroad learns that an employee is exposed to noise levels that exceed an 8-hour TWA of 90 dB(A), the railroad *must* provide the employee with HP, but need only consider the use of noise operational controls.

The RSAC spent a great deal of time discussing options and developing the recommended requirements for § 229.121 and thus a discussion is warranted here. An Engineering Controls Task Force, a subgroup of the Noise Task Force, met to discuss the viability of engineering controls. The group reviewed OSHA and MSHA regulations and compliance documents and journal articles. Among its findings,

the group identified certain items that might help reduce noise exposure in the locomotive cab. In identifying these items, FRA has given serious consideration to those items which are feasible and those items which are not feasible.

FRA believes that the specified items are feasible maintenance and engineering controls. The group found that certain maintenance tasks—*e.g.*, repair, replacement, or installation of cab insulation, door seals, window seals, weatherstripping, and electrical cabinet insulation and seals—can help reduce in-cab noise levels. The group also discussed other engineering controls and maintenance items which have been shown to reduce noise exposure in the cab, *e.g.*, venting piping for air brake exhaust and power control devices out and under the locomotive; using air cooling devices so that windows can be closed; and using noise-dampening window glass which limits the penetration of noise and thereby limits the contribution of outside noise. In addition, the group discussed the location of locomotive horns and agreed that relocation of the horn to the center position had reduced crew noise exposure.

FRA recognized that there are many benefits to using engineering and maintenance controls. First, they do not interfere with crew and radio communication, which HP can do. HP can interfere with crew and radio communication by blocking out necessary sounds in addition to unwanted noise. Second, engineering and maintenance controls do not present the potential hazard of overprotection that HP presents. Engineering controls block out noise at its source, thus there is no concern that necessary sounds will be blocked out too. Third, engineering controls put less burden on the employee and as a result, are easier for employees to use. With HP, railroads must ensure that employees are properly trained on the use of the devices, and employees must ensure that they wear and properly use the devices. Due to the benefits of engineering controls, FRA did not want to exclude their use. However, due to burden that it would impose on railroads if there was a general requirement for the use of engineering controls, FRA did not include the requirement as found in OSHA's rule. As a compromise, then, FRA identified the specific engineering controls—the design and build requirements in § 229.121(a) and the maintenance requirements in § 229.121(b)—which railroads must use.

This background section has sought to provide an overview of FRA's rule, as well as a broad comparison to OSHA's rule. A more thorough discussion of the differences between OSHA's and FRA's standards is provided in the section-by-section analysis below.

### VII. Responsibilities of Railroads and Employees

The primary responsibility for compliance with this regulation lies with employers, *i.e.*, railroads. As such, railroads would have several enumerated responsibilities. This regulation would require railroads to: develop and implement a noise monitoring program; administer a hearing conservation program; establish and maintain an audiometric testing program; make audiometric testing available to employees; implement noise operations controls (if desired); require the use of hearing protection; make hearing protection available to employees at no cost; train employees in the use and care of hearing protection; ensure proper fitting of and supervise the correct use of hearing protection; give employees the opportunity to select hearing protection from a variety of suitable hearing protection; evaluate hearing protection attenuation; initiate and offer a training program, maintain and retain records; and build and maintain locomotives according to specified standards.

The responsibilities of employees derive from those of the railroad. Employees' responsibilities come from railroad policies, which are issued pursuant to this regulation. This regulation would require employers to: use their hearing protection when mandated by the railroad; care for their hearing protection as trained by the railroad; and complete the training program which is offered by the railroad. There is one additional obligation for which employees have primary responsibility—employees must report for audiometric testing once every three years. While railroads have an affirmative obligation to offer testing, employees have an affirmative obligation to report for testing. Without adequate audiometric testing, a HCP will not succeed, and so FRA is identifying an employee's audiometric testing obligation as a primary responsibility.

Because employee responsibilities are, for the most part, derivative, compliance would generally take place through the railroad disciplinary process, rather than direct enforcement by FRA. FRA does, however, recognize one major exception. FRA may assess

civil penalties for a wilful violation<sup>54</sup> for an employee who does not report for audiometric testing. Overall, FRA expects that employees will fully comply with all their responsibilities. Railroads should perform required actions, and employees should reciprocate with their commensurate responsibilities. Railroads should set expectations of compliance, and employees should meet those expectations of compliance.

### VIII. Compliance

FRA's principal method of enforcement will be through audits. With an industrial hygienist as team leader, an audit team will examine a railroad's hearing conservation program. The team will examine whether the railroad is adequately protecting its employees. The team will speak with the program manager, review records (*e.g.*, noise monitoring records, audiograms, standard threshold shift records, etc.) and determine the extent to which the railroad is complying with the requirements of this regulation. If warranted, FRA will take enforcement action against the railroad.

In addition, if FRA has reason to believe that certain locomotive crews are being exposed to high noise doses, FRA inspectors will ride in the locomotive cab with those crews to measure the sound levels and determine the crews' exposure. FRA inspectors may also review maintenance records to determine whether railroads have corrected defective conditions (*e.g.*, loose windows, deteriorated seals). Additionally, FRA will investigate employee complaints of excessive noise.

### IX. Section-by-Section Analysis

This section-by-section analysis explains the provisions of the NPRM. Of course, a number of the issues and provisions of the proposed rule have been discussed and addressed in detail in the preceding discussions. Accordingly, the preceding discussions should be considered in conjunction with those below and will be referred to as appropriate.

#### Part 227—Occupational Noise Exposure Subpart A—General

##### Section 227.1 Purpose and Scope.

This section identifies the purpose and scope of this part. This is a general provision. Per paragraph (a), the purpose of this part is to protect the occupational health and safety of employees involved in specified

<sup>54</sup> Under the railroad safety laws, civil penalties may be assessed against individuals only for willful violations. See 49 U.S.C. 21304.

railroad activities and/or operations. More specifically stated, the purpose of this part is to protect the hearing of individuals who experience their primary noise exposure in the locomotive cab. Hearing loss occurs cumulatively over time and thus, the purpose of this proposed rule is to protect individuals over the span of their railroad career. Per paragraph (b), this part prescribes minimum Federal safety standards for the specified railroad workplace safety items (*i.e.*, occupational noise).

### Section 227.3 Application.

This section identifies the applicability of this part. FRA proposes that this part will apply to all railroads and contractors to railroads. This section identifies three exceptions. First, this part will not apply to railroads that operate only on track inside an installation that is not part of the general railroad system of transportation.

Second, this part will not apply to rapid transit operations in an urban area that are not connected to the general railroad system of transportation. This part will still apply to rapid transit operations in an urban area that are connected to the general railroad system. Rapid transit operations connected to the general system are a specialized set of operations (*e.g.*, the Maryland Mass Transit Administration's Central Light Rail Line in Baltimore). FRA regulates at least the shared use portions these operations, because FRA has jurisdiction over such operations by statute.<sup>55</sup> FRA realizes that these types of operations have already applied for and received shared use waivers from FRA's other regulations. FRA also recognizes that these types of operations might need to seek an additional waiver, consistent with 49 CFR part 211, in order to be exempted from the requirements of this part. FRA seeks comment from the public on how to handle these types of operations.

Third, this part will not apply to railroads that operate tourist, scenic, historic, or excursion operations, whether they are on or off the general railroad system of transportation. The term "tourist, scenic, historic, or excursion operations" is defined in § 227.5 to mean "railroad operations that carry passengers, often using antiquated equipment, with the

conveyance of the passengers to a particular destination not being the principal purpose." Congress has directed that, in issuing safety rules, FRA take into account the unique financial, operational, and other factors that may apply to such railroads. 49 U.S.C. 20103(f). For example, these operations are often seasonal and generally use somewhat antiquated equipment.

In this proposal, FRA exempts these operations from the rule; however, FRA is still considering this issue and invites public comments. FRA believes that certain circumstances, such as employee assignments and railroad equipment, might result in conditions that expose these employees to high noise levels. If that is the case, then these employees might also need the protection of this rule. FRA plans to consult with tourist and historic railroad operators and their associations, as well as the RSAC Working Group on tourist railroads, to determine the applicability of this rule to those employees. For now, FRA believes that this situation is best handled through such separate proceedings.

Fourth, this part will not apply to employees of foreign railroads operating in the U.S. if they meet the following requirements: (1) The government of the foreign railroad must have established requirements for hearing conservation for railroad employees in that jurisdiction; (2) the foreign railroad must undertake to comply with those requirements while operating within the U.S.; and (3) the Associate Administrator for Safety must determine that the foreign government requirements are consistent with the purpose and scope of part 227. A "foreign railroad" refers to a railroad that is incorporated in a place outside the United States and is operated out of a foreign country but operates for some distance in the U.S. (*e.g.*, Canadian National Railroad). Employees excepted from application would be those employees of a foreign railroad whose primary reporting point is in Canada and Mexico.

The Associate Administrator's evaluation and determination would only be made at the request of the foreign railroad. As a practical matter, this evaluation could be accomplished at the request of an association of foreign railroads (*e.g.*, the Railway Association of Canada), and the exception would then be available to all railroads of that country entering the U.S.

The Associate Administrator must find that the foreign government's requirements are consistent with the

purpose and scope of the new part, specifically that their legitimate purpose "is to protect the occupational health and safety of employees whose predominant noise exposure occurs in the locomotive cab." This standard does not require a finding of equivalence in terms of program effectiveness, because making such a finding would require an estimation of incremental hearing loss over the working life of specific populations (which is scientifically impracticable). Further, more important than precise equivalence is the integrity of each of the North American governments' programs. Employees and program managers need to know what rules apply and need to be able to carry out those programs without the confusion that would be inherent in changing the rules at international boundaries. FRA will request similar treatment of U.S. railroads operating into Canada and Mexico, in order to achieve the goal of harmonization.

### Section 227.5 Definitions

This section contains proposed definitions for key terms. The definitions are set forth alphabetically. Most of these definitions have been taken from the standards issued by OSHA and the Mine Safety and Health Administration (MSHA) and the recommendations issued by the National Institute of Occupational Safety and Health (NIOSH) and the American Conference of Governmental Industrial Hygienists (ACGIH). These are definitions that are widely used by noise professionals. This includes definitions such as "Audiologist," "Decibel," "dB(A)," "Hertz," "Medical Pathology," and "Otolaryngologist."

This section also contains some basic definitions that are standard to several of FRA's regulations. This includes definitions such as "Administrator," "FRA," "Person," "Railroad," and "Tourist, scenic, historic, or excursion operations." Several of the definitions, however, are new or fundamental concepts that require further discussion.

The term "Continuous Noise" is being added by FRA in order to clarify its use in § 227.105. This definition comes from OSHA. See 29 CFR 1910.95(b)(2).

The term "Employee" refers to individuals engaged or compensated by a railroad, as well as to contractors to a railroad. One of FRA's objectives in covering contractors is to promulgate standards that are applicable to all those individuals that are exposed to the specified levels of locomotive cab noise. Whether an individual is paid by a railroad or a contractor is irrelevant. The most important issue is the prevention of hearing loss. FRA holds no position

<sup>55</sup> Under the Federal railroad safety laws, FRA has jurisdiction over all railroads except "rapid transit operations in an urban area that are not connected to the general railroad system of transportation." 49 U.S.C. 20102. For a discussion of FRA's jurisdiction over passenger operations, see 49 CFR part 209, Appendix A.

on the practice of a railroad contracting work out to another company, but FRA strongly believes that contract employees are entitled to the same level of safety as railroad employees. To the extent that contract employees work under the circumstances presenting the noise hazards addressed in this regulation, those contractors must be protected.

The term "Exchange Rate" refers to the change in sound levels which would require halving or doubling the allowable exposure time to maintain the same noise dose. FRA has set the exchange rate for this regulation at 5 dB. Both OSHA and MSHA also use a 5dB exchange rate. See OSHA's "Occupational Noise Exposure," 29 CFR 1910.95(a) and MSHA's "Health Standards for Occupational Noise," 30 CFR 62.101.

The term "Hearing Protector" is currently defined in the NPRM as "any device or material, capable of being worn on the head or in the ear canal, designed wholly or in part to reduce the level of sound entering the ear, and which has a scientifically accepted indicator of its noise reduction value." The RSAC discussed variations of this definition but ultimately agreed upon this definition. FRA adopted that definition.

Despite the RSAC consensus on this definition during its development, several Working Group members expressed the view that the phrase, "which has a scientifically accepted indicator of its noise reduction value," is too general and provides too much leeway. They would prefer to see that phrase replaced with a requirement to use a specific indicator—the Noise Reduction Rating. With such a change, the definition of "hearing protector" would read as follows: "any device or material, capable of being worn on the head or in the ear canal, designed wholly or in part to reduce the level of sound entering the ear, and which has a Noise Reduction Rating." The Noise Reduction Rating (NRR) is one of several methods that exist for estimating the amount of sound attenuation that a hearing protector provides. The NRR is one of the most commonly used methods. FRA seeks comments from the public on the definition of hearing protector and asks whether FRA should use a general description for an indicator (*i.e.*, "which has a scientifically accepted indicator of its noise reduction value), the NRR, or some other specific type of indicator.

The term "Noise Operational Controls" was developed by the RSAC as the functional equivalent of the term "administrative controls." FRA has

accepted the RSAC's recommended term and definition. The term "administrative controls" is used by OSHA, MSHA, and NIOSH. OSHA uses the term in its noise regulations. See 29 CFR 1910.95(b)(1) and 29 CFR 1926.52(a). MSHA also uses the term in its occupational noise exposure rule. See 30 CFR 62.130. NIOSH defines "administrative controls" as "[e]fforts, usually by management, to limit workers' exposure by modifying workers' schedule or location, or by modifying the operating schedule of noisy machinery." See NIOSH's Common Hearing Loss Prevention Terms.<sup>56</sup>

The term "Occasional Service" refers to service of not more than a total of 20 days with one or more assignments in a calendar year. The term is used only once in this proposed regulation. This term is added to clarify its use in § 227.101.

The terms "Sound Level" and "Sound Pressure Level" can be used interchangeably. The definition comes from OSHA's regulation. See Appendix I to 29 CFR 1910.95. OSHA's regulation, in addressing SLOW time response, referenced a now-outdated ANSI standard (ANSI S1.4–1971 R1976)). FRA changed that cite to ANSI S1.43–1997 which updates the citation to reflect the current ANSI standard.

FRA invites comment from the public about all of the proposed definitions, as well as any other terms that the public believes should be defined.

#### Section 227.7 Preemptive Effect

This section informs the public of FRA's views on the preemptive effect of the proposed rule. While the presence or absence of such a section does not in itself affect the preemptive effect of the rule, it informs the public about the statutory provision which governs the preemptive effect of the rule. Section 20106 of title 49 of the United States Code provides that all regulations prescribed by the Secretary related to railroad safety preempt any State law, regulation, or order covering the same subject matter, except a provision necessary to eliminate or reduce an essentially local safety hazard that is not incompatible with a Federal law, regulation, or order and that does not unreasonably burden interstate commerce. With the exception of a provision directed at an essentially local safety hazard, 49 U.S.C. 20106 will preempt any State regulatory agency rule covering the same subject matter as the regulations in the proposed rule.

#### Section 227.9 Penalties

This section identifies the civil penalties that FRA may impose upon any person, including a railroad or an independent contractor providing goods or services to a railroad, that violates any requirement of this part. These penalties are authorized by 49 U.S.C. 21301, 21302, and 21304. This penalty provision parallels penalty provisions included in numerous other safety regulations issued by FRA.

Essentially, any person who violates any requirement of this part or causes the violation of any such requirement will be subject to a civil penalty of at least \$500, and not more than \$11,000, per violation. Civil penalties may be assessed against individuals only for willful violations. Where a grossly negligent violation or a pattern of repeated violations creates an imminent hazard of death or injury to persons, or causes death or injury, a civil penalty not to exceed \$22,000 per violation may be assessed. In addition, each day will constitute a separate offense. Furthermore, a person may be subject to criminal penalties under 49 U.S.C. 21311 for knowingly and willfully falsifying reports required by these regulations. FRA believes that the inclusion of penalty provisions for failure to comply with this regulation is important in ensuring that compliance is achieved.

With respect to the penalty amounts contained in this section, the Federal Civil Penalties Inflation Adjustment Act of 1990, Pub. L. 101–410 Stat. 890, 28 U.S.C. 2461 note, as amended by the Debt Collection Improvement Act of 1996 Pub. L. 104–134, April 26, 1996, required agencies to adjust for inflation the maximum civil monetary penalties within the agency's jurisdiction. The resulting \$11,000 and \$22,000 maximum penalties were determined by applying the criteria (set forth in sections 4 and 5 of the statute) to the maximum penalties otherwise provided for in the Federal railroad safety laws.

#### Section 227.11 Responsibility for Compliance

This section clarifies FRA's position that the requirements contained in this proposed rule are applicable not only to any "railroad" subject to this part but also to any "person" (as defined in "227.5) that performs any function required by this rule. Although various sections of the rule address the duties of a railroad, FRA intends that any person who performs any action on behalf of a railroad or any person who performs any action covered by this rule is required to perform that action in the

<sup>56</sup> See [www.cdc.gov/niosh/hpterm.html](http://www.cdc.gov/niosh/hpterm.html).

same manner as required of a railroad or be subject to FRA enforcement action.

#### Section 227.13 Waivers

This section sets forth the procedures for seeking waivers of compliance with the requirements of this part. Requests for such waivers may be filed by any interested party. In reviewing such requests, FRA conducts investigations to determine if a deviation from the general criteria can be made without compromising or diminishing rail safety. This section is consistent with the general waiver provisions contained in other Federal regulations issued by FRA.

#### Section 227.15 Information Collection

This section notes the provisions of this part that have been reviewed and approved by the Office of Management and Budget (OMB) for compliance with the Paperwork Reduction Act of 1995. See 44 U.S.C. 3501 *et seq.*

### Subpart B—Occupational Noise Exposure for Railroad Operating Employees

#### Section 227.101 Scope

This section identifies the individuals to whom this rule will apply. In subparagraph (a)(1), FRA proposes that this rule will cover employees who regularly perform service subject to the provisions of the hours of service law governing “train employees.” See 49 U.S.C. 21101(5) and 21103. This refers to employees who are engaged in functions traditionally associated with train, engine, and yard service; for example, engineers, conductors, brakemen, switchmen, and firemen. In general, these employees encounter their predominant occupational noise exposure in the locomotive cab, and therefore, FRA plans to appropriately tailor the noise monitoring and noise testing programs in this section to address the exposure that these employees experience.

With respect to the term “regularly” in subparagraph (a)(1), FRA intends to cover individuals who perform some level of work in a locomotive cab. In making this assessment, the railroad should consider an employee’s work over the period of a year. FRA would like railroads to think about how they use their workforces, *i.e.*, take a serious look at the work that their employees perform, determine which employees will experience potentially hazardous noise exposure in the cab, and then place those employees in a hearing conservation program.

Given the nature of the railroad industry, FRA is aware that some of

these employees may not always experience their predominant noise exposure in the cab. Due to longstanding labor practices in the railroad industry concerning seniority privileges and concerning the ability of railroad employees to bid for different work assignments, these railroad employees are likely to change jobs frequently and to work, for extended periods of time, on assignments that involve duties outside the cab. For example, an employee might start the year in a job that involves mostly outside-the-cab work, spend three months working primarily inside the cab, and then return to outside-the-cab work for the rest of the year. In this type of situation, FRA’s regulations can govern the noise exposure of this employee throughout the year despite the fact that the employee only spent three months inside the cab. This employee can be covered by FRA’s regulations, because he spent time, no matter how little, in a locomotive cab.

Under an alternative to the proposed scope provision, OSHA’s regulations would apply to these employees when they are outside the cab and FRA’s regulations would apply to these employees when they are inside the cab. The employee would switch back and forth between OSHA’s and FRA’s hearing conservation programs throughout the year. FRA believes this would be both illogical and unworkable.

This rule will not extend to employees who occasionally and briefly enter the cab. That includes employees who move equipment only within the confines of locomotive repair or servicing areas protected by blue signals (*see* § 227.101(a)(1)(i)) or who move locomotives for distances of less than 100 feet for inspection or maintenance purposes (*see* § 227.101(a)(1)(ii)). The job assignments of these employees usually involve consistent and significant work outside the cab, such as moving about on the shop floor, working on the ground to connect the air hoses and MU cable for locomotives, and performing locomotive servicing (*e.g.*, sanding or fueling). This is why these types of employees are being excepted from FRA’s regulation. Increasingly, however, inside hostling duties are commingled with other mechanical duties involving major additional sources of noise exposure. These employees would remain under the authority of OSHA with respect to occupational noise exposure, unless the railroad elected to place them in the FRA program based upon their expected mix of assignments (*see* § 227.103).

In addition, this rule will not extend to contractors who operate historic

equipment in occasional service, as long as those contractors have been provided with hearing protection and are required (where necessary) to use the hearing protection while operating the historic equipment. Although these contractors will not be in the railroad’s HCP, it is still important that they use HP, because they will be working in noisy environments (*e.g.*, historic locomotives). Occasional service is defined in § 227.5 and refers to service of not more than a total of 20 days with one or more assignments in a calendar year. This exception will apply to all members of the crew responsible for operating the train; that includes, but is not limited to, engineers, conductors, firemen, and brakemen. When originally raised, this exception contemplated service on steam locomotives; however, FRA has instead used the term “historic equipment,” thereby encompassing steam locomotives as well as diesel locomotives and other antiquated equipment typically used in tourist and scenic operations.

A Working Group member raised this issue during a meeting. The member explained that a railroad will occasionally hire a contractor (with special expertise) to operate a steam locomotive for one or two days as part of a special excursion operation. The member was concerned that the railroad would have to place those temporary, contract employees in a hearing conservation program. The Working Group discussed this issue and recommended this exception. FRA decided to include the exception. Pursuant to this provision, those contractors are exempted, because they provide limited service and thus will have limited exposure to noise in a locomotive cab. Railroads should note, however, that this provision will not exempt regular railroad employees who happen to perform this occasional service on historic equipment.

FRA realizes that earlier provisions in this proposed rule have discussed historic operations. Section 227.3(b)(3) excludes from this part railroads that perform historic operations. Despite the apparent similarity, these provisions are different. The earlier provision excludes railroads that operate, among other things, historic operations, while this provision excludes contract employees who work for a freight railroad (such as Union Pacific Railroad or CSX Railroad) operating tourist, scenic, and excursion equipment.

Pursuant to § 227.101(b), all other railroad employees who are exposed to noise hazards but are outside the scope of this regulation will continue to be

covered by OSHA's noise standard, which is located at 29 CFR 1910.95.

*Section 227.103 Noise Monitoring Program*

Railroad noise monitoring programs entail a system of monitoring that evaluates employee noise exposure. Noise monitoring is performed for one or more of the following reasons: To determine whether hearing hazards exist; to ascertain whether noise presents a safety hazard by interfering with oral communication; to ascertain whether noise presents a safety hazard by impairing recognition of audible warning signals; to identify which employees need to be included in a hearing conservation program; to define and establish the amount of hearing protection that is necessary; to evaluate specific noise sources for noise control purposes; and to evaluate the success of noise control efforts.

FRA's proposed regulation requires railroads to develop and implement a noise monitoring program by a specific date, depending on the size of the railroad. These noise monitoring programs are intended to determine whether an employee's exposure to noise may equal or exceed an 8-hour time-weighted average of 85 dB(A). Factors which suggest that noise exposure in the cab may meet or exceed a TWA of 85 dB(A) include: employee complaints about the loudness of the noise, indications that train employees are experiencing hearing loss, noisy conditions that make conversation difficult, and route-specific or locomotive-specific factors that suggest the possibility of an excessive noise dose. In addition, actual workplace noise measurements can suggest whether or not a monitoring program should be initiated.

FRA's proposed noise monitoring requirements cover noise in cabs and noise in exterior environments in which employees work during their work shifts. FRA's proposal would involve the monitoring of some employees whose daily functions are entirely outside of the cab and some employees whose daily functions are both inside and outside of the cab. This ensures that the hearing conservation program addresses the full noise exposure that is experienced by employees within the scope of this rule.

FRA's proposed rule text on railroad noise monitoring programs is nearly identical to OSHA's rule on noise monitoring programs. Paragraphs (a) through (d) and (f) of 227.103 are very similar to the provisions found in 29 CFR 1910.95(d), OSHA's "Monitoring" section. Paragraph (a) provides the

general requirement that all railroads must develop and implement a noise monitoring program. FRA has re-worded OSHA's language (from 29 CFR 1910.95(d)(1)) to make the provision more clear.

Also, FRA has identified dates by which railroads must develop and implement a noise monitoring program. The date varies based on the size of the railroad. Class I, passenger, and commuter railroads have 12 months from the effective date of this rule to establish a noise monitoring program. Railroads with 400,000 or more employee hours, but that are not a class I, passenger, or commuter railroad have 18 months to comply. Railroads with fewer than 400,000 employee hours have 30 months to comply.

FRA is proposing to classify railroads by employee hours, rather than classes, for several reasons. First, it is a more specific and better-defined distinction than a class distinction. Second, FRA collects and maintains data on employee hours and thus FRA can more easily identify a railroad's category based on employee hours. Third, an hours distinction is probably more reflective than a class distinction of a railroad's ability to comply with this regulation. For example, all switching and terminal operations are categorized as class III railroads regardless of their revenue. By using a class distinction and staggering implementation for class III railroads, FRA would delay implementation for all switching and terminal operations, not just those that are small. But by using an hours distinction, FRA would delay implementation for only those switching and terminal operations that are small. Fourth, FRA has already used this distinction in other regulations, such as § 217.9(d) (a recordkeeping requirement in the CFR part addressing railroad operating rules) and § 220.11 (radio communication requirements for roadway workers). FRA considered staggering the implementation dates based on classes (class I, II, and III); however, for the reasons discussed in this paragraph, FRA proposes to stagger the implementation dates based on employee hours. FRA seeks comment as to which option is the most appropriate.

FRA is adjusting the implementation dates for smaller operations because of their unique situation. FRA understands that they lack the resources, manpower, and money of larger operations, and thus FRA is providing them with more time to comply with the requirements of this part. In addition, FRA is required, by law, to consider the impact of its regulations on smaller entities. The Small Business Regulatory Enforcement

and Fairness Act (SBREFA)<sup>57</sup> requires agencies to employ communication, enforcement, and regulatory systems that consider the unique aspects of small entities. For the purposes of the regulation, small entities are defined as operations with less than 400,000 employee hours per year. The Act specifically provides that agencies should avoid "one size fits all" enforcement and regulatory programs and should, to the extent possible, minimize unnecessary economic burdens. One of the Act's suggestions is that agencies use phase-in implementation dates to permit gradual compliance where no immediate safety risk exists, and that is what FRA has proposed here. For all the reasons discussed here, FRA has also provided phase-in implementation dates here and in two other locations in this proposed rule—in § 227.109(e)(2) (audiometric testing) and § 227.119(b)(2) (training).

Paragraph (b) discusses sampling strategy and is virtually identical to OSHA's provision. OSHA's provision is found in 29 CFR 1910.95(d)(i) and (ii).

Paragraph (c) specifies how railroads should conduct noise measurements. Paragraph (c)(1) requires that all continuous, intermittent, and impulsive sound levels from 80 dB to 130 dB shall be integrated into the measurement of noise exposure. Paragraph (c)(1) is identical to OSHA's comparable provision. See 29 CFR 1910.95(d)(2)(i).

OSHA promulgated its general industry noise standards for occupational noise in 1981. In its preamble to that noise rulemaking, OSHA explained that its intent was to increase the upper limit to 140 dB as noise dosimeters were improved and became readily available. OSHA further explained that its decision to adopt the 80 to 130 dB range (and not the 80 to 140 dB range) reflected the technological limitations of sound level meters and noise dosimeters at the time of the regulation's promulgation.<sup>58</sup>

Recently, in 2002, OSHA issued an Advance Notice of Proposed Rulemaking (ANPRM) for a Hearing Conservation Program for Construction Workers.<sup>59</sup> In that ANPRM, OSHA stated that it "believes that most, if not all, of today's noise dosimeters and integrating sound level meters are capable of dynamic ranges from 80 dB to 140 dB."<sup>60</sup> FRA seeks comments on whether, in light of technological advances, the 80 to 140 dB range is

<sup>57</sup> Pub. L. 104–121, 110 Stat. 857 (codified at 5 U.S.C. 601 *et. seq.*)

<sup>58</sup> See 46 FR 4078, 4135 (January 16, 1981).

<sup>59</sup> See 67 FR 50610 (August 5, 2002).

<sup>60</sup> See 67 FR 50610, 50605 (August 5, 2002).

more appropriate for calculating railroad operating employees noise doses. If so, what are the expected impacts, *i.e.*, costs and benefits, associated with such a change?

Paragraph (c)(2) specifies that railroads shall take noise measurements under typical operating conditions using a sound level meter, integrated sound level meter, or noise dosimeter. The instrumentation should meet the appropriate standard set forth by the American National Standard Institute (ANSI); these standards set performance and accuracy tolerances. A sound level meter used to comply with this regulation shall meet the American National Standard, ANSI S1.4-1983 (R2001) (or its successor). An integrating-averaging sound level meter (iSLM) used to comply with this part shall meet the American National Standard, ANSI S1.43-1997 (R2002) (or its successor). A noise dosimeter used to comply with this regulation shall meet the American National Standard, ANSI 1.25-1991 (R2002) (or its successor). Each instrument should be set to an A-weighted SLOW response.

Paragraph (c)(2), for the most part, is from FRA's current noise regulation, § 229.121(d). Note, however, that FRA has added the ANSI standard for noise dosimeters, updated the ANSI standard for sound level meters (from ANSI S1.4-1971 to ANSI S1.4-1983 (R2001)), and included a reference and citation to integrating-averaging sound level meters. In doing so, FRA has made this regulation more current and comprehensive.

FRA's use of standards established by other organizations, such as ANSI, is a means of establishing technical requirements without increasing the volume of Code of Federal Regulations. This NPRM uses several different ANSI standards, including the ones above. In developing the final rule, FRA will seek the proper authority from the Office of the Federal Register to formally incorporate these standards by reference.

While the regulation provides that a railroad may use either a noise dosimeter, SLM, or iSLM to conduct noise measurements, a railroad may choose to use any combination of those instruments. Using several instruments helps to develop a more complete picture of the noise environment, because the instruments provide different information. A SLM and an iSLM measure the sound levels at fixed locations in the cab and during transient events (*e.g.*, application of the alerter, brakes, or horn). They also characterize the emissions of suspected noise sources (*e.g.*, vibrating panels). A noise

dosimeter and an iSLM measure an employee's overall noise exposure. An iSLM is particularly useful, because it characterizes the contribution of transient events to an employee's overall dose. A noise dosimeter, which is worn by the employee, is useful because it accumulates all the noise exposure data from an employee's work shift. From that, a tester can determine an employee's noise dose during a work shift.

Paragraph (c)(3) specifies that all instruments used to measure employee noise exposure shall be calibrated to ensure accurate measurements. Again, this paragraph is identical to OSHA's provision, which is found in 29 CFR 1910.95(d)(2)(ii).

Paragraph (d) provides that a railroad shall repeat noise monitoring whenever there is a change in operation, process, equipment, or controls that increases noise exposures to the extent that either 1) additional employees may be exposed at the action level, or (2) the attenuation provided by the hearing protectors may be inadequate to meet the requirements of § 227.103. Once again, this paragraph is identical to OSHA's provision, which is located at 29 CFR 1910.95(d)(3).

Paragraph (f) specifies that a railroad shall provide affected employees or their representatives with an opportunity to observe any noise dose measurements conducted pursuant to this section. This parallels OSHA's provision, which is found in 29 CFR 1910.95(f).

There are also some notable differences in § 227.103. First, FRA is adding a new subsection, paragraph "e," which states that, "In administering the monitoring program, the railroad shall take into consideration the identification of work environments where the use of hearing protectors may be omitted." This provision will ensure that railroads do not excessively rely on reflexive use of hearing protectors when structuring their hearing conservation programs. FRA believes that well managed programs already focus on this issue, incorporating such monitoring, as necessary, to determine general categories of work assignments that require hearing protectors and those that do not. FRA fully recognizes that no sustainable amount of monitoring could support a job-by-job analysis at all locations on the railroad. FRA also recognizes that such a level of monitoring is not appropriate given the objective of the hearing conservation program.

Examples of situations where hearing protection may be omitted include:

(1) Cabs designed for sound reduction. These cabs should be

monitored over time on a sample basis to ensure that their noise-insulating qualities continue to function as intended; and

(2) "Ground" assignments where employees work around moving equipment but have limited exposure to loud and persistent noise sources such as locomotives or retarders.

There are several benefits that accrue when employees refrain from over-using hearing protectors. It reduces any danger of infection from the misuse of hearing protectors. It strengthens overall employee compliance with hearing protector use by focusing requirements (to use hearing protectors) where it makes a difference. Among ground personnel, it maximizes the availability of auditory cues associated with the movement of equipment; this results in improved personal safety. In addition, among cab crews with existing hearing loss (from whatever source), it avoids negative impacts on the discrimination of voice communications, both radio and in-person. This, in turn, limits the noise dose of other employees in the workplace who would otherwise have to live with excessively high radio volume and struggle to be heard while calling signals and communicating other information.

Second, FRA is also adding another new paragraph, (g) Reporting of Monitoring Results, which requires railroads (1) to notify each monitored employee of the results of the monitoring, and (2) to post the monitoring results at the appropriate crew origination point for a minimum of 30 days.

Section 227.103(g)(1) is similar to OSHA's notification provision. OSHA requires an employer to notify employees of the results of the monitoring if the employee is exposed at or above an 8-hour time-weighted average of 85 decibels. See 29 CFR 1910.95(e). FRA also requires a railroad to notify employees of the results. However, there is a difference. OSHA requires an employer to notify each employee *that is exposed at or above an 8-hour TWA of 85 dB(A)* of the results of his or her monitoring. By contrast, FRA requires a railroad to notify each employee *that is monitored* of the results of his or her monitoring.

Section 227.103(g)(2) is a new section. There is no comparable provision in OSHA's rule. This section specifies that a railroad must post the monitoring results. The posting should include sufficient information to permit other crews to interpret the meaning of the results in the context of the operations monitored. The information is intended to help crews and labor officials to

understand the conditions under which the monitoring was conducted. There are a wide range of data elements that a railroad could include in its posting. FRA believes that the railroad should include enough information so that the monitored crew, as well as other crews, are able to understand, interpret, and assess the results of the monitoring.

FRA recommends, though does not require, that a railroad include the following data elements: (1) A description of the monitoring event: The date of the monitoring, the start time and end time of the monitoring, the locations of the beginning and end of the monitoring; the assignment or train identification number or train symbol; the locomotive consist (including locomotive numbers, models, and dates of manufacture); and a train profile (including car counts, length of train, tonnage, and power consist details); and (2) circumstances of the monitoring: Number of crew members monitored, job title(s) of the crew members monitored, duration of crew member exposure, number of crew members monitored, placement of measurement equipment, results of the monitoring, and the equipment used for monitoring.

These data elements are useful, because they contain information on items and conditions that can impact the noise level in the locomotive cab. The date of monitoring is important, because it indicates the time of year of the monitoring, which in turn indicates general weather conditions (*e.g.*, it was likely that there was ice on the rail or that it was raining). The start and end time indicate the length of the crew exposure to noise. The location of the monitoring indicates the topography of the specific run (*e.g.*, there were many hills, curves, or closed embankments). The assignment or train identification number or train symbol indicate the type of equipment and the make-up of the train. The locomotive consist provides information which can be used to figure out tractive effort. The train profile provides specific information on the particulars of that train, *i.e.*, car counts, the number of loaded cars, the number of empty cars, the length of the train, tonnage, and power consist details. The monitoring circumstances are useful, as well, because they convey the specifics of the railroad's monitoring efforts.

Section 227.103(g) is the product of extensive RSAC discussions and negotiations. It reflects a compromise of labor and railroad concerns. To reach this compromise, the RSAC considered numerous proposals concerning monitoring observations and reporting. The RSAC's initial proposals did not

include an observation provision and instead focused on reporting requirements. One proposal, without an observation requirement, required a railroad to notify each employee exposed during a monitored exposure, as well as the employee's designated representative, of the results of the monitoring. A variation to that proposal required a railroad to notify each employee and employee's representative upon written request by the employee. Another proposal, also without an observation requirement, required railroads to provide the monitoring information to the president of each labor organization that represented monitored employees. In yet another proposal, railroads would have been required to submit to FRA an annual summary of its noise monitoring activity. FRA would then have made this information publicly available.

In the end, the RSAC recommended to retain the observation provision contained in OSHA's provision. See 29 CFR 1910.95(f). In addition, the RSAC recommended that railroads shall notify monitored employees of the results of monitoring (regardless of the TWA) and shall post monitoring results at appropriate crew origination points. FRA believes this is the most effective proposal, because the proposal satisfies both labor's request for access to information and management's request for a reasonable and practical means of complying with the observation and reporting provisions. Nonetheless, FRA seeks comment from the public on this proposal. See proposed § 227.103(f).

#### *Section 227.105 Protection of Employees*

In this section, FRA establishes the permissible noise exposures for railroad employees. In paragraph (a), FRA proposes the prescribed limits that noise exposure may not exceed. These standards are the same as FRA's current noise standard (49 CFR 229.121), OSHA's permissible noise exposures (29 CFR 1910.95(a), Table G-16), and OSHA's occupational noise exposure limits (29 CFR 1926.52(a), Table D-2). The standards limit employee exposure to 90 dB(A) as an 8-hour TWA, with a 5 dB exchange rate. Where an employee is exposed to noise that exceeds the prescribed limits, the railroad shall provide appropriate protection for that employee.

In paragraph (b), FRA addresses measurement artifacts. FRA proposes that railroads should note the apparent source of noise exposure and, if possible, remove the measurement artifacts from their noise measurements.

Artifacts include events such as an unintentional brushing of the noise dosimeter microphone. Artifacts cause the noise level to spike, which, in turn, results in higher overall noise dose levels. FRA proposes to exclude these measurement artifacts from the calculations, because they are not experienced as noise exposure by the employee.

The Working initially considered a draft provision that was based on OSHA's standard; it required railroads to remove measurement artifacts; the sentence originally provided that "the apparent source of the noise exposures *shall* be noted and measurement artifacts *shall* be removed." By contrast, the proposed provision, based on the full RSAC recommendation, allows railroads to choose whether or not they want to remove the measurement artifacts. At one of its meetings, the Working Group discussed this issue at the request of a railroad representative. The representative had explained that if there is a measurement artifact, he will remove it, since artifacts can cause the overall noise levels to increase. He emphasized that not only would he remove the artifact, but he would want to remove it. However, he is concerned about a situation where he tries valiantly, but is unable to, identify the artifact. If he is unable to identify the artifact, he is going to be unable to remove the artifact. To address that practical concern, the proposed regulation contains this provision whereby a railroad has the option of removing an artifact. Practical concerns aside, FRA maintains that it is in the best interest of a railroad to remove measurement artifacts, because the inclusion of artifacts results in calculations that are not representative of an employee's noise exposure.

Paragraph (c) provides that employee exposure to continuous noise shall not exceed 115 dB(A). Paragraph (c) is the same as 49 CFR 229.121(c), FRA's current noise regulation. It merely restates an existing requirement.

Paragraph (d) addresses continuous noise exposure above 115 dB(A). This requirement differs from OSHA's standards. OSHA prohibits unprotected exposures above 115 dB(A) (*See* 29 CFR 1910.95(a) and 29 CFR 1926.52(a)). By contrast, FRA proposes that employees can be exposed to continuous noise between 115 dB(A) and 120 dB(A) as long as their total daily duration does not exceed 5 seconds. FRA is making this proposal because of the operational realities of railroading and the resulting safety implications.

In the railroad industry, it is generally recognized that very brief excursions

above 115 dB(A) sometimes occur in the cab. For the most part, these noise exposures are brief, non-recurring events. Some of these excursions are due to external conditions that may be difficult, or unwise, to prevent. The sounding of the locomotive horn is a prime example. The locomotive horn is a safety device used to warn the public and railroad employees of oncoming train traffic. If the horn is used while cab windows are open or while the cab is adjacent to reflective surfaces, the noise level in the cab may exceed 115 dB(A). FRA would not want to eliminate the sounding of the horn, however, because the horn is very important to safe rail operations. Unfortunately, then, these types of noise exposures are unavoidable.

Working Group discussions revealed that some RSAC members did not wish to penalize the railroads for these brief excursions above 115 dB(A). At the same time, other RSAC members did not wish to stray, to any great extent, from the existing OSHA standard. It should be noted, however, that certain RSAC members expressed the view that there may be health effects associated with longer exposures over 115 dBA, while other RSAC members contended that health effects will not occur until much higher noise levels.

Recognizing the realities of railroad work, the RSAC recommended this provision. The proposed regulation permits very brief exposures to continuous noise (which is defined as noise that exceeds one second) so long as the exposures do not exceed a total of 5 seconds within one day or work shift. FRA concludes that this short cumulative time limit will effectively distinguish incidental, and perhaps unavoidable and necessary noise exposures, from longer exposures that stem from undesirable noise overexposure found in deficient rolling stock that should not be in use.

#### *Section 227.107 Hearing Conservation Program*

Section 227.107 sets out the requirement that railroads establish a hearing conservation program for all employees exposed to noise at or above the action level. It also provides that railroads shall compute employee noise exposure in accordance with Table 1 of § 227.105 and the tables found in Appendix A and without regard to any attenuation provided by the use of hearing protectors. Section 227.107 is identical to the comparable provision in OSHA's occupational noise regulation. OSHA's provision is found at 29 CFR 1910.95(c).

As for the current state of hearing conservation programs, FRA recognizes that most class I railroads, as well as some regional and commuter railroads, already have hearing conservation programs and that those HCPs meet the requirements of OSHA's occupational noise standard. Although not required, railroads have included cab employees in those hearing conservation programs. Thus, several railroads are already complying with the requirements of this proposed rulemaking, *i.e.*, establishing a HCP, offering training, conducting audiometric testing, etc.

#### *Section 227.109 Audiometric Testing Program*

This section sets out the requirements for railroads to establish and maintain an audiometric testing program for employees that are covered by the hearing conservation program. It requires railroads to establish a baseline audiogram and then to conduct periodic audiograms. It also specifies the requirements for conducting, evaluating, and following-up with the audiograms.

Paragraph (a) notes the general requirement that each railroad shall establish and maintain an audiometric testing program as set forth below. Paragraph (b) provides that audiometric tests shall be provided for employees, at no cost to employees. This paragraph refers only to the audiogram. (An audiogram is more popularly known as a hearing test.) It does not refer to additional costs that might be incurred by employees, *e.g.*, missed trips or missed work time that is incurred as a result of the audiogram.

Paragraph (c) requires that appropriate professionals or trained audiometric technicians administer the audiometric tests. It specifies that audiometric tests be administered by a licensed or certified audiologist, otolaryngologist, or other qualified physician (§ 227.109(c)(1)); or by a certified audiometric technician under the supervision of an audiologist, otolaryngologist or physician (§ 227.109(c)(2)). In order to be qualified under the standard, an individual must be competent in the administration of hearing tests and in the care and use of audiometers. In addition to trained technicians, this can also include hearing aid specialists, industrial hygienists, and nurses with appropriate credentials.

OSHA has recognized two methods by which a technician can become qualified in the administration of audiometric tests. (*See* 48 FR 9738). FRA, likewise, recognizes those methods. The first method, and one of the best methods, is for a technician to

successfully complete a course that is designed for the training and certification of audiometric technicians. *See* § 227.109(c)(2)(i). The second method is for a technician to demonstrate, to the satisfaction of the professional supervisor of the hearing conservation program, that he or she is competent in the administration of audiometric tests and the use and care of audiometers. The technician must be able to show competence in the proper use, maintenance, calibration, and functioning of the particular type of audiometer being used. *See* § 227.109(c)(2)(ii). Where a technician (of either qualification type) performs an audiometric test, that technician must be responsible to an audiologist, otolaryngologist, or physician. *See* § 227.109(c)(2)(iii).

Paragraph (d) addresses the instruments that should be used during audiometric testing; it notes that the instruments used for audiometric testing must meet the requirements of Appendix C "Audiometric Testing Requirements."

Paragraphs (e) and (f) discuss audiograms. For purposes of this regulations, there are two types of audiograms: A baseline audiogram and a periodic audiogram. A baseline audiogram is the reference audiogram to which all future audiograms are compared. Baseline audiograms are necessary, because they can then be used as points of comparison for subsequent audiograms. Periodic audiograms are the subsequent audiograms that are conducted at regular intervals in the future. They can be used to identify deterioration in hearing ability and to track the effectiveness of a hearing conservation program. Paragraph (e) provides the requirements for baseline audiograms, and paragraph (f) provides the requirements for periodic audiograms. These provisions differ from OSHA; the differences are discussed below.

Paragraph (g) provides the requirements for evaluation of audiograms. It states that each employee's periodic examination should be compared to that employee's baseline audiogram to determine if the audiogram is valid and to determine whether a standard threshold shift (STS) has occurred. *See* § 227.109(g)(1). If the periodic audiogram demonstrates a STS, a railroad may obtain a retest within 90 days and use the retest as the periodic audiogram. *See* § 227.109(g)(2). The audiologist, otolaryngologist, or physician shall review problem audiograms and shall determine whether there is a need for further evaluation. *See* § 227.109(g)(3). The

term “problem audiograms” refers to audiograms that have had technical or administrative problems. In a general sense, it refers to situations where the testing equipment did not work, where there is evidence that the test-taker skewed the test results, or where the results are medically atypical. Examples of problem audiograms include audiograms that show large differences in hearing thresholds between the two ears, audiograms that show unusual hearing loss configurations that are atypical of noise induced hearing loss, and audiograms with thresholds that are not repeatable.<sup>61</sup>

Paragraph (h) provides the follow-up procedures. Section 227.109(h)(1) explains that a railroad shall notify an employee if the employee experiences a standard threshold shift (as indicated through a comparison of the employee’s baseline audiogram and periodic audiogram). Section 227.109(h)(2) identifies the steps that a railroad should take if the railroad learns that an employee has experienced a standard threshold shift. Section 227.109(h)(3) specifies further notification procedures for subsequent audiometric testing.

Paragraph (i) identifies two situations where an audiologist, otolaryngologist, or physician may substitute a periodic audiogram in place of the baseline audiogram. The two situations are: (1) The audiogram reveals that the standard threshold shift is persistent, and (2) the hearing threshold shown in the periodic audiogram indicates significant improvement over the baseline audiogram. See 227.109(i).

Paragraph (j) addresses standard threshold shifts. It provides that when determining whether a standard threshold shift has occurred, the individual evaluating the audiogram can consider the contribution of age (presbycusis) to the change in hearing level. The individual evaluating the audiogram should use the procedure described in Appendix F: “Calculation and Application of Age Correction to Audiograms.” See 227.109(j).

While most of section 227.109 tracks the requirements found in OSHA’s regulation (29 CFR 1910.95(g)), there are a few differences. FRA’s proposed regulation differs from OSHA’s regulation in three areas: (1) Baseline audiograms, (2) periodic audiograms, and (3) time frames for re-testing and for employee notification.

First, OSHA and FRA differ with respect to baseline audiograms. OSHA requires employers to establish a valid baseline audiogram within 6 months of

an employee’s first exposure at or above the action level. Like OSHA, FRA provides a railroad with 6 months from a new employee’s first tour of duty to establish a baseline audiogram for that employee. See § 227.109(e)(1). (A railroad has one year to establish a baseline audiogram if it uses mobile test vans to meet these requirements.) Although OSHA’s regulatory text did not provide additional time to establish baseline audiograms for existing employees, OSHA, provided one year from the effective date of the rule for employers to establish baseline audiograms for existing employees. See the “Effective Date” of OSHA’s Final Rule. See 48 FR 9738. FRA also provided railroads with additional time for establishing baseline audiograms for existing employees. However, unlike OSHA, FRA has several categories of existing employees and different terms for each. For an existing employee without a baseline audiogram, a railroad will have two years from the effective date of the rule to establish a baseline audiogram for that employee. See § 227.109(e)(2). FRA is providing railroads with more time to establish baseline audiograms for employees without baseline audiograms, because FRA realizes that railroads will need time to “catch up” on testing. The decision to provide railroads with extra time for this category of employee recognizes the administrative difficulties of testing a large number of employees, as well as the high potential cost of testing so many employees in a short period of time. Railroads with 400,000 or fewer employee hours will have three years from the effective date of the rule to establish a baseline audiogram for existing employees.<sup>62</sup>

For existing employees who have had a baseline audiogram, a railroad may or may not be able to use that baseline audiogram, depending on how the baseline audiogram was obtained. Where an existing employee has already had a baseline audiogram as of the effective date of this rule, and it was obtained under conditions that satisfy the requirements found in 29 CFR 1910.95(h), the railroad must use that baseline audiogram. Section 1910.95(h) identifies OSHA’s audiometric test requirements for employees who obtained audiograms as part of a hearing conservation program. The requirements in 29 CFR 1910.95(h) are the same requirements that are found in FRA’s proposed regulation at § 227.109.

Where an existing employee has already had a baseline audiogram as of the effective date of this rule, and it was obtained under conditions that satisfy the requirements in 29 CFR 1910.95(h)(1) but not the requirements found in 29 CFR 1910.95(h)(2)–(5), the railroad may elect to use that baseline audiogram as long as the individual administering the Hearing Conservation Program makes a reasonable determination that the baseline audiogram is valid and is clinically consistent with the other material in the employee’s medical file. This provision evolved out of comments made by numerous railroad hearing conservation individuals. Those individuals thought that it was in the employee’s best interest to use grandfathered baseline audiograms; however, they were concerned that they would not be able to identify the information required to satisfy 29 CFR 1910.95(h)(2)–(5). To address those concerns, FRA has included this provision.

Many railroad employees—locomotive engineers, specifically—will have baseline audiograms that were obtained as part of the hearing acuity testing for FRA’s Locomotive Engineer Qualification.<sup>63</sup> (See 49 CFR 240.121). As part of the locomotive engineer certification process, many engineers will have had an audiogram that meets OSHA’s 29 CFR 1910.95(h) requirements. As stated above, railroads must accept these baseline audiograms if they were obtained in compliance with the requirements found in 29 CFR 1910.95(h).

In essence, then, FRA is “grandfathering” certain pre-existing baseline audiograms. FRA is grandfathering these baseline audiograms, because they provide a more accurate picture of an individual’s initial hearing ability. They indicate an employee’s initial hearing level and thus, when compared with subsequent audiograms, they will reflect the true extent of an employee’s hearing loss (if any). In addition, grandfathering these baseline audiograms eliminates unnecessary costs for the railroad, because railroads do not need to re-test employees that already have baseline audiograms.

OSHA also decided to adopt a lenient policy on accepting baseline audiograms that were taken before the promulgation of the hearing conservation amendment. OSHA noted that it would be flexible in accepting or grandfathering old baseline audiograms, because in most cases, this would be more protective of employees;

<sup>61</sup> OSHA Interpretation Letter from OSHA to Mr. J. Christopher Nutter dated May 9, 1994.

<sup>62</sup> For a further discussion on allowances for small entities, see the preamble discussion for § 227.103(a).

<sup>63</sup> See Qualification and Certification of Locomotive Engineer, 49 CFR part 240.

old baseline audiograms allow the true extent of hearing loss over the years to be evaluated. In its Final Rule, OSHA noted that “this policy is consistent with the exercise of professional judgment. It is the responsibility of the professional supervising the hearing conservation program to determine which pre-existing audiograms are acceptable and which to choose as the baseline.”<sup>64</sup>

Many railroads have expressed concern about the record-keeping requirements associated with grandfathered baseline audiograms. Section 227.121 requires railroads to maintain records of employee audiometric tests and to retain them for the duration of the employee’s employment. Those records should include information such as the name and job classification of the employee, the date of the audiogram, the examiner’s name, the date of the last acoustic or exhaustive calibration of the audiometer, and accurate records of the measurements of the background sound pressure levels in the audiometric test rooms. Railroads explain that they will not be able to provide all the required information for grandfathered baseline audiograms. FRA is fully aware of the railroads’ concerns. FRA recognizes that, in some cases, railroads will not have some of that information and will not be able to obtain some of that information (e.g., a railroad might not know the examiner or the last exhaustive calibration for a baseline audiogram that was obtained five years ago). FRA will be cognizant of that fact when evaluating what records are available and when evaluating the adequacy of the available records. Overall, FRA will take a practical approach toward the audiometric test record-keeping requirements for grandfathered baseline audiograms.

Second, FRA differs from OSHA with respect to periodic audiograms. OSHA’s comparable requirement, “Annual Audiogram,” states that “[a]t least annually after obtaining the baseline audiogram, the employer shall obtain a new audiogram for each employee exposed” at or above the action level. See 29 CFR 1910.95(g)(6).<sup>65</sup> FRA’s proposed rule is stated in paragraph (f), “Periodic Audiogram.” Subparagraph (f)(1) requires railroads to offer audiometric testing to each covered

employee at least once a year. FRA is aware that most large railroads already do this, and thus it should not impose a new burden on railroads. Subparagraph (f)(2) requires railroads to conduct audiometric testing of covered employees at least once every three years. This requirement mirrors part 240, in which locomotive engineers must receive a hearing test (as part of the engineer certification process) at least once every three years. See 49 CFR 240.201(c).

This provision reflects a compromise that evolved out of RSAC discussions. While employees often disfavor mandatory hearing testing, railroads generally favor mandatory hearing testing. To satisfy both concerns, FRA established a compromise position whereby railroads must test employees at least once every three years but must offer testing at least once a year. This provision is also important, because it provides additional assurances that FRA’s hearing conservation efforts will be effective. The RSAC discussions indicate that the employee participation in existing railroad hearing conservation programs has been low. RSAC members agree that the effectiveness of a hearing conservation program would be improved by increased participation, and these provisions increase participation.

Third, FRA’s proposal differs from OSHA’s regulation with respect to time frames. In 29 CFR 1910.95(g)(7)(ii), if an annual audiogram shows that an employee has experienced a standard threshold shift, OSHA gives an employer 30 days to obtain a re-test. By comparison, FRA proposes to give an employer 90 days to obtain a re-test. See § 227.109(g)(2). FRA’s standard gives employers more time to obtain a re-test, because FRA realizes that railroads can experience administrative difficulties in testing their employee population. The railroad employee population is widely dispersed, is subject to statutory Hours of Service limitations, and often works irregular hours.

In 29 CFR 1910.95(g)(8)(i), OSHA’s standard provides that, if a comparison of the annual audiogram and the baseline audiogram indicates that a standard threshold shift has occurred, the employer shall inform the employee within 21 days. By contrast, FRA’s proposal states that the railroad shall inform the employee of the determination within 30 days. See § 227.109(h)(1). FRA’s standard provides railroads with more time, because FRA is taking into account the mobile railroad workforce and railroad’s difficulty in providing notice to that mobile workforce. Moreover, there is no

substantial harm if the railroads have an additional nine days to notify employees.

#### *Section 227.111 Audiometric Test Requirements*

Once again, this section is almost identical to OSHA’s Audiometric Test Requirements. OSHA’s requirements can be found at 29 CFR 1910.95(h). FRA’s proposed §§ 227.111(a) through (d) are identical to OSHA’s §§ 1910.95(h)(1) through (h)(5). Section 227.111(a) provides that audiometric tests shall be pure tone, air conduction hearing threshold examinations and shall test frequencies including 500, 1000, 2000, 3000, 4000, and 6000 Hz. Section 227.111(b) addresses audiometers, § 227.111(c) addresses pulse-tone and self-recording audiometers, and § 227.111(d) addresses room requirements for audiometric testing.

In § 227.111(e), FRA’s proposed rule differs from OSHA’s rule in two ways, one minor and one substantial. The minor difference is found in § 227.111(e)(1), where FRA adds “or by appropriate calibration device.” In OSHA’s rule the audiometer shall be checked by testing a person with known, stable hearing thresholds. FRA’s rule allows that method and also allows the audiometer to be tested with an appropriate calibration device.

The more substantial difference is found in § 227.111(e)(3). OSHA requires employers to perform an exhaustive calibration of the audiometer at least every two years. As a general rule, FRA is also requiring railroads to perform an exhaustive calibration at least every two years. However, FRA is proposing stricter requirements for mobile test vans. FRA proposes that railroads perform an exhaustive calibration of the audiometers on mobile test vans at least once a year.

FRA proposes this stricter requirement for mobile vans because of the nature of mobile service work. Mobile vans are constantly in movement, and so the audiometric equipment in those mobile vans are subject to greater mechanical stress. An exhaustive annual calibration will ensure that the audiometer is continually producing accurate test results. Moreover, the cost of such a calibration is low. Accordingly, FRA concluded that the minimal cost of this stricter requirement would be easily offset by the assurance of more accurate test data.

<sup>64</sup> See 48 FR 9738.

<sup>65</sup> OSHA’s application of this provision may be at variance with the language. See OSHA’s Standard Interpretations, “Free audiometric testing for employees exposed over the action level,” July 27, 1987. For a copy of the letter, see [http://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=INTERPRETATIONS&p\\_id=19570](http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=19570).

### Section 227.113 Noise Operational Controls

This section provides for the use of noise operational controls. As explained in the background section of this preamble, noise operational controls are the functional equivalent of OSHA's term "administrative controls." Operational controls refer to efforts to limit workers' noise exposure by modifying workers' schedules or locations, or by modifying the operating schedule of noisy machinery. Examples of operational controls include, but are not limited to, the following: Placement of a newer (*i.e.*, quieter) locomotive in the lead; rotation of employees in and out of noisy locomotives; and variation of employee's routes, *e.g.*, rotation of employees on routes that have many grade crossings (which means that horn is sounded more often). Operational controls are beneficial, because they help reduce the total daily noise exposure of employees, thereby reducing the harmful cumulative effects of noise. They also make the environment safer and take the burden off employees to protect himself or herself. FRA seeks comments from the public on the proposed use of this measure.

This proposed regulation does not require railroads to use operational controls. (This is unlike OSHA's standard, which makes operational controls mandatory). Rather, this regulation gives railroads the option of using operational controls. Railroads can use operational controls, by themselves, to lower the total noise dose exposure (as long as the total noise dosage is not 90 dB(A) as an 8-hour TWA, in which case the railroad must require hearing protection). Railroads can also use operational controls in combination with the other controls. Those other controls include hearing protection and FRA's design, build, and maintenance requirements (*i.e.*, those items found in § 229.121, through which FRA has embodied OSHA's concept of engineering controls). FRA realizes operating requirements and labor agreements may affect a railroad's ability to use noise operational controls; nevertheless, FRA would like railroads to remain open to their use.

While operational controls will be an option for all railroads, FRA expects that the smaller railroads will be in the best position to use them and benefit from the flexibility that they provide. Small railroad work is characterized by more limited hours of operation and more flexible work rules, and thus it is more conducive to the use of operational controls. Noise operational

controls are even more useful to small railroads since they rarely have the opportunity to implement engineering controls. Unlike larger railroads, small railroads infrequently buy new locomotives or rebuild old locomotives.

The regulation notes that "[w]hen employees are exposed to sound exceeding an 8-hour TWA of 90 dB(A), railroads may use noise operational controls." FRA would like to clarify, however, that railroads may consider noise operational controls at any point in time. In other words, railroads need not wait until sound reaches an 8-hour TWA of 90 dB(A) before considering and/or using operational controls.

### Section 227.115 Hearing Protectors

This section addresses another measure—hearing protectors (HP)—that can be used to minimize employee exposure to noise in the locomotive cab. The term "hearing protector" is defined in § 227.5. However, in simpler words, a hearing protector is a "personal safety product that is worn to reduce the harmful auditory and/or annoying effects of sound."<sup>66</sup> Hearing protectors can be divided into three main categories: (1) Ear plugs are placed in or against the entrance of the ear canal to form a seal and block sound. (2) Ear muffs fit over and around the ears to provide an acoustic seal against the head. (3) Helmets encase the entire head.<sup>67</sup>

With respect to the rail industry, RSAC members noted that ear plugs and ear muffs are the most commonly-used forms of hearing protection. During Working Group discussions, a railroad representative of the RSAC noted that several railroads occasionally have used low attenuation ear muffs, electronic-assisted ear muffs, and active noise cancellation ear muffs. The representative also indicated that several railroads have tried using radio headsets. Crews have not received them well, and so railroads have not used them widely.<sup>68</sup> FRA invites comments from the public on the use of these types of hearing protection.

Paragraph (a) proposes that railroads shall require the use of hearing protectors where employees are exposed to sound exceeding an 8-hour time-weighted-average of 90 dB(A). Paragraphs (b)–(e) are modeled after the

similar OSHA provision, which is located at 29 CFR 1910.95(i).

There is one significant difference between FRA's proposal and OSHA's provision. FRA has added subparagraph (b)(2), which requires railroads to consider two important factors when offering (and requiring) hearing protectors: (1) Employees' ability to understand and respond to voice communications, and (2) employees' ability to hear and respond to audible warnings. This requirement addresses FRA's concern that the use of hearing protection may be counter-productive, especially for employees with existing hearing loss. If, for example, there is a cab employee who is exposed to a TWA of 85 or 86 dB(A), the railroad will not want to simply put 30 dB noise reduction HP on that employee, because it will reduce the employee's hearing ability and thus the employee's ability to listen and communicate in the cab. The ability of these employees to discriminate speech and recognize other auditory clues can be critical to avoiding train accidents and incidents. In the transportation industry, there are important concerns about communication, in general, and about speech communication in noise, in particular. FRA seeks comment from the public on the proposal contained in this regulation, as well as any suggestions as to how best address this issue.

During meetings, some labor members of the RSAC noted their unease with the hearing protector requirement located in § 227.115(b)(2). They are concerned that some railroads might use a mandatory hearing protector provision as a disciplinary tool or as a means for harassing an employee. They also state that some employees find HP to be uncomfortable, and if railroads unnecessarily mandate the use of HP, compliance may erode and employees could encounter excessive noise exposure. FRA believes there are many beneficial aspects to HP, and thus FRA is including this section. FRA seeks comment from the public on these concerns.

Paragraph (d) generated a great deal of discussion and thus is discussed here. Paragraph (d) states that "The railroad shall give employees the opportunity to select their hearing protectors from a variety of suitable hearing protectors. The selection shall include devices with a range of attenuation levels." This paragraph is intended to help ensure that railroads offer employees suitable hearing protectors. Providing a choice of suitable devices increases the likelihood that the employee will use the device as required. The first sentence of this paragraph is almost identical to OSHA's

<sup>66</sup> Berger, Elliott H. (2000). "Hearing Protection Devices" in *The Noise Manual*, edited by Elliott H. Berger, Larry H. Royster, Dennis P. Driscoll, Julia Doswell Royster, and Martha Lane, American Industrial Hygiene Association, 381.

<sup>67</sup> Berger at 383.

<sup>68</sup> See the discussion below on § 227.121(d) for a further discussion of radio headsets.

rule. The second sentence is an addition to FRA's rule. FRA included the second sentence to acknowledge the importance of having a variety of hearing protectors with a range of hearing attenuation levels. Ensuring inclusion of low or moderate attenuation devices furthers safety by facilitating communication and detection of audible cues in the workplace.

The related matter of electronic communication headsets arose during Working Group meetings and generated extensive discussions. Railroad representatives strongly disfavor the use of these devices. They maintain that these types of devices are ineffective and have gained poor acceptance by crews. They also assert that it is expensive for them to purchase such devices and to apply the necessary wiring to locomotives to use these devices. Labor representatives, in response, agree that these devices have gained poor acceptance by crews, but assert that the poor acceptance is due to the conditions of their use, *i.e.*, non-temperature controlled locomotive cabs make for a warm cab environment and the resulting heat build-up under the headsets causes discomfort. Labor representatives believe that these hearing protection devices enhance communication and that crews would more widely and readily accept these devices if the circumstances of their use were improved.

For the purposes of this rule, FRA does not require a railroad to offer electronic communication headsets (wired or wireless), but FRA does not intend to discourage the use of this technology. If a railroad elects to accommodate an employee with hearing loss by providing that employee with an electronic headset, the railroad would also need to provide the other regularly assigned crew members with compatible equipment.

There are a few other miscellaneous issues related to this provision. With respect to locomotive engineers, the issue of hearing acuity is addressed in 49 CFR Part 240. In addition, with respect to crew members with documented hearing loss, the proposed rule does not vary or add to the railroad's duties under the Americans with Disabilities Act.

#### *Section 227.117 Hearing Protector Attenuation*

FRA's proposal is identical to OSHA's Hearing Protector Attenuation provisions. OSHA's standard is found at 29 CFR 1910.95(j). Paragraph (a) provides that a railroad shall evaluate HP attenuation for the specific noise environments in which the protector

will be used and directs that a railroad shall use one of the methods described in Appendix B to this part, "Methods for Estimating the Adequacy of Hearing Protector Attenuation." Those methods include the Noise Reduction Rating (NRR), NIOSH methods #1, #2, and #3, and objective measurement.

FRA seeks comment on an additional method, "Method B," which is not included in Appendix B. Method B refers to the ANSI S12.6-1997 entitled *Methods for Measuring Real-Ear Attenuation of Hearing Protectors*. This standard "provides attenuation estimates based on the responses of subject who are given the manufacturer's directions and are told to fit the device themselves as best they can."<sup>69</sup> Instead of the traditional method of obtaining attenuation estimates, which uses experimenters who fit highly trained subjects, this method uses subjects that are untrained in the fitting of hearing protectors. Arguably, "the NRR derived from Method B more closely resembles the real-world performance of hearing protectors."<sup>70</sup> Although this method is not included in Appendix B, FRA thinks that it would be a useful method and so seeks comment on its inclusion in the rule as yet one more method of measuring hearing protector attenuation.

Paragraph (b) states that hearing protectors shall attenuate employee exposure to an 8-hour TWA of 90 decibels or lower, as required by § 227.115 of this subpart.

Paragraph (c) provides that hearing protectors for employees who have experienced a STS must attenuate exposure to an 8-hour time-weighted average of 85 decibels or lower. During RSAC discussions, a railroad representative raised some practical concerns about this requirement. Per § 227.115(d), an employee selects his hearing protection. The railroad representative is concerned that an employee might select hearing protection that is not protective enough, *e.g.*, an employee might want to use HP with lower attenuation because he or she finds it more comfortable. FRA notes that a railroad should offer its employees a variety of hearing protectors with several different types of attenuation, all of which provide adequate protection.

Paragraph (d) explains that the railroads should re-evaluate the adequacy of hearing protector

attenuation whenever noise exposures increase to the extent that hearing protectors may no longer provide adequate attenuation. FRA believes it is necessary for railroads to conduct noise monitoring in order to know whether noise exposures have changed.

#### *Section 227.119 Training Program*

This section discusses FRA's proposed training program. OSHA's training program provision is located at 29 CFR 1910.95(k). While FRA's training program, in general, is similar to OSHA's training program, FRA's training also contains some distinct features of its own.

First, FRA's proposal in § 227.119(a)(2) is different than the comparable provision in OSHA's regulation. FRA requires each employee to complete the hearing training program at least once every three years. By contrast, OSHA requires employees to complete a hearing training program at least once a year. FRA's triennial training requirement is consistent with FRA's triennial audiometric testing requirement; that requirement is found in § 227.109(f)(ii).

Second, FRA has added an entire subparagraph, § 227.119(b). Subparagraph (b) identifies the times when a railroad should initiate training for employees. For new employees, a railroad shall provide training within 6 months after the employee's first tour of duty in a position identified within the scope of this part. *See* § 227.119(b)(1). FRA seeks comment on the appropriateness of this start time. In particular, FRA wants to know whether railroads should initiate training no later than six months after the employee's first occupational exposure or whether railroads should initiate training prior to the expiration of the six months (*i.e.*, when the occupational exposure occurs or before the occupational exposure first occurs). For existing employees, a railroad shall provide training within two years of the effective date of this rule. Railroads with 400,000 or less employees hours have three years to provide training.<sup>71</sup>

Third, in § 227.119(c), FRA has added some items to the list of information required by OSHA for a hearing conservation training program. Sections 227.119(c)(1)–(5) contains the same items that are found in OSHA's training section, 29 CFR 1910.95(k)(3). Those items are: The effects of noise on hearing; the purpose of hearing protectors; the advantages, disadvantages, and attenuation of

<sup>69</sup> Council for Accreditation in Occupational Hearing Conservation "Hearing Conservation Manual," Fourth Edition, 114 (2002).

<sup>70</sup> *Id.*

<sup>71</sup> For a discussion on small entities, see the preamble discussion on § 227.103(a).

various types of hearing protectors; instructions on selection, fitting, use, and case of hearing protectors; and the purpose of audiometric testing and an explanation of test procedures. Sections 227.119(c)(6)–(11) contain FRA's additional training items.

Section 227.119(c)(6) requires railroads to provide an explanation of noise operational controls, where used. This is most relevant for short lines, because they are most likely to use noise operational controls. Section 227.119(c)(7) requires railroads to provide employees with general information concerning the expected range of workplace noise exposure levels associated with major categories of railroad equipment and operations (e.g., switching and road assignments, hump yards proximate to retarders) and appropriate reference to requirements of the railroad concerning the use of hearing protectors.

This provision, as originally conceptualized, required railroads to provide employees with workplace noise exposure levels, including examples of where hearing protectors are or are not necessary, of types of equipment that emit excessive noise, and of operations that produce excessive noise. During meetings, some Working Group members expressed concern that railroads would have to provide detailed information specific to each employee. That would have been administratively difficult for railroads. After discussing the issue, the Working Group, and ultimately the RSAC, recommended that the requirement be expressed in more general terms. FRA accepted that recommendation. The general language addresses the railroad's administrative concerns. The general language also captures FRA's intention that railroads should provide a general discussion of the ranges of noise exposure levels that an employee might encounter. FRA does not intend that a railroad provide an individualized report to each employee.

Furthermore, FRA notes that railroads may provide details of requirements for the use of hearing protectors during safety or operating rules training, if the railroad so chooses, as long as the railroad retains the appropriate records required by this part. This provision was included to address railroad representatives' concerns about the timing of this training. Some railroad representatives asserted that this material was already covered at the time of the audiometric test. Others asserted that a portion of this information was already covered in the railroad safety rules training. Accordingly, FRA did not specify the delivery time for these

training requirements. A railroad may choose to present this information at the safety rules training, operating rules training, during audiometric testing, and/or at any other time. A railroad can even present this information to an employee at different times, as long as an employee can reasonably understand the information and make sense of it.

Section 227.119(c)(8) requires railroads to explain the purposes of noise monitoring and a general description of noise monitoring procedures. The intention of this provision is that railroads will provide employees with an understanding of how monitoring is conducted and how monitoring helps to identify potentially high exposures of excessive doses. FRA does not foresee that railroads will have to provide employees with a complex, technical discussion. Rather, railroads should provide employees with enough information so that they know what will occur and what equipment will be used during monitoring.

Section 227.119(c)(9) requires railroads to provide information concerning the availability of a copy of this rule, the requirements of this rule as they affect the responsibilities of employees, and employees' rights to access records required under this part. FRA mandates that employees must participate in the audiometric testing program specified in this rule, and thus it is important that the railroads, at a minimum, explain this rule's requirements as they affect employees. This provision is not too different from OSHA's requirement; OSHA's rule contains a provision whereby the employer shall make available copies of this standard and shall also post a copy in the workplace. See 29 CFR 1910.95(l)(1). FRA had, at one point, considered a more general provision that would have broadly required railroads to provide information on the requirements of this subpart. However, FRA decided that this more narrow requirement struck a better balance between the need to provide employees relevant information and the scope of the information that railroads will have to provide.

For the reasons discussed above, FRA believes these additional requirements (i.e., § 227.119(c)(6)–(9)) are important. FRA's has included these requirements to ensure that the railroad conveys general knowledge to its employees. Also, FRA believes that it is important for employees to have an understanding of how hearing loss occurs. By accomplishing this, FRA believes that employees will take further steps to protect themselves, i.e., there will be an

increase in employee audiograms and employee use of HP.

Section 227.119(c)(10) requires railroads to train employees on how to determine what can trigger an excessive noise report, pursuant to § 229.121(b). Section 227.119(c)(11) requires railroads to train employees on how to file an excessive noise report, pursuant to § 229.121(b). This information will be helpful to employees, because it will enable them to identify when noise exposures are loud in the locomotive cab. Also, it will educate employees, so that they know how to respond to excessive noise in the locomotive cab. These two training elements were not found in the consensus document which the RSAC forwarded to FRA. Rather, these two elements were added as a result of OSHA's review of this proposed rule. FRA invites comments on these two new training requirements.

Some railroad representatives have explained that they use already-established programs to satisfy their OSHA training requirements, and so these additional requirements will necessitate the creation of new programs and instructor training, as well as cost more. A "canned" OSHA training program, however, is not sufficient training for a railroad employee (although a "canned" OSHA training program does suffice as training for the OSHA-related elements in the FRA training program). Such a training program does not contemplate the unique needs of the railroad operating environment—e.g., the mobile nature of his or her work, the variety of noise sources to which he or she is exposed—while FRA's training program does.

This regulation does not specify a delivery method. As currently written, a railroad can provide this information through any medium it chooses. FRA understands that employees typically receive their training by viewing a video presentation or by operating an interactive computer program. About one-half of the class I railroads uses videos, while the other half uses computers. As between video and computer training, FRA would prefer that railroads use computer training because of its interactive component. The interactive component (e.g., the ability to test employees' knowledge of the subject matter as they learn and the ability of employees to obtain further information during the session) creates a more effective learning environment.

Video and computer training aside, traditional classroom training is the most beneficial, because it allows employees to ask questions and receive immediate feedback. Railroad representatives feel that classroom

training should not be mandated; they note that alternative forms of training have been successfully used in other industries, as well as in the railroad industry. Railroads feel that any requirement that departs from a standardized OSHA training program might result in significantly increased costs with questionable additional benefit. FRA seeks comments on whether railroads should conduct training through the use of traditional classroom methods, video presentations, or computer training. With respect to traditional classroom methods, is there a need for that kind training (for occupational noise) in the railroad industry?

#### Section 227.121 Recordkeeping

This section contains the recordkeeping requirements for this regulation. This section first sets out some general recordkeeping provisions and then specifies which records railroads must maintain and retain. FRA is granted authority to inspect records from the Federal Railroad Safety Act (see 49 U.S.C. 20107). Pursuant to that authority, FRA must act within certain parameters when inspecting records. FRA must enter upon property and inspect records at a reasonable time and in a reasonable manner and must seek records that are relevant to FRA's investigation.

Section 227.121(a)(1)(i) provides that a railroad shall make records available to FRA, or to a railroad employee, former employee, or employee's representative, upon written authorization of such employee. In general, an individual employee would not be able to request the individual testing records of another employee. However, that employee would be able to receive the records of a monitored run if the employee was in the cab or if the employee works in the same yard. Section 227.121(a)(1)(ii) provides that a regional or national labor representative may request copies of reports for specific locations. These reports should not contain identifying information of an employee unless an employee authorizes the release of such information in writing. Section 227.121(a)(2) permits records to be kept in written or electronic form, and § 227.121(a)(3) discusses the transfer of records from a railroad that ceases to do business.

The first few records requirements parallel OSHA's rule. In paragraph (b), FRA proposes that railroads maintain exposure measurement records and retain them for three years. See 29 CFR 1910.95(m)(1). In paragraph (c), FRA proposes that railroads maintain

employee audiometric test records and retain them for the duration of the employee's employment. See 29 CFR 1910.95(m)(2). FRA included a list of specific records; that list comes from OSHA's regulation. FRA has included all of OSHA's records except for one, "the employee's most recent noise exposure assessment." FRA excluded that record from the list because it is impracticable. Realistically speaking, the individual performing the employee's audiometric test would not have access to this noise measurement data and thus would not be able to enter it on the audiogram. In that respect, this requirement will be impractical. Moreover, this information would already be included in the records maintained under § 227.121(b). Railroad representatives support the removal of this requirement to include individual employee exposure data on the audiometric test record.

For a discussion on FRA's position toward the audiometric test recordkeeping requirements for grandfathered baseline audiograms, see the preamble discussion in § 227.107. In short, FRA expects railroads to make a good faith effort in obtaining the audiometric test records for grandfathered baseline audiograms. At the same, FRA understands that, in several cases, that might be very difficult, if not impossible, since the baseline audiograms were presumably obtained years ago. Accordingly, FRA recognizes that railroads will sometimes be unable to provide some of the required information from the audiometric testing records for grandfathered baseline audiograms.

The subsequent records requirements are new provisions that are not found in OSHA's regulation. FRA invites comment on the following proposed provisions. In paragraph (d), FRA establishes a requirement that railroads maintain a record of all positions and persons that are required to be placed in a Hearing Conservation Program. Railroads are to retain these records as long as the position and/or person is designated to be in the Hearing Conservation Program. In paragraph (e), FRA establishes a requirement that railroads maintain copies of the training materials required by § 227.119.

In paragraph (f), FRA establishes a requirement that railroads maintain lists of employees who have been found to have experienced a standard threshold shift (STS) within the prior calendar year. Railroads are to retain this list for five years. FRA seeks comment as to whether this is an appropriate amount of time for railroad to retain a list of STSs. A STS should be noted on the list

for the year in which it occurred; the STS need not be re-entered on the list for subsequent years. FRA might review this information during an inspection or audit. FRA believes that this information can help to assess the effectiveness of a railroad's HCP over time. This information is not required to be reported to FRA, nor is it considered to be an accident/incident injury or illness report, pursuant to part 225.

#### Appendices A–G

FRA proposes to adopt appendices A–F from OSHA's noise standard. With the exception of a minor edits (e.g., changing "appendix A to § 1910.95 to "appendix A to part 227"), FRA is adopting these appendices in their entirety. FRA seeks comment on that proposal.

FRA also seeks comment on whether or not it should adopt the non-mandatory Appendix G. Appendix G addresses conventional workplaces, rather than the railroad industry. As such, it does not accurately characterize the noise environment in the locomotive cab. In addition, much of the general material in Appendix G is also covered in the preamble discussion of this NPRM, and so it is unnecessary to repeat in Appendix G.

#### Appendix H—Schedule of Civil Penalties

This appendix is being reserved until the final rule. At that time, it will include a schedule of civil penalties to be used in connection with this part. Because such penalty schedules are statements of policy, notice and comment are not required prior to their issuance. See U.S.C. 553(b)(3)(A).

Nevertheless, commenters are invited to submit suggestions to FRA describing the types of actions or omissions under each regulatory section that would subject a person to the assessment of a civil penalty. Commenters are also invited to recommend what penalties may be appropriate, based upon the relative seriousness of each type of violation.

#### PART 229—RAILROAD LOCOMOTIVE SAFETY STANDARDS

##### Section 229.4 Information Collection

This section notes the provisions of this part that have been reviewed and approved by the Office of Management and Budget (OMB) for compliance with the Paperwork Reduction Act of 1995. See 44 U.S.C. 3501 *et seq.*

##### Section 229.5 Definitions

The term "Decibel" refers to a unit of measurement of sound pressure levels, and the term "dB(A)" refers to the

sound pressure levels in decibels measured on the A-weighted scale. These terms are commonly accepted and widely used by noise professionals.

The term "Excessive Noise Report," as used in § 229.121(b), refers to a report filed by a locomotive cab occupant that indicates that the locomotive is producing an unusual level of noise such that the noise significantly interferes with normal cab communications or that the noise raises a concern with respect to hearing conservation.

The term "Upper 99% Confidence Limit" is a statistical probability statement. A confidence limit refers to the lower and upper boundaries of a statistic confidence interval. A confidence interval gives an estimated range of values which is likely to include an unknown population parameter. The estimated range is calculated from a given set of sample data. For example, if the upper 99% confidence limit for the noise level of a population of locomotives is 87 dB(A), then in a sample of 100 locomotives, at least 99 will be found to have a noise level of 87 dB(A) or less.

#### *Section 229.121 Locomotive Cab Noise*

##### (a) Performance Standards for Locomotives

FRA recognizes, and commends, railroads and manufacturers for their diligent efforts and work, thus far, in making locomotives quieter. In recent years, locomotive builders have responded to industry pressure to design and build new locomotives with better sound reduction techniques and with lower noise exposure levels. Many new locomotives now have several of the following features, which reduce the cab noise exposure level: moving the horn back to the center of the locomotive; insulating the inside of the cab; insulating the cab floor; piping the exhaust of the air brake system outside of the cab; and installing air conditioning in the cab to allow cab windows to be closed.

In addition to the above features, manufacturers have developed and offered "quiet cabs," which isolate the cab occupant from noise sources of both high and low frequencies. One manufacturer, in particular, has developed a locomotive cab that is vibrationally isolated from the locomotive body, thereby resulting in substantially less noise in the cab and arguably less vibration in the cab. The manufacturer has recently discontinued offering this feature as an option. Another manufacturer has developed a locomotive design that isolates the

diesel engine, which decreases the transfer of noise and vibration throughout the locomotive. Manufacturers claim that they can achieve normal noise exposure levels of 75 dB(A) in these locomotive cabs. At the time of the issuance of this proposed rule, these units are not yet pervasive throughout the industry.

Paragraph (a)(1) of proposed § 229.121(a) establishes a design requirement for all locomotives that are manufactured after January 1, 2005. It provides that all locomotives of each design or model shall average less than or equal to 85 dB(A), with an upper 99% confidence limit of 87 dB(A). This performance standard ensures that newly-built locomotives will not produce excessive noise levels. For the most part, this section imposes requirements that reflect current equipment and design, and, therefore, they should not impose a new burden on railroads or locomotive manufacturers. FRA, at one point, had considered using the average for a fleet; however, due to the difficulty of defining the term "fleet," FRA is not using it. Instead, FRA is using the terms "design" and "model." While the term "model" tends to be accepted terminology in the U.S., the term "design" is used more internationally, and, therefore, the inclusion of both terms provides for a more complete understanding of this provision.

Paragraph (a)(1) also includes some guidelines for these build provisions. A manufacturer may determine the average by testing a representative sample of locomotives or an initial series of locomotives, provided that there are suitable manufacturing quality controls and verification procedures in place to ensure product consistency. To determine whether the standard in this regulation is met, the railroad may rely on certification from the equipment manufacturer for a production run.

Paragraph (a)(2) discusses the issue of alterations on locomotive that are manufactured in accordance with paragraph (a)(1). If the average sound level for a particular locomotive design or model is less than 82 dB(A), a railroad shall not make any alterations that cause the average sound level for that locomotive design or model to exceed 82 dB(A). If the average sound level for a particular locomotive design or model is between, or includes, 82 dB(A) to 85 dB(A), then a railroad shall not make any alterations that cause the average sound level for that locomotive design or model to increase to 85 dB(A). For purposes of the maintenance conducted pursuant to § 229.121(a), replacement in kind is not an alteration.

Replacement in kind refers to a situation where an individual removes a part and replaces that part with the identical part of the same make and model. That identical part must be of equivalent or better quality. The purpose underlying this provision is FRA's desire that railroads retain equipment's essential quiet cab status through the life of that locomotive and especially after the railroad performs maintenance on the locomotive.

In developing this recommended provision, the RSAC considered several other possible provisions. One of those provisions stated that the railroad should not alter any portion of the equipment originally designed to reduce interior noise unless the alteration essentially maintained the existing noise level or decreased the existing noise level. As that provision was somewhat vague, the Working Group sought to better define the term "alteration." FRA suggested that an alteration would be permissible if it only resulted in a modest increase in noise. A "modest increase" referred to the lesser amount as between an increase of 3 dB or 85 dB(A). In other words, an alteration must not increase the noise level by more than 3 dB. And, where the noise level was 83 dB(A), the noise level could only increase 2 dB, and where the noise level was 84 dB(A), the noise level could only increase 1 dB. In all cases, the maximum permissible noise level would be 85 dB(A). Certain railroad representatives of the Working Group disfavored this provision, because they felt that it limited their ability to conduct maintenance on equipment. To address those concerns and to produce a better defined standard, FRA is using the provision now found in the rule text, which was the provision ultimately recommended by the RSAC.

Paragraph (a)(3) directs railroads and manufacturers to conduct static testing, as specified in Appendix H. Appendix H (to part 229) contains a set of procedures for conducting in-cab static test measurements on locomotives. Through the static test, railroads and manufacturers can determine whether newly-built locomotives meet the requirements of § 229.121. The rule states that a railroad or manufacturer shall follow the Appendix H static test protocols to determine compliance with paragraph (a)(1). The rule also states that a railroad or manufacturer shall also follow the Appendix H static test protocols to determine compliance with paragraph (a)(2), but only to the extent reasonably necessary to evaluate the effect of alterations during maintenance. In sum, then, a railroad or manufacturer

must conduct static testing pursuant to (a)(1) and may conduct static testing for (a)(2) if they find it is needed.

(b) Equipment Maintenance

This section stipulates the noise-related maintenance requirements for locomotives. Paragraph (b)(1) discusses the provisions concerning an excessive noise report. When a cab occupant in a locomotive operating in service experiences an unusual noise level, he or she may file a report with the railroad. In that report, the occupant should indicate those items which he or she believes are substantially contributing to the noise. An "unusual level of noise" refers to a noise level in the cab that is much higher or much different than that to which the occupant is normally accustomed; it is, for example, a banging or squealing sound. It is, however, not just any irritating noise. Not only must the noise level be excessive and unusual, but it must also either (1) significantly interfere with normal cab communications and/or (2) raise hearing conservation concerns.

A noise level significantly interferes with normal cab communications if it prevents the locomotive cab occupants from safely and effectively conducting their job assignments. Noise can degrade job safety in several ways. Certain parameters, such as high noise levels, high-frequency noise; and intermittent, unexpected, uncontrollable, or continuous noise can jeopardize job safety by distracting, disrupting, or annoying an individual. In addition, noise can be a safety hazard if it "masks" alarm signals or warning shouts. Masking is "an increase in the threshold of audibility of one sound (the *masked* sound) caused by the presence of another sound (the *masking* sound or *masker*)." <sup>72</sup> In the railroad operating environment, the masked sound can be an alarm or warning sound, speech from a coworker or over a radio, or a sound produced by a machine (e.g., air brake exhaust, engine noise). Masking becomes a problem when an intentional or incident sound that is conveying useful information is rendered inaudible or when speech that is conveying critical information is rendered unintelligible. Where noise masks necessary speech or other warning signals, it disrupts speech, interferes with the communication, and prevents a cab occupant from safely performing his job. As these employees operate large pieces of equipment and transport

large quantities of (sometimes dangerous) materials, there are serious consequences for errors in operation.

This proposed rule does not identify the precise decibel level at which communication is deemed to have been "significantly interfered," because it is impossible to identify any single number due to the fact each individual has a different sensitivity to hearing and different susceptibility to hearing loss. Moreover, the identification of a single decibel level would be meaningless to cab occupants. As crew members do not have measurement instrumentation with them on their runs (nor do they know how to use them), the crew occupants would be unable to determine the precise decibel levels during any single run.

A noise level raises hearing conservation concerns if, for example, it causes the occupant to question the effectiveness of his or her hearing protection or if the occupant is experiencing new noise-related medical conditions such as tinnitus (i.e., a ringing, buzzing, roaring, or other sound in the ear). This proposed rule operates under the assumption that the person identifying this hearing conservation concern is an individual who has been trained in hearing protection (as most employees likely will be) and understands the basic principles of hearing protection and attenuation—that is why this person is informed enough to determine that there is a hearing conservation concern.

Upon receiving an excessive noise report, a railroad must immediately correct any conditions that are required to be immediately corrected under part 229. Examples are broken or missing windows or broken or extremely loose handholds that are hitting the car body. For all other items, the railroad could allow the locomotive to run until that locomotive's next 92 day periodic inspection (as per § 229.23). At that time, the railroad would be expected to inspect the locomotive and attempt to identify the item or items that it believes is substantially contributing to the noise. The mechanical employee inspecting the locomotive would be held to the standard of a reasonably prudent mechanical employee. Where the railroad could identify that item, FRA expects that the railroad would repair and/or replace that item. FRA understands that there might be situations where a railroad brings a locomotive to the shop and makes reasonable efforts to identify a condition but is unable to do so. FRA does not intend to penalize a railroad in those situations. The railroad shall maintain a record of the excessive noise report, as

well as records of any maintenance or attempted maintenance. (Records will be discussed further in § 229.121(b)(4)).

However, if the repair of the item supposedly contributing to the noise requires significant shop or material resources that are not readily available, the railroad is not required to repair that locomotive at the 92 day periodic inspection. In that situation, the railroad shall schedule its maintenance of that item to coincide with other major equipments repairs commonly used for the particular type of maintenance needed. The types of repairs to which FRA is referring include difficult-to-access equipment; vibration-isolating systems such as bushings or elastomers; and situations where the railroad had to replace the insulation padding under the cab or remove the insulation from the inside of the cab walls.

Paragraph (b)(2) identifies specific items which might lead a locomotive cab occupant to file an excessive noise report. These listed maintenance items, along with the design and build requirements in paragraph (a), embody the concept of OSHA's engineering controls. Whereas OSHA imposes a general requirements on employers to use engineering controls, FRA identifies specific items that railroads must address. This particular list evolved out of discussions of an engineering controls task force, a smaller group within the Working Group.<sup>73</sup> This list contains items that are likely to deteriorate over time and thus would contribute to the noise level in the cab. This includes: defective cab window seals, defective cab door seals, broken or inoperative windows, deteriorated insulation or insulation that has been removed for other reasons, and unsecured panels in the cab. The list also notes that air brakes that vent inside the cab can be a noise source.

The task force recommended these items to the Working Group, which in turn recommended them to the RSAC. The RSAC accepted this list and recommended it to FRA. FRA adopted the RSAC's list, though with one exception. FRA removed "unsecured appurtenances in the cab" from the list. FRA's existing regulations, 49 CFR 229.7, address this item, so FRA believes it is unnecessary to also include that item here. Section 229.7 identifies prohibited acts for locomotive safety standards. It provides that a locomotive and its appurtenances must be in proper condition and safe to operate.

<sup>72</sup> "Speech Communications and Signal Detection in Noise," G.S. Robinson & J.G. Casali in *The Noise Manual*, 569 (2000).

<sup>73</sup> See Section VI for a discussion of the engineering controls task force.

While some of the other listed items might appear redundant, they are, in fact, not fully addressed by FRA's existing regulations. For example, cab doors are mentioned in § 229.119(a); that section provides that "cab doors shall be equipped with a secure and operable latching device." While a secure and operable latching device is one component of a door, there are several other components to a door; some of which could result in noisy conditions, such as door hinges, missing doors, or a damaged door. Another item on the list is cab windows; they are mentioned in § 229.119(b), which provides that windows of the lead locomotive shall provide an undistorted view of the right-of-way for the crew from their normal position in the cab, and in section 223, which discusses window glazing. But there are other conditions that might exist. Worn window framing that permits a window to rattle is probably not viewed as a defect under FRA's existing regulations but it might be an unwanted noise source. The other listed items—cab window seals, cab door seals, insulation, and air brake venting—are not currently covered in this context in any of FRA's existing regulations.

Paragraph (b)(3) addresses a railroad's response to an excessive noise report. The proposed rule provides that a railroad has an obligation to respond to an excessive noise report filed by a locomotive cab occupant. This sentence makes explicit a railroad's obligation to make an appropriate response to cab occupant noise concerns. This first sentence was not part of the document which the RSAC forwarded to FRA. Rather, this sentence was added as a result of OSHA's review of this proposed rule. The rest of this section was part of the consensus document from the RSAC.

The proposed rule also provides that a railroad meets its obligation to respond to an excessive noise report if the railroad makes a good faith effort to identify the cause of the reported noise. In addition, if the railroad successfully determines the cause of the reported noise, then the railroad meets its obligation to respond to the excessive noise report if it repairs or replaces the item causing the noise.

Paragraph (b)(3) addresses a concern that railroad representatives raised during Working Group discussions. The representatives were concerned that they might be cited for violations in situations where they had inspected a condition (in response to a excessive noise report) but were unable to find a problem or where they had inspected the locomotive, identified the problem,

and repaired that problem only to later find out that the noise concern continued to persist. It is not FRA's intention to cite railroads in these situations. The purpose of this regulation is to address unusually noisy conditions in the cab and commensurate with that, to ensure that railroads make concerted, good faith efforts to identify and if possible, correct, such noisy conditions.

Paragraph (b)(4) contains the recordkeeping requirements for this section. Railroads shall maintain a record of any excessive noise reports filed pursuant to paragraph (b)(1); and any inspection, test, maintenance, replacement, or repair completed pursuant to paragraph (b)(1). In that record, the railroad shall include the date on which the excessive noise report was filed; and the date on which the inspection, test, maintenance, replacement, or repair occurred. The railroad shall note any attempts to identify conditions and any attempts to correct conditions.

Railroads shall retain these records for 92 days if they are made pursuant to § 229.21; or for 1 year if they are made pursuant to § 229.23. During RSAC discussions, several members suggested that railroads retain these records for two years. Other members suggested that a two year retention requirement was unreasonable. The RSAC discussed this two year retention option and instead decided to recommend the 92 day/1 year retention proposal. FRA adopted the RSAC's recommendation. FRA believes the 92 day/1 year retention proposal is most appropriate, because it is consistent with the retention requirements in existing FRA regulations, *i.e.*, § 229.21 ("Daily Inspection") and § 229.23 ("Periodic inspection: General").

Railroads shall establish an internal, auditable monitoring system that tracks the above-mentioned records, *i.e.*, the noise-related maintenance tasks. The system should include, at a minimum, information such as the locomotive number, the date of the complaint or inspection (from which the maintenance task arose), the items thought to have caused the problem, and the actions taken to correct the problem. These records can be maintained in writing or electronically. As this is an auditable system, FRA will review these records as part of compliance audits.

Nothing in paragraph (b) should be read to discourage or limit the use of equipment improvements or innovations that arise after publication of the final rule. In addition, nothing in paragraph (b) should be read to compromise existing duties found in

part 229 to make prompt repairs to other components and systems (*e.g.*, to malfunctioning turbo chargers) that generate noise in the cab and along the wayside.

#### Appendices D–G

Appendices D through G are being reserved for future use.

#### Appendix H

Appendix H is a set of procedures for conducting in-cab static test measurements of locomotives. Railroads and locomotive manufacturers should use this protocol to determine whether they have built and (where necessary) maintained locomotives that meet the performance standards prescribed in 49 CFR 229.121(a). In formulating this protocol, FRA looked to several sources, including the procedures used by General Electric (GE) and the Electric Motor Division (EMD) of General Motors (GM), other regulations concerning railroad noise measurement,<sup>74</sup> and various measurement manuals and technical reports on transportation noise measurement and analysis.<sup>75</sup>

FRA presented an initial draft of appendix H at a RSAC Working Group meeting in July 2002. At that meeting, the Working Group established an appendix H task force to further develop the procedures. The task force, which consisted of FRA, railroad, locomotive manufacturers, and labor representatives met several times and produced several drafts. The Task Force made recommendations to the Working Group, which in turn made recommendations to the full RSAC. RSAC ultimately recommended a version of appendix H to FRA that FRA found acceptable. FRA considered all of the factors and arguments raised in these extensive discussions and produced this appendix.

Earlier drafts of the appendix set forth procedures that covered a wide range of topics and addressed many elements associated with measurement. Those drafts contained specific provisions for data collection, compliance, environmental criteria, test site requirements, and record keeping. Most notably, those drafts contained recommended measurement practices for each of those provisions.

<sup>74</sup> See 40 CFR part 201, EPA's "Noise Emission Standards for Transportation Equipment; Interstate Rail Carriers," and 49 CFR part 210, FRA's "Railroad Noise Emission Compliance Regulation."

<sup>75</sup> See "Railroad Noise Control: The Handbook for the Measurement, Analysis, and Abatement of Railroad Noise," Report No. DOT/FRA/ORD-82/02-H (1982). See also "Measurement of Highway-Related Noise," Report No. DOT/VNTSC/FHWA-96-5 (1996).

Some members of the Working Group expressed concern with that approach. They asserted that it was unnecessary to include most of those recommended measurement practices in the protocol, since some of those recommended practices are common practices already used in the industry, are frequently incorporated in ANSI standards, and are often explained in manufacturer's instructions.<sup>76</sup>

After discussing these concerns, the Working Group reformulated its approach. The RSAC ultimately agreed with this reformulated approach and recommended it to FRA. FRA adopted that recommendation. The overall goal for appendix H changed from the development of an all-encompassing specific, step-by-step measurement procedure for testing entities to the development of a minimum set of measurement requirements necessary for compliance with § 229.121(a). The testing entities could use these requirements as a basis for developing their own more detailed measurement procedures, if they so desired. Accordingly, the recommended practices were revised, modified, and in some cases, removed. The paragraphs below will discuss many of the recommended practices that were found in the earlier versions of the appendix but have been removed from this version.

While most of these recommended practices have been removed from this document, FRA still acknowledges their utility and encourages railroads and manufacturers to use them. FRA would like to emphasize that if the agency were to conduct a compliance test (or re-test), its representatives (*i.e.*, inspectors) would probably employ many of these recommended practices, along with the minimum standards set out in appendix H. FRA is likely to use these measurement practices, because they constitute good measurement practices and add to the validity, accuracy, and repeatability of measurements. Also, FRA inspectors may not possess the extensive acoustical measurement background that some of the testing entities possess, and so the inspectors may need the additional explanation and criteria to understand the measurement protocol. As an aside, FRA notes that railroads and

manufacturers are free to use procedures that are more stringent than those provided in this protocol.

#### I. Measurement Instrumentation

This section discusses the instrumentation that should be used for conducting measurements. This testing entity shall use an integrating sound level meter (iSLM) that meets the requirements of American National Standard (ANSI) S1.43-1997, "Specification for Integrating-Averaging Sound Level Meters" and shall calibrate the iSLM with an acoustic calibrator that meets the requirements of ANSI S1.40-1984 (R1997), "Specification for Acoustical Calibrators." The testing entity should use a Type 1 instrument, but where a Type 1 instrument is not available, the testing entity may use a Type 2 instrument.

An earlier draft of the appendix included more specific calibration requirements, meter specifications, and mounting/orientation requirements. The provisions in that draft required the testing entity to follow the manufacturer's instruction for mounting and orienting the microphone; to calibrate the sound level measurement system at least annually (as well as conduct field/routine calibration); and to use iSLMs that have the capability to store for later retrieval the A-weighted, equivalent sound level and maximum sound level. In addition, the draft suggested that the testing entity use an iSLM with tripod mountings or with a secured handhold. Some members of the RSAC suggested the removal of these specific requirements. As one RSAC member explained, these provisions are not relevant to this section because they apply to procedures, not instrumentation specifications. FRA decided that, overall, the removal of these provisions would not be detrimental since most of these items are already addressed within the ANSI standard, and many of these items would be addressed in other sections of this appendix. The original draft also contained citations to certain International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) standards.<sup>77</sup> At the request of an RSAC member, FRA removed these citations. The RSAC member had explained that ISO and IEC standards were unnecessary and that the ANSI standards were sufficient. FRA seeks comment from the public on whether

FRA should only include ANSI standards or whether FRA should also include reference to these ISO and/or IEC standards.

The decision whether to require a Type 1 or Type 2 instrument generated a great deal of discussion. FRA had considered requiring the use of Type 1 instruments, because they are more precise instruments and because they are used by other U.S. DOT modes.<sup>78</sup> Some RSAC members felt strongly that testing entities should not be required to use Type 1 instruments. They asserted that the minimal benefit derived from using Type 1 instruments did not justify the expensive cost of Type 1 instruments. They asserted that there would be little variance in the readings for the two instruments, yet a Type 1 instrument would cost \$600 to \$3,000 more than a Type 2 instrument. In addition, they pointed to other noise-related federal regulations that allow the use of Type 2 devices.<sup>79</sup> After extensive discussions, the Working Group agreed to the proposal in its current state. The RSAC adopted that proposal, as did the FRA. The proposal reflects a compromise between FRA's initial preference to use Type 1 instruments and certain industry member's concerns about a Type 1 requirement.

#### II. Test Site Requirements

This section sets forth the requirements for the testing site where in-cab static measurements are conducted. This section specifies the placement of the locomotive, the installation of locomotive appurtenances, the operational requirements for locomotives, and the condition of the testing environment. Number 1 provides that a locomotive should not be positioned in an area where large reflective surfaces are directly adjacent to or within 25 feet of the locomotive cab, and number 2 provides that a locomotive should not be positioned where other locomotives or rail cars are present on directly adjacent tracks next to or within 25 feet of the locomotive cab.

In earlier drafts, FRA had considered much more specific requirements for numbers 1 and 2. An initial draft listed types of large reflective surfaces from which the test site should be free

<sup>78</sup> Federal Aviation Administration (FAA) standards require the use of Type 1 instruments. See 14 CFR part 36, Appendix G, Section G36.105(b). Federal Highway Administration (FHWA) standards recommend the use of Type 1 meters. See "Measurement of Highway-Related Noise," Report No. DOT/VNTSC/FHWA-96-5 (1996) for the specific FHWA criteria and recommendations.

<sup>79</sup> See *e.g.*, 49 CFR 393.94(c)(4); 40 CFR 201.22(a); 49 CFR 229.129(b).

<sup>76</sup> Many of the recommended practices, which were removed from this appendix, are discussed in the paragraphs below. They include the following: The SLM should be calibrated annually, and/or the SLM should be used with tripod mountings or positioned with a secure handhold. This provision was ripe for removal, since it is often covered in the manufacturer's instructions and is also discussed in ANSI S1.43-1997 (Specifications for Integrating-Averaging Sound Level Meters).

<sup>77</sup> For example, the relevant IEC standards were International Standard IEC 61672-1 (2002-05) (concerning SLMs) and International Standard IEC 60942 (1997-11) (concerning microphone windscreens and acoustic calibrators).

(barriers, hills, signboards, parked vehicles, locomotives, or rail cars on adjacent tracks, bridges, or buildings); required both sides of the locomotive to be clear of large reflective surfaces (for a minimum distance of 400 feet); and excluded locomotives and rail cars directly in front of or behind the test locomotive from that 400 foot requirement. Subsequent drafts also considered minimum distances of 100 feet, 25 feet, and zero feet. FRA decided that the 25 foot requirement was the most appropriate distance, because it did not impose a financial burden on the testing entities (as a 100 or 400 foot requirement would have) yet it still provided a minimum distance of separation between the locomotive and reflective surfaces. Also, 25 feet is a smaller distance, so it allows for an easily-duplicated test area. An earlier draft also specified track conditions (tie and ballast track that is free of track work, bridges, and trestles) and recommended the removal of all unnecessary equipment from the cab. The intent of these more restrictive provisions for numbers 1 and 2 was to ensure that there was an adequate distance between the tested locomotive and other noise sources and/or reflective surfaces. This would isolate in-cab noise (due to the locomotive) from other contaminating noise sources, which in turn, would produce the best quality measurements.

Members of the RSAC raised several concerns with these provisions. They felt that several of these requirements were ambiguous. They also explained that noise sources and reflecting objects, for the most part, affect measurements by making the in-cab noise levels higher, so if a locomotive complies with FRA's regulatory requirements when measured in these noisy circumstances, then the locomotive is performing better than expected. In addition, they stated that the creation of a specified test area free of large, reflecting surfaces and other noise sources would create an economic burden on the testing entities. Following lengthy discussions, Working Group consensus, and RSAC approval, FRA adopted the current proposal—*i.e.*, the testing entity has discretion to decide whether it wants to conduct these measurements in a test area that is free of reflecting objects and noise sources or in a test area that is a less ideal environment.

Number 3 specifies the condition of locomotive appurtenances during testing. It provides that “[a]ll windows, doors, cabinets, seals, *etc.*, must be installed in the locomotive and be closed.” Numbers 4 and 5 contain operational requirements. They specify

that a locomotive must be warmed up to standard operating temperature and that the heating/ventilation/air conditioning (HVAC) system must be operating on high. FRA has included these operational requirements to ensure that a tested locomotive's performance is typical of a normally-operating locomotive, and to ensure that any results are replicable based on a standardized locomotive operational criteria.

Number 6 provides that “[t]he locomotive shall not be tested in any site specifically designed to artificially lower in-cab noise levels.” For example, a site should not contain sound absorbent materials. This concept was originally contemplated in more specific terms, *i.e.*, the “test site railroad track shall be tie and ballast, free of special track work and bridges or trestles.” The purpose of that concept was to ensure that testing entities did not create conditions that artificially lower the noise measurements. In order to capture this concept in broader and more generic terms, the FRA proposes this provision as it is expressed now in number 6.

### III. Procedures for Measurement

This section provides detailed measurement procedures to be used during testing. Number 1 specifies the settings for the integrating-averaging sound level meter (iSLM), and number 2 describes the calibration procedure for iSLMs. Calibration is a method of validating the performance of the measurement equipment and is important because it verifies the accuracy of measurements. Both field system (routine) and laboratory (comprehensive) calibration should be conducted on iSLMs.

Number 3 identifies the four locations at which microphones should be placed and measurements taken. There are four measurements in the cab: Above the left seat, above the right seat, between the seats, and near the center of the back wall. FRA had considered the inclusion of two additional microphone positions—one above the toilet and one in the front vestibule of the locomotive cab. As explained by various RSAC members, these positions are not representative of positions inside the locomotive cab where crew members spend a substantial amount of time; they are merely transient points through which cab employees pass through to enter or exit the cab or to go to the bathroom. In addition, these locations vary by locomotive, including some locomotives that do not have these positions. Accordingly, FRA has

removed these two measurement positions.

Number 4 specifies that the individual conducting the test should be as far away as possible from the measurement microphone. This is so that the individual does not impact the measurement, *e.g.*, shield the microphone from noise sources. For the same reason, the procedure also specifies that only two people can be inside the locomotive cab during testing.

Number 5 requires the manufacturer or railroad to test a locomotive under self-loading conditions if the locomotive is equipped with self-load. The purpose of this provision is to ensure that the in-cab noise level during testing is representative of the in-cab noise level during operation (*i.e.*, under load). Conducting the test in self-load mode simulates the operation of a locomotive that is pulling cars. It is important that the noise measurements are obtained under self-load, because the locomotive is under additional stress and generates more noise. In-cab noise levels of a locomotive that is self-loaded are noticeably louder than those in a locomotive that is not self-loaded and so this provision is necessary.

If the locomotive is not equipped with the ability to operate in the self-load mode, the manufacturer or railroad shall test the locomotive with “no-load” and add three decibels to the measured level. “No-load” is defined as maximum RPM, with no electric load. The AAR submitted a report to FRA in June 2003. The report, “Locomotive Static Noise Tests,” provided data on the noise levels for locomotives that are self-loading and those that are not self-loading. The testing data showed little correlation between the condition of various cab features and noise levels, however, the data indicated a mean and median sound level difference of two decibels between locomotives under load and locomotives not under load. FRA had proposed a four decibel adjustment (*i.e.*, the mean of approximately two decibels plus one standard deviation of 1.518). The Working Group, and ultimately the RSAC, recommended an adjustment of three decibels. FRA considered the RSAC recommendation. FRA decided to use a three decibel adjustment, however FRA also is also requiring manufacturers and railroads to record the load conditions during testing. The records requirement is located in the record keeping section; it states that a testing entity should maintain records of testing conditions and procedures, including whether or not the locomotive

was tested under self loading conditions. (See section IV, number 5).

Number 6 requires manufacturers and railroads to record the sound level at the highest horsepower or throttle setting. These settings were selected, because they produce the highest noise level inside the locomotive cab.

Number 7 specifies the metric, sampling rate, and measurement duration for in-cab static measurements. The metric is the A-weighted  $L_{av}$ ; it is also referred to as  $L_{OSHA}$  and  $L_{eq(5)}$ . It represents a level of continuous constant sound that is equivalent to the same amount of A-weighted acoustic energy of the actual time-varying source.  $L_{av}$  is defined in the appendix as the equivalent sound level with a 5 dB exchange rate (with the meter set to A-weighting and slow response). Although an equation is not specified in the appendix, the definition implies the following:

$$L_{av} = 16.61 \times \log_{10} \left( \frac{1}{T} \sum_{i=1}^N t_i \times 10^{L_i/16.61} \right)$$

Where:

N = number of time intervals over which the measurements are taken,  
 $t_i$  = time duration of the I-th interval,  
 T = the total time duration of the measurement (*i.e.*: =  $t_1 + t_2 + \dots + t_N$ ),  
 $L_i$  = the A-weighted sound level of the I-th interval, and  
 $16.61 = q = [\text{Exchange Rate}] / [\log_{10}(2)]$ .

The A-weighted  $L_{av}$  sound level should be measured using a one second sampling interval for a minimum duration of 30 seconds. The sampling rate and measurement duration rate specify how often samples are taken over a specified time range and are used to compute the equivalent sound level. FRA determined that, due to the continuous nature of in-cab noise, a 30 second measurement duration was sufficient to accurately represent in-cab noise levels.

In addition to the  $L_{av}$ , FRA also considered using an A-weighted  $L_{eq}$  with a 3 dB exchange rate as the metric. The  $L_{eq}$  provides an energy-average of the noise levels during the measurement interval.

Number 8 specifies the standard for determining compliance with 49 CFR 229.121(a). It provides that the highest (*i.e.*, loudest) measurement of the four  $L_{av}$  measurements in the locomotive cab should be used as the end metric to determine whether the locomotive complies with § 229.121(a). Although this standard uses a measurement that is not representative of all four measurements in the locomotive cab, it

provides a measurement that is most representative of how loud it can be in a locomotive cab. It accounts for the worse noise levels in the locomotive cab. Also, the 'highest  $L_{av}$  standard' has the advantage of requiring little processing. In addition, locomotive manufacturers currently use the 'highest  $L_{av}$  standard.'

Before deciding on the 'highest  $L_{av}$  standard,' FRA also considered energy-averaging across the four measurement positions. While energy-averaging is a very good representation of the overall noise levels in the locomotive cab (because it averages together all the energy levels), averaging, in general, is not representative of the worst, or loudest, noise levels in the cab. FRA seeks comment on the appropriateness of its decision to use the 'highest  $L_{av}$  standard.' Number 9 provides that if a locomotive fails to meet the requirements of § 229.121, the locomotive may be re-tested according to the requirements of Section II of this appendix, "Test Site Requirements." This concept originated as a provision allowing a re-test in an area free of reflective surfaces and noise sources for a locomotive that fails a test. That provision provided that: "If the test fails under original acoustical field conditions, adverse weather, or other factors that may have contributed to the failure, the test may be repeated in an acoustic free field, fair weather, etc." RSAC members explained that railroads and manufacturers already conduct these types of tests, and they wanted to ensure that this appendix allowed them to continue doing so. As an alternative to that provision, the RSAC considered permitting such a test as long as the test area was well-defined, *e.g.*, where the test area was defined as an area free of large reflecting surfaces or noise sources and that there was a minimum distance of 200 feet around the locomotive. That proposal was also rejected, because some RSAC members felt that the 200-foot minimum distance was too restrictive.

Ultimately, then, FRA decided to include the provision contained here in number 9 (in the "Procedures for Measurement" section); it provides that a railroad or manufacturer may re-test a locomotive if that locomotive fails a static test. FRA also decided that the testing entity must record the suspected reason for the failure in its records. That requirement is located in the record keeping section (*see* section IV, number 7).

#### IV. Record Keeping

This section requires testing entities to maintain records of their testing.

They must retain these records for a minimum of three years and may keep these records in either written or electronic form. Those records include: the name of the person conducting the test and date of the test; the description of the tested locomotive; the description of the sound level meter and calibrator; the recorded measurement during calibration and for each microphone location during operating conditions; any other information necessary to describe the testing conditions and procedures (*e.g.*, whether the locomotive was tested under self-loading conditions); and, where applicable, the suspected reason for a test failure (where a locomotive fails a test and can be re-tested under section III(9)).

#### V. Removed Sections

There were several provisions which were considered but ultimately were not included in the appendix. In particular, there were two notable sections: Environmental Criteria and Quantities Measured, as well as the requirement of pre- and post-background testing.

##### A. Environmental Criteria

The Environmental Criteria specified optimal meteorological conditions that should be followed during testing. The criteria provided that meteorological conditions, such as precipitation or wind, should not interact with the locomotive or rail car such that they are audible from within the cab. The purpose of specifying this criteria was to prevent those factors from interfering with the measurements and invalidating the test. In general, conducting noise measurements under favorable meteorological conditions is a good, and common, practice. However, some RSAC members believed that these conditions should be left up to the testing entity's best judgement. Moreover, they asserted that they did not believe that entities would conduct noise testing during severe weather conditions that would be audible in the cab. Because these conditions would only serve to raise the noise level inside the cab (and would only make it more difficult, not easier, for a locomotive to pass a test), this requirement was not included in the appendix.

The Environmental Criteria also provided that the air temperature and relative humidity inside the cab should be within the manufacturer's recommended operational ranges for the iSLM or the individual measurement instrumentation. This requirement was initially placed in the appendix to account for the temperature and humidity restrictions specified by

microphone and acoustic measurement instrumentation manufacturers in their supplemental literature. Members of the RSAC acknowledged that these restrictions are mentioned in the ANSI standard and are part of the proper operation of a sound level meter. As a result, FRA decided that it was unnecessary to repeat these requirements in this appendix.

#### *B. Quantities Measured*

The "Quantities Measured" section specified the metrics that should be used in the measurement procedure. It noted that all instances of exterior noise contamination that is audible inside the cab should be noted and that any noise level above 115 dB(A) would invalidate the noise test. All of the information contained in this section was already stated in other parts of the appendix and NPRM, so FRA decided to simplify the appendix and remove this section.

#### *C. Pre- and Post-Background Testing*

FRA had considered pre- and post-background testing requirements. There was much discussion about this requirement, and ultimately, the RSAC recommended not to include it in this protocol. In an early proposal, this provision required manufacturers and railroads to observe the sound levels before and after the static test measurements (at each of the in-cab measurement locations) and ensure that those sound levels were at least 10 dB(A) below the sound level observed during the in-cab static measurements. Manufacturers and railroads were to measure the pre- and post-tests when the locomotive was shut down, and the sound level measurements were to be representative of the ambient noise in the cab during the test. In a later revised form, this provision required manufacturers and railroads to establish baseline noise levels in the cab (on a locomotive that has been shut down) after completing the testing at the high horsepower/throttle setting.

FRA presented this requirement because of the utility of background noise measurements; they provide key pieces of information that can be vital to the procedure and the validity of the measurements. First, pre- and post-noise measurements ensure that ambient noise does not interfere with the test measurement. If the background noise is the same (or at least very similar) during the pre- and post-background noise measurement, one can infer that the background noise did not impact the noise measurement test. Second, pre- and post-testing, along with notation of extraneous noise contamination during the test measurement, ensures that the

measurements are not affected by additional noise sources that are atypical of the in-cab noise environment. If there is a variation between the pre- and post-noise measurements and there are notations of extraneous noises during the test measurement, that might indicate that there were changes in the test environment (*e.g.*, changing weather conditions, additional noise sources, etc.). Third, the use of pre- and post-testing ensures that the measurements obtained are actually from the source that is being measured. They ensure that the sound levels measured in the locomotive cab are actually due to the loaded locomotive, and not due to some other noise source.

Several RSAC members did not want to include a pre- and post-background noise measurement requirement in the appendix. They explained that they were not concerned with background noise if it did not impact the locomotive's ability to pass the test. They further asserted that a background noise level shift, even if it were 10 dB or more, is still probably below the criterion level and thus, is most likely irrelevant to whether or not the locomotive meets the criteria of this protocol. They also explained that, if there were external noise occurrences during the static test and those external noise occurrences affected the test, then the testing entity would simply conduct another test. Finding these arguments persuasive, FRA has decided to remove the pre- and post-background testing requirement, in accordance with RSAC's recommendation.

### **X. Regulatory Impact and Notices**

#### *A. Executive Order 12866 and DOT Regulatory Policies and Procedures*

This rule has been evaluated in accordance with existing policies and procedures and determined to be non-significant according to DOT policies and procedures and "other significant" pursuant to Executive Order 12866 (44 FR 11034; February 26, 1979). FRA has prepared and placed in the docket a regulatory analysis addressing the economic impact of this proposed rule. Document inspection and copying facilities are available at Room PL-401 on the plaza level of the Nassif Building, U.S. Department of Transportation, 400 Seventh Street, SW., Washington, DC. Photocopies may also be obtained by submitting a written request to the Docket Management Facility; U.S. Department of Transportation, 400 Seventh Street, SW., Nassif Building, Room PL-401, Washington, DC 20590-001. In addition, all documents

supporting this rule are available online at <http://dms.dot.gov>.

As part of the regulatory impact analysis, FRA has assessed quantitative measurements of costs expected from this proposed rule. Over a twenty year period, the Present Value (PV) of the estimated costs is \$15.4 million. The analysis also includes qualitative discussions and quantified examples of the benefits of this proposed rule. The analysis concludes that an average savings of 24 noise-induced hearing loss cases per year would cover the average annual costs of the proposed rule.

The costs anticipated for this proposed rule include: implementation of noise monitoring programs, implementation of hearing conservation programs, audiometric testing, hearing protection, hearing conservation training programs, and additional locomotive maintenance related to noise issues.

The major benefit anticipated for this proposed rule will be the savings from a reduction in noise-induced hearing loss cases among railroad operating employees. Other quantifiable benefits include: reductions in employee absenteeism due to noise exposures, reductions in employee injuries related to noise exposures, and reductions in human factor caused train accidents. In addition, qualitative benefits should accrue from improved cab crew communications, including: increased employee performance due to decreased noise exposures; decreased vision issues related to noise exposures; and decreased stress and fatigue.

#### *B. Regulatory Flexibility Act of 1980 and Executive Order 13272*

The Regulatory Flexibility Act of 1980 (5 U.S.C. 601 *et seq.*) requires Federal agencies to review proposed and final rules to assess their impact on small entities. FRA has prepared and placed in the docket an Initial Regulatory Flexibility Assessment (IRFA), which assesses the impact of this proposed rule on small entities. Document inspection and copying facilities are available at Room PL-401 on the plaza level of the Nassif Building, U.S. Department of Transportation, 400 Seventh Street, SW., Washington, DC. Photocopies may also be obtained by submitting a written request to the Docket Management Facility; U.S. Department of Transportation, 400 Seventh Street, SW., Nassif Building, Room PL-401, Washington, DC 20590.

Executive Order No. 13272, "Proper Consideration of Small Entities in Agency Rulemaking," requires federal agencies, among other things, to notify the Chief Counsel for Advocacy of the

Small Business Administration (SBA) of any of its draft rules that will have a significant economic impact on a substantial number of small entities. The Executive Order also requires federal agencies to consider any comments provided by the SBA and to include in the preamble to the rule the agency's response to any written comments by the SBA, unless the agency head certifies that the inclusion of such material would not serve the public interest. 67 FR 53461 (Aug. 16, 2002).

The U.S. Small Business Administration (SBA) stipulates that the largest that a "for-profit" railroad business firm may be, and still be classified as a "small entity," is 1,500 employees for "Line-Haul Operating" Railroads and 500 employees for "Switching and Terminal Establishments."<sup>80</sup> "Small entity" is defined in 5 U.S.C. 601 as a small business concern that is independently owned and operated and is not dominant in its field of operation. SBA's "size standards" may be altered by Federal agencies, upon consultation with SBA and in conjunction with public comment. Pursuant to that authority, FRA has published a final policy which formally establishes "small entities" as railroads that meet the line haulage revenue requirements of a Class III railroad.<sup>81</sup> The revenue requirements are currently \$20 million or less in annual operating revenue. The \$20 million limit (which is adjusted by applying the railroad revenue deflator adjustment)<sup>82</sup> is based on the Surface Transportation Board's (STB) threshold for a Class III railroad carrier. FRA uses the same revenue dollar limit to determine whether a railroad shipper or contractor is a small entity.

However, in this rulemaking, FRA proposes to define small entities by annual employee hours. A small entity is one that has "less than 400,000 annual employee hours." FRA has used this definition in the past (*e.g.*, 49 CFR parts 217, 219, and 220) to alleviate reporting requirements. By using this definition, FRA is capturing most small entities that would be defined by the SBA as small businesses. FRA proposes to use this alternative definition of "small entity" in this proposed rulemaking and requests comments on its use.

<sup>80</sup> See "Table of Size Standards," U.S. Small Business Administration, 13 CFR part 121.

<sup>81</sup> See "Final Policy Statement Concerning Small Entities Subject to the Railroad Safety Laws" (68 FR 24891; May 9, 2003).

<sup>82</sup> For further information on the calculation of the specific dollar limit please, see 49 CFR part 1201.

FRA has identified approximately 410 small railroads that could potentially be affected by this proposed regulation.<sup>83</sup> FRA does not expect this regulation to impose a significant burden on these small railroads. In addition, FRA does not require Tourist, Steam or Historic operations to meet any of the proposed requirements. As a result, approximately 220 very small railroad operations will incur no burden from this proposed rulemaking.

Additionally, this proposed rule does not extend to contractors who operate historic equipment in occasional service, as long as those contractors have been provided with hearing protection and are required (where necessary) to use the hearing protection while operating the historic equipment. These contractors tend to work for very small businesses, and these contractors are likely to be current, former, or retired railroad employees. These operations would certainly be classified as small businesses. FRA does not know how many of these types of operations could potentially be affected by this proposed rule. However, since FRA's proposed regulation does not extend coverage to these operations, none of them will be impacted.

FRA's proposed rule requires railroads to establish a hearing conservation program for railroad operating employees who have noise exposures that equal or exceed an 8-hour time-weighted average of 85 dB(A), *i.e.*, the action level. Railroad noise monitoring data<sup>84</sup> indicates that only about 45 percent of the employee assignments would require inclusion in a hearing conservation program. Therefore, FRA expects that less than 50 percent of the affected employees on small railroads will be included in a hearing conservation program. FRA expects that after initial noise exposure monitoring, some small railroads will not need to establish hearing conservation programs, because none of their work assignments will meet or exceed the action level.

This proposed rule contains a few reporting and recordkeeping requirements. The requirements primarily involve records that are needed for medical purposes, compliance assessment, and program evaluation.

The impacts of this proposed rule result primarily from the requirements of the hearing conservation program. In

<sup>83</sup> 680 railroads—220 (tourist, steam & historic) railroads—50 (large, medium, passenger, and commuter) railroads = 410 railroads.

<sup>84</sup> See FRA's Regulatory Impact Analysis, Appendix C.

general, the costs are proportional to the number of employees affected. Thus, the impact on small entities (which have fewer employees) should be less than that on medium and large railroads. In addition, most large and some medium railroads currently have voluntary and/or OSHA hearing conservation programs, which eases compliance with this proposed rule. FRA anticipates that the burdens will result from developing hearing conservation programs, conducting noise monitoring, providing hearing protectors, and maintaining locomotives in response to excessive noise reports.

The two requirements that have the greatest impact are (1) the audiometric testing requirement and (2) the training requirement. FRA's proposed audiometric testing program section requires railroads to establish and maintain an audiometric testing program for employees that are covered by the hearing conservation program. It requires railroads to establish a baseline audiogram and then to conduct periodic audiograms. It also specifies requirements for conducting, evaluating, and following-up with the audiograms. FRA estimates that the average cost of audiograms (*i.e.*, hearing tests) is \$40 each, and that each audiogram will take an average of 25 minutes. FRA also proposes to require railroads to conduct periodic audiometric testing of covered employees at least once every three years. FRA requires railroads to offer audiograms to all covered employees annually.

FRA's training program, in general, is similar to OSHA's hearing conservation training program. FRA requires each employee to complete the hearing training program at least once every three years. By contrast, OSHA requires employees to complete a hearing training program at least once a year. FRA's triennial training requirement is consistent with OSHA's triennial audiometric testing requirement. FRA anticipates that the American Short Line and Regional Railroad Association (ASLRRA) will develop a generic training program for its members, which will ease the burden on small entities.

With respect to compliance, smaller railroads will have more time to comply. Railroads with less than 400,000 employee hours will receive additional time to comply with the three most significant burdens and costs. First, these railroads will have an additional 18 months to establish hearing conservation programs. Second, these railroads will have an additional year (12 months) to establish valid baseline audiograms for employees that have been placed in the FRA hearing

conservation program. Third, these railroads will have an additional year (12 months) to establish hearing conservation training programs.

The rulemaking process for this proposed rule included outreach to small entities. This NPRM was produced in conjunction with the Railroad Safety Advisory Committee (RSAC). Representation on RSAC included the ASLRRRA.

The IRFA concludes that this proposed rule will not have a significant economic impact on a substantial number of small entities. In order to determine the significance of the

economic impact for the final rule's Regulatory Flexibility Assessment (RFA), FRA will review the comments from all interested parties on the potential economic impact on small entities of this proposed rulemaking. FRA will consider the comments, or lack thereof, when making a decision on the RFA for the final rule.

As noted above, Executive Order No. 13272 requires Federal agencies to notify SBA Office of Advocacy of any of its draft rules that would have a significant economic impact on a substantial number of small entities. Since FRA has determined that this

proposed rule will not have significant impact on a substantial number of small entities, FRA has not provided notification to SBA.

*C. Paperwork Reduction Act of 1995*

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act of 1995, 44 U.S.C. 3501 *et seq.* The sections that contain the new information collection requirements and the estimated time to fulfill each requirement are as follows:

CFR Section—49	Respondent universe	Total annual responses	Average time per response	Total annual burden hours	Total annual burden cost
227.13—Waivers	460 Railroads	5 petitions	1 hour	5	\$175
227.103—Noise Monitoring Program	460 Railroads	460 programs	2 hours/8 hours/600 hours	5,165	0 (incl. in RIA)
—Notification to Employee of Monitoring.	460 Railroads	905 lists	30 minutes	453	15,855
127.107—Hearing Conservation Program (HCP).	460 Railroads	461 HCPs	150 hrs/2 hrs/31 hrs/7.5 hours	2,875	0 (incl. in RIA)
227.109—Audiometric Testing Prog.—Existing Empl.	78,000 Employees	60,000 audiogram + 18,000 audiogram.	7 min/25 min.	7,000 + 7,500.	0 (incl. in RIA)
—Periodic Audiograms	78,000 Employees	8,000 audiograms	25 minutes	3,333	0 (incl. in RIA)
—Evaluation of Audiograms	78,000 Employees	2,000 evaluations + 420 retests	6 min/2.5 hours	1,250	0 (incl. in RIA)
—Problem Audiograms	8,000 Employees	450 documents	10 minutes	8	280
—Follow-up Procedures—Notifications.	8,000 Employees	280 notifications	15 minutes	70	2,450
—Fitting/Training of Employees: Hearing Protectors.	240 Employees	240 training sess.	2 minutes	8	0 (incl. in RIA)
—Referrals For Clinical/Otological Examinations.	240 Employees	20 referrals/result	2 hours	40	4,800
—Notification to Employee of Need: Otological Exam.	240 Employees	20 notifications	5 minutes	2	70
—New Audiometric Interpretation	240 Employees	20 notifications	20 notifications	2	70
227.111—Audiometric Test Requirements.	1,000 Mobile Vans	1,000 tests	45 minutes	750	52,500
227.117—Hearing Protection Attenuation—Evaluation.	460 Railroads	50 evaluations	30 minutes	25	1,750
—Re-Evaluations	460 Railroads	10 re-evaluations	30 minutes	5	350
227.119—Hearing Conservation Training Prog—Development.	460 Railroads	461 programs	8 hours/2 hours/116 hours/75 hour.	891	0 (incl. in RIA)
—Employee Training	460 Railroads	18,000 trained employees	30 minutes	9,000	0 (incl. in RIA)
227.121—Record Keeping—Authorization: Records.	460 Railroads	10 requests + 10 responses	10 min. + 15 min.	4	104
229.121—Locomotive Cab Noise—Tests/Certifications.	3 Equipment Manuf.	700 tests/certific.	40 min. + 5 min.	111	7,770
—Equipment Maintenance: Excessive Noise Reports.	460 Railroads	3,000 reports + 3,000 records	10 min + 5min.	750	21,750
—Maintenance Records	460 Railroads	2,250 records	8 minutes	300	0 (incl. in RIA)
—Internal Auditable Monitoring Systems.	460 Railroads	460 systems	36 min. +8.25 hour	506	0 (incl. in RIA)
Appendix H—Static Test Protocols/Records.	700 Locomotives	2 retests + 2 rec.	35 min. + 5 min.	1	0 (incl. in RIA)

All estimates include the time for reviewing instructions; searching existing data sources; gathering or maintaining the needed data; and reviewing the information. Pursuant to 44 U.S.C. 3506(c)(2)(B), FRA solicits comments concerning: Whether these information collection requirements are necessary for the proper performance of the functions of FRA, including whether the information has practical utility; the accuracy of FRA's estimates of the burden of the information collection requirements; the quality, utility, and

clarity of the information to be collected; and whether the burden of collection of information on those who are to respond, including through the use of automated collection techniques or other forms of information technology, may be minimized. For information or a copy of the paperwork package submitted to OMB, contact Mr. Robert Brogan, Information Clearance Officer, at 202-493-6292.

Organizations and individuals desiring to submit comments on the collection of information requirements

should direct them to Mr. Robert Brogan, Federal Railroad Administration, 1120 Vermont Avenue, NW., Mail Stop 17, Washington, DC 20590. Comments may also be submitted via e-mail to Mr. Brogan at the following address: [Robert.Brogan@fra.dot.gov](mailto:Robert.Brogan@fra.dot.gov).

OMB is required to make a decision concerning the collection of information requirements contained in this proposed 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. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

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

#### D. Federalism Implications

FRA has analyzed this proposed rule in accordance with the principles and criteria contained in Executive Order 13132 issued on August 4, 1999, which directs Federal agencies to exercise great care in establishing policies that have federalism implications. See 64 FR 43255.

The RSAC, which recommended the proposed rule, has as permanent members two organizations representing State and local interests: the American Association of State Highway and Transportation Officials (AASHTO) and the Association of State Rail Safety Managers (ASRSM). The RSAC regularly provides recommendations to the FRA Administrator for solutions to regulatory issues that reflect significant input from its State members. From the absence of further comment from these representatives, or of any other representatives of State government, FRA concludes that this proposed rule has no federalism implications.

#### E. Environmental Impact

FRA has evaluated these regulations 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. This proposed rule meets the criteria that establish this as a non-major action for environmental purposes.

#### F. Unfunded Mandates Reform Act of 1995

Pursuant to Section 201 of the Unfunded Mandates Reform Act of 1995 (Pub. L. 104-4, 2 U.S.C. 1531), each Federal agency "shall, unless otherwise prohibited by law, assess the effects of Federal regulatory actions on State,

local, and tribal governments, and the private sector (other than to the extent that such regulations incorporate requirements specifically set forth in law)." Section 202 of the Act (2 U.S.C. 1532) further requires that "before promulgating any general notice of proposed rulemaking that is likely to result in the promulgation of any rule that includes any Federal mandate that may result in the expenditure by State, local, and tribal governments, in the aggregate, or by the private sector, of \$100,000,000 or more (adjusted annually for inflation) in any 1 year, and before promulgating any final rule for which a general notice of proposed rulemaking was published, the agency shall prepare a written statement" detailing the effect on State, local, and tribal governments and the private sector. This proposed rule will not result in the expenditure, in the aggregate, of \$100,000,000 or more in any one year, and thus preparation of such a statement is not required.

#### G. Energy Impact

Executive Order 13211 requires Federal agencies to prepare a Statement of Energy Effects for any "significant energy action." See 66 FR 28355; May 22, 2001. Under the Executive Order a "significant energy action" is defined as any action by an agency that promulgates or is expected to lead to the promulgation of a final rule or regulation, including notices of inquiry, advance notices of proposed rulemaking, and notices of proposed rulemaking: (1)(i) That is a significant regulatory action under Executive Order 12866 or any successor order, and (ii) is likely to have a significant adverse effect on the supply, distribution, or use of energy; or (2) that is designated by the Administrator of the Office of Information and Regulatory Affairs as a significant energy action. FRA has evaluated this final rule in accordance with Executive Order 13211. FRA has determined that this proposed rule is not likely to have a significant adverse effect on the supply, distribution, or use of energy. Consequently, FRA has determined that this proposed rule is not a "significant energy action" within the meaning of the Executive Order.

#### H. Privacy Act

Anyone is able to search the electronic form of all comments received into any of DOT's dockets by the name of the individual submitting the comment (or signing the comment, if submitted on behalf of an association, business, labor union, etc). You may review DOT's complete Privacy Act Statement published in the **Federal**

**Register** on April 11, 2000 (Volume 65, Number 70, Pages 19477-78) or you may visit <http://dms.dot.gov>.

#### List of Subjects

##### 49 CFR Part 227

Locomotives, Noise control, Occupational safety and health, Penalties, Railroad safety, Reporting and recordkeeping requirements.

##### 49 CFR Part 229

Locomotives, Penalties, Railroad safety, Reporting and recordkeeping requirements.

#### The Proposed Rule

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

#### PART 227—OCCUPATIONAL NOISE EXPOSURE

1. Part 227 is added to read as follows:

##### Subpart A—General

- Sec.
- 227.1 Purpose and scope.
- 227.3 Application.
- 227.5 Definitions.
- 227.7 Preemptive effect.
- 227.9 Penalties.
- 227.11 Responsibility for compliance.
- 227.13 Waivers.
- 227.15 Information collection.

##### Subpart B—Occupational Noise Exposure for Railroad Operating Employees

- 227.101 Scope.
- 227.103 Noise monitoring program.
- 227.105 Protection of Employees.
- 227.107 Hearing conservation program.
- 227.109 Audiometric testing program.
- 227.111 Audiometric test requirements.
- 227.113 Noise operational controls.
- 227.115 Hearing protectors.
- 227.117 Hearing protector attenuation.
- 227.119 Training program.
- 227.121 Recordkeeping.
- Appendix A to Part 227—Noise Exposure Computation
- Appendix B to Part 227—Methods for Estimating the Adequacy of Hearing Protector Attenuation
- Appendix C to Part 227—Audiometric Measuring Instruments
- Appendix D to Part 227—Audiometric Test Rooms
- Appendix E to Part 227—Acoustic Calibration of Audiometers
- Appendix F to Part 227—Calculations and Application of Age Corrections to Audiograms
- Appendix G to Part 227—Monitoring Noise Levels
- Appendix H to Part 227—Schedule of Civil Penalties [Reserved]

**Authority:** 49 U.S.C. 20103, 20103 (note), 20701-20702; 49 CFR 1.49.

**Subpart A—General****§ 227.1 Purpose and scope.**

(a) The purpose of this part is to protect the occupational health and safety of employees whose predominant noise exposure occurs in the locomotive cab.

(b) This part prescribes minimum Federal health and safety standards for specified workplace safety subjects. This part does not restrict a railroad or railroad contractor from adopting and enforcing additional or more stringent requirements.

**§ 227.3 Application.**

(a) Except as provided in paragraph (b) of this section, this part applies to all railroads.

(b) This part does not apply to—

(1) A railroad that operates only on track inside an installation that is not part of the general railroad system of transportation;

(2) A rapid transit operation in an urban area that is not connected to the general railroad system of transportation;

(3) A railroad that operates tourist, scenic, historic, or excursion operations, whether on or off the general railroad system of transportation; or

(4) Employees of a foreign railroad whose primary reporting point is outside the U.S. while operating trains or conducting switching operations in the U.S. if: the government of that foreign railroad has implemented requirements for hearing conservation for railroad employees; the foreign railroad undertakes to comply with those requirements while operating within the U.S.; and FRA's Associate Administrator for Safety determines that the foreign requirements are consistent with the purpose and scope of this part 227. A "foreign railroad" refers to a railroad that is incorporated in a place outside the United States and is operated out of a foreign country but operates for some distance in the U.S.

**§ 227.5 Definitions.**

As used in this part—

*Action level* means an eight-hour time-weighted-average sound level (TWA) of 85 dB(A), or, equivalently, a dose of 50 percent, integrating all sound levels from 80 dB(A) to 130 dB(A).

*Administrator* means the Administrator of the Federal Railroad Administration or the Administrator's delegate.

*Artifact* means any signal received or recorded by a noise measuring instrument that is not related to occupational noise exposure and may adversely impact the accuracy of the occupational noise measurement.

*Audiologist* means a professional, specializing in the study and rehabilitation of hearing, who is certified by the American Speech-Language-Hearing Association (ASHA), or licensed by a state board of examiners.

*Baseline audiogram* means an audiogram, recorded in accordance with § 227.109, against which subsequent audiograms are compared to determine the extent of change of hearing level.

*Class I, Class II, and Class III railroads* have the meaning assigned by the regulations of the Surface Transportation Board (49 CFR part 120; General Instructions 1–1).

*Continuous noise* means variations in sound level that involve maxima at intervals of 1 second or less.

*Decibel (dB)* means a unit of measurement of sound pressure levels.

*dB(A)* means the sound pressure level in decibels measured on the A-weighted scale.

*Employee* means any individual who is engaged or compensated by a railroad or by a contractor to a railroad to perform any of the duties defined in this part.

*Exchange rate* means the change in sound level, in decibels, which would require halving or doubling of the allowable exposure time to maintain the same noise dose. For purposes of this part, the exchange rate is 5 decibels.

*FRA* means the Federal Railroad Administration.

*Hearing protector* means any device or material, which is capable of being worn on the head or in the ear canal, is designed wholly or in part to reduce the level of sound entering the ear, and has a scientifically accepted indicator of its noise reduction value.

*Hertz (Hz)* means a unit of measurement of frequency numerically equal to cycles per second.

*Medical pathology* means a condition or disease affecting the ear, which is medically or surgically treatable.

*Noise operational controls* means a method used to reduce noise exposure, other than hearing protectors or equipment modifications, by reducing the time a person is exposed to excessive noise.

*Occasional service* means service of not more than a total of 20 days in a calendar year.

*Otolaryngologist* means a physician specializing in diagnosis and treatment of disorders of the ear, nose, and throat.

*Periodic audiogram* is a follow-up audiogram conducted at regular intervals after the baseline audiogram.

*Person* means an entity of any type covered under 1 U.S.C. 1, including but not limited to the following: A railroad;

a manager, supervisor, official, or other employee or agent of a railroad; an owner, manufacturer, lessor, or lessee of railroad equipment, track, or facilities; an independent contractor providing goods or services to a railroad; and any employee of such owner, manufacturer, lessor, lessee, or independent contractor.

*Railroad* means any form of non-highway ground transportation that runs on rails or electromagnetic guide-ways and any entity providing such transportation, including:

(1) Commuter or other short-haul

railroad passenger service in a metropolitan or suburban area and commuter railroad service that was operated by the Consolidated Rail Corporation on January 1, 1979; and

(2) High speed ground transportation systems that connect metropolitan areas, without regard to whether those systems use new technologies not associated with traditional railroads. The term "railroad" is also intended to mean a person that provides transportation by railroad, whether directly or by contracting out operation of the railroad to another person. The term does not include rapid transit operations in an urban area that are not connected to the general railroad system of transportation.

*Representative personal sampling* means measurement of an employee's noise exposure that is representative of the exposures of other employees who operate similar equipment under similar conditions.

*Sound level or Sound pressure level* means ten times the common logarithm of the ratio of the square of the measured A-weighted sound pressure to the square of the standard reference pressure of twenty micropascals, measured in decibels. For purposes of this part, SLOW time response, in accordance with American National Standard (ANSI) S1.43–1997 or its successor, is required.

*Standard threshold shift* means a change in hearing sensitivity for the worse, relative to the baseline audiogram, or relative to the most recent revised baseline (where one has been established), of an average of 10 dB or more at 2000, 3000, and 4000 Hz in either ear.

*Time-weighted-average eight-hour (or 8-hour TWA)* means the sound level, which, if constant over 8 hours, would result in the same noise dose as is measured. For purposes of this part, the exchange rate is 5 decibels.

*Tourist, scenic, historic, or excursion operations* means railroad operations that carry passengers, often using antiquated equipment, with the

conveyance of the passengers to a particular destination not being the principal purpose.

#### § 227.7 Preemptive effect.

Under 49 U.S.C. 20106, issuance of the regulations in this part preempts any State law, regulation, or order covering the same subject matter, except an additional or more stringent law, regulation, or order that is necessary to eliminate or reduce an essentially local safety hazard; is not incompatible with a law, regulation, or order of the United States Government; and does not impose an unreasonable burden on interstate commerce.

#### § 227.9 Penalties.

(a) Any person who violates any requirement of this part or causes the violation of any such requirement is subject to a civil penalty of at least \$500 and not more than \$11,000 per violation, except that: Penalties may be assessed against individuals only for willful violations, and, where a grossly negligent violation or a pattern of repeated violations has created an imminent hazard of death or injury to persons, or has caused death or injury, a penalty not to exceed \$22,000 per violation may be assessed. Each day a violation continues shall constitute a separate offense. See Appendix H to this part for a statement of agency civil penalty policy.

(b) Any person who knowingly and willfully falsifies a record or report required by this part may be subject to criminal penalties under 49 U.S.C. 21311.

#### § 227.11 Responsibility for compliance.

Although the duties imposed by this part are generally stated in terms of the duty of a railroad, any person, including a contractor for a railroad, who performs any function covered by this part must perform that function in accordance with this part.

#### § 227.13 Waivers.

(a) A person subject to a requirement of this part may petition the Administrator for a waiver of compliance with such requirement. The filing of such a petition does not affect that person's responsibility for compliance with that requirement while the petition is being considered.

(b) Each petition for waiver under this section must be filed in the manner and contain the information required by 49 CFR part 211.

(c) If the Administrator finds that a waiver of compliance is in the public interest and is consistent with railroad safety, the Administrator may grant the

waiver subject to any conditions the Administrator deems necessary.

#### § 227.15 Information collection.

(a) The information collection requirements of this part were reviewed by the Office of Management and Budget pursuant to the Paperwork Reduction Act of 1980 (44 U.S.C. 3501 *et seq.*) and are assigned OMB control number 2130-NEW.

(b) The information collection requirements are found in the following sections: §§ 227.13, 227.103, 227.107, 227.109, 227.111, 227.117, 227.119, and 227.121.

### Subpart B—Occupational Noise Exposure for Railroad Operating Employees

#### § 227.101 Scope.

(a) This subpart shall apply to the working conditions of—

(1) Any person who regularly performs service subject to the provisions of the hours of service laws governing “train employees” (see 49 U.S.C. 21101(5) and 21103), but does not apply to:

(i) Employees who move locomotives only within the confines of locomotive repair or servicing areas, as provided in 49 CFR 218.5 and 218.29(a), or

(ii) Employees who move a locomotive or group of locomotives for distances of less than 100 feet and this incidental movement of a locomotive or locomotives is for inspection or maintenance purposes, or

(iii) Contractors who operate historic equipment in occasional service, provided that the contractors have been provided with hearing protectors and, where necessary, are required to use the hearing protectors while operating the historic equipment;

(2) Any direct supervisor of the persons described in paragraph (a)(1) of this section whose duties require frequent work in the locomotive cab; and

(3) At the election of the railroad, any other person (including a person excluded by paragraph (a)(1) of this section) whose duties require frequent work in the locomotive cab and whose primary noise exposure is reasonably expected to be experienced in the cab, if the position occupied by such person is designated in writing by the railroad, as required by § 227.121(d).

(b) Occupational noise exposure and hearing conservation for employees not covered by this subpart is governed by the appropriate occupational noise exposure regulation of the U.S. Department of Labor, Occupational Safety and Health Administration (29 CFR part 1910).

#### § 227.103 Noise monitoring program.

(a) No later than [12 months after the effective date of the final rule] for class 1, passenger, and commuter railroads; [18 months after the effective date of the final rule] for railroads with 400,000 or more employee hours; and [30 months after the effective date of the final rule] for railroads with fewer than 400,000 employee hours, each railroad shall develop and implement a noise monitoring program to determine whether any employee covered by the scope of this subpart may be exposed to noise that may equal or exceed an 8-hour TWA of 85 dB(A).

(b) Sampling strategy. (1) In its monitoring program, the railroad shall use a sampling strategy that is designed to identify employees for inclusion in the hearing conservation program and to enable the proper selection of hearing protection.

(2) Where circumstances such as high worker mobility, significant variations in sound level, or a significant component of impulse noise make area monitoring generally inappropriate, the railroad shall use representative personal sampling to comply with the monitoring requirements of this section, unless the railroad can show that area sampling produces equivalent results.

(c) Noise measurements. (1) All continuous, intermittent, and impulse sound levels from 80 decibels to 130 decibels shall be integrated into the noise measurements.

(2) Noise measurements shall be made under typical operating conditions using a sound level meter conforming, at a minimum, to the requirements of ANSI S1.4-1983 (R2001), Type 2, and set to an A-weighted SLOW response; or using an integrated sound level meter conforming, at a minimum, to the requirements of ANSI S1.43-1997 (R2002), Type 2, and set to an A-weighted SLOW response; or using a noise dosimeter conforming, at a minimum, to the requirements of ANSI 1.25-1991 (R2002), and set to an A-weighted SLOW response.

(3) All instruments used to measure employee noise exposure shall be calibrated to ensure accurate measurements.

(d) The railroad shall repeat noise monitoring, consistent with the requirements of this section, whenever a change in operations, process, equipment, or controls increases noise exposures to the extent that:

(1) Additional employees may be exposed at or above the action level; or

(2) The attenuation provided by hearing protectors being used by employees may be inadequate to meet the requirements of this section.

(e) In administering the monitoring program, the railroad shall take into consideration the identification of work environments where the use of hearing protectors may be omitted.

(f) Observation of monitoring. The railroad shall provide affected employees or their representatives with an opportunity to observe any noise dose measurements conducted pursuant to this section.

(g) Reporting of monitoring results.

(1) The railroad shall notify each monitored employee of the results of the monitoring.

(2) The railroad shall post the monitoring results at the appropriate crew origination point for a minimum of 30 days. The posting should include sufficient information to permit other crews to understand the meaning of the results in the context of the operations monitored.

**§ 227.105 Protection of employees.**

(a) A railroad shall provide appropriate protection for its employees who are exposed to noise that exceeds the limits of those shown in Table 1 of this section, as measured on the dB(A) scale as set forth in appendix A of this part.

(b) In assessing whether exposures exceed 115 dB(A), as set forth in paragraph (a) and Table 1 of this section, the apparent source of the noise exposures shall be noted and measurement artifacts may be removed.

(c) Except as set forth in paragraph (d) of this section, exposure to continuous noise shall not exceed 115dB(A).

(d) Exposures to continuous noise greater than 115 dB(A) and equal to or less than 120dB(A) are permissible, so long as the total daily duration does not exceed 5 seconds.

TABLE 1.—PERMISSIBLE NOISE EXPOSURES <sup>1</sup>

Duration permitted in hours	Sound level in dB(A)
16 .....	85
12 .....	87
8 .....	90
6 .....	92
4 .....	95
2 .....	100
1 .....	105
1/2 .....	110
1/4 or less .....	115

**§ 227.107 Hearing conservation program.**

Consistent with the requirements of the noise monitoring program, the railroad shall administer a continuing, effective hearing conservation program, as set forth in § 227.121, for all employees exposed to noise at or above

the action level. For purposes of the hearing conservation program, employee noise exposure shall be computed in accordance with Table 1 in § 227.105 and with the tables in Appendix A of this part, and without regard to any attenuation provided by the use of hearing protectors.<sup>1</sup>

**§ 227.109 Audiometric testing program.**

(a) Each railroad shall establish and maintain an audiometric testing program as set forth in this section by making audiometric testing available to all its employees who are required to be included in a hearing conservation program pursuant to § 227.107.

(b) *Cost.* The audiometric tests shall be provided at no cost to employees.

(c) *Tests.* Audiometric tests shall be performed by:

(1) A licensed or certified audiologist, otolaryngologist, or other physician; or

(2) By a qualified technician who is certified by the Council of Accreditation in Occupational Hearing Conservation or any equivalent organization; or has satisfactorily demonstrated competence in administering audiometric examinations, obtaining valid audiograms, and properly using, maintaining, and checking calibration and proper functioning of the audiometers being used. A technician who performs audiometric tests must be responsible to an audiologist, otolaryngologist or physician.

(d) *Instruments.* All audiograms obtained pursuant to this section shall be obtained with instruments that meet the requirements of appendix C of this part: Audiometric Measuring Instruments.

(e) *Baseline audiogram.* This paragraph applies to employees who are required by § 227.107 to be included in a hearing conservation program as of [the effective date of the final rule].

(1) New employees. Except as provided in paragraph (e)(1)(i) of this section, the railroad shall establish a valid baseline audiogram within 6 months of the new employee's first tour of duty.

(i) Mobile test van exception. Where mobile test vans are used to meet the baseline audiogram requirement for new employees, the railroad shall obtain a

<sup>1</sup> When the daily dose noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions: C1/T1+C2/T2 Cn/Tn exceeds unity, then the mixed exposure should be considered to exceed the limit value. Cn indicates the total time of exposure at a specified noise level, and Tn indicates the total time of exposure permitted at that level. Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.

valid baseline audiogram within 1 year of the new employee's first tour of duty.

(ii) [Reserved]

(2) Existing employees. (i) If the employee has not had a baseline audiogram as of [the effective date of the final rule], the railroad shall establish a valid baseline audiogram within two years of [the effective date of the final rule]. Railroads with less than 400,000 employee hours shall do so within 3 years.

(ii) If the employee has had a baseline audiogram as of [the effective date of the final rule] and it was obtained under conditions that satisfy the requirements found in 29 CFR 1910.95(h), the railroad must use that baseline audiogram.

(iii) If the employee has had a baseline audiogram as of [the effective date of the final rule], and it was obtained under conditions that satisfy the requirements in 29 CFR 1910.95(h)(1), but not the requirements found in 29 CFR 1910.95(h)(2) through (h)(5), the railroad may elect to use that baseline audiogram as long as the individual administering the Hearing Conservation Program makes a reasonable determination that the baseline audiogram is valid and is clinically consistent with the other materials in the employee's medical file.

(3) Testing to establish a baseline audiogram shall be preceded by at least 14 hours without exposure to occupational noise in excess of the level specified in § 227.115. Hearing protectors may be used as a substitute for the requirement that baseline audiograms be preceded by 14 hours without exposure to workplace noise.

(4) The railroad shall notify its employees of the need to avoid high levels of non-occupational noise exposure during the 14-hour period immediately preceding the audiometric examination.

(f) *Periodic audiogram.* (1) At least once a year after obtaining the baseline audiogram, the railroad shall offer an audiometric test to each employee included in the hearing conservation program.

(2) At least once every three years, the railroad shall require each employee included in the hearing conservation program to take an audiometric test.

(g) *Evaluation of audiogram.* (1) Each employee's periodic audiogram shall be compared to that employee's baseline audiogram to determine if the audiogram is valid and to determine if a standard threshold shift has occurred. This comparison may be done by a technician.

(2) If the periodic audiogram demonstrates a standard threshold shift, a railroad may obtain a retest within 90

days. The railroad may consider the results of the retest as the periodic audiogram.

(3) The audiologist, otolaryngologist, or physician shall review problem audiograms and shall determine whether there is a need for further evaluation. A railroad shall provide all of the following information to the person performing this evaluation:

(i) The baseline audiogram of the employee to be evaluated;

(ii) The most recent audiogram of the employee to be evaluated;

(iii) Measurements of background sound pressure levels in the audiometric test room as required in appendix D of this part: Audiometric Test Rooms; and

(iv) Records of audiometer calibrations required by § 227.111.

(h) *Follow-up procedures.* (1) If a comparison of the periodic audiogram to the baseline audiogram indicates that a standard threshold shift has occurred, the railroad shall inform the employee in writing within 30 days of the determination.

(2) Unless a physician or audiologist determines that the standard threshold shift is not work-related or aggravated by occupational noise exposure, the railroad shall ensure that the following steps are taken:

(i) Employees not using hearing protectors shall be fitted with hearing protectors, shall be trained in their use and care, and shall be required to use them.

(ii) Employees already provided with hearing protectors shall be refitted, shall be retrained in the use of hearing protectors offering greater attenuation, if necessary, and shall be required to use them.

(iii) If subsequent audiometric testing is necessary or if the railroad suspects that a medical pathology of the ear is caused or aggravated by the wearing of hearing protectors, the railroad shall refer the employee for a clinical audiological evaluation or an otological examination.

(iv) If the railroad suspects that a medical pathology of the ear unrelated to the use of hearing protectors is present, the railroad shall inform the employee of the need for an otological examination.

(3) If subsequent audiometric testing of an employee whose exposure to noise is less than an 8-hour TWA of 90 decibels indicates that a standard threshold shift is not persistent, the railroad shall inform the employee of the new audiometric interpretation and may discontinue the required use of hearing protectors for that employee.

(i) *Revised baseline.* A periodic audiogram may be substituted for the baseline measurement by the audiologist, otolaryngologist, or physician who is evaluating the audiogram if:

(1) The standard threshold shift revealed by the audiogram is persistent; or

(2) The hearing threshold shown in the periodic audiogram indicates significant improvement over the baseline audiogram.

(j) *Standard threshold shift.* In determining whether a standard threshold shift has occurred, allowance may be made for the contribution of aging (presbycusis) to the change in hearing level by correcting the annual audiogram according to the procedure described in appendix F of this part: Calculation and Application of Age Correction to Audiograms.

#### § 227.111 Audiometric test requirements.

(a) Audiometric tests shall be pure tone, air conduction, hearing threshold examinations, with test frequencies including 500, 1000, 2000, 3000, 4000, and 6000 Hz. Tests at each frequency shall be taken separately for each ear.

(b) Audiometric tests shall be conducted with audiometers (including microprocessor audiometers) that meet the specifications of and are maintained and used in accordance with ANSI S3.6–1996 “Specification for Audiometers” or its successor, which is incorporated by reference.

(c) Pulsed-tone and self-recording audiometers, where used, shall meet the requirements specified in appendix C of this part: Audiometric Measuring Instruments.

(d) Audiometric examinations shall be administered in a room meeting the requirements listed in appendix D of this part: Audiometric Test Rooms.

(e) Audiometer calibration. (1) The functional operation of the audiometer shall be checked before each day’s use by testing a person with known, stable hearing thresholds or by appropriate calibration device, and by listening to the audiometer’s output to make sure that the output is free from distorted or unwanted sounds. Deviations of 10 decibels or greater require an acoustic calibration.

(2) Audiometer calibration shall be checked acoustically at least annually in accordance with appendix E of this part: Acoustic Calibration of Audiometers. Test frequencies below 500 Hz and above 6000 Hz may be omitted from this check. Deviations of 15 decibels or greater require an exhaustive calibration.

(3) Except for audiometers used in mobile test vans, an exhaustive calibration shall be performed at least every two years in accordance with the ANSI S3.6–1996 “Specification for Audiometers” or its successor. Test frequencies below 500 Hz and above 6000 Hz may be omitted from this calibration. For audiometers used in mobile test vans, the exhaustive calibration shall be performed annually.

#### § 227.113 Noise operational controls.

When employees are exposed to sound exceeding an 8-hour TWA of 90 dB(A), the railroad may use noise operational controls to reduce exposures below those required by Table 1 of § 227.105.

#### § 227.115 Hearing protectors.

(a) When employees are exposed to sound exceeding an 8-hour TWA of 90 dB(A), the railroad shall require that hearing protectors be utilized to reduce exposures below those required by Table 1 of § 227.105.

(b) A railroad shall make hearing protectors available to all of its employees exposed to noise at or above the action level, at no cost to the employees.

(1) Hearing protectors shall be replaced as necessary.

(2) When offering hearing protectors, a railroad shall consider an employee’s ability to understand and respond to voice radio communications and audible warnings.

(c) A railroad shall require the use of hearing protectors when:

(1) The employee is exposed to sound exceeding an 8-hour TWA of 90 dB(A); or

(2) The employee is exposed to sound levels that meet or exceed the action level, and the employee:

(i) Has not yet had a baseline audiogram established pursuant to § 227.109; or

(ii) Has experienced a standard threshold shift and is required to use hearing protectors under § 227.109(h).

(d) The railroad shall give employees the opportunity to select their hearing protectors from a variety of suitable hearing protectors. The selection shall include devices with a range of attenuation levels.

(e) The railroad shall provide training in the use and care of all hearing protectors provided to employees.

(f) The railroad shall ensure proper initial fitting and supervise the correct use of all hearing protectors.

#### § 227.117 Hearing protector attenuation.

(a) A railroad shall evaluate hearing protector attenuation for the specific

noise environments in which the protector will be used. The railroad shall use one of the evaluation methods described in appendix B of this part: Methods for Estimating the Adequacy of Hearing Protection Attenuation or objective measurement.

(b) Hearing protectors shall attenuate employee exposure to an 8-hour TWA of 90 decibels or lower, as required by § 227.115.

(c) For employees who have experienced a standard threshold shift, hearing protectors must attenuate employee exposure to an 8-hour time-weighted average of 85 decibels or lower.

(d) The adequacy of hearing protector attenuation shall be re-evaluated whenever employee noise exposures increase to the extent that the hearing protectors provided may no longer provide adequate attenuation. A railroad shall provide more effective hearing protectors where necessary.

#### § 227.119 Training program.

(a) The railroad shall institute an occupational noise and hearing conservation training program for all employees included in the hearing conservation program.

(1) The railroad shall offer the training program annually; and

(2) The railroad shall require each employee to complete the training at least once every three years.

(b) The railroad shall provide the training required by paragraph (a) of this section:

(1) For new employees, within six months after the employee's first tour of duty in a position identified as within the scope of this part.

(2) For existing employees as of [the effective date of the final rule], within two years of [the effective date of the final rule]. Railroads with fewer than 400,000 employee hours shall do so within 3 years.

(c) The training program shall include and the training materials shall reflect, at a minimum, information on all of the following:

- (1) The effects of noise on hearing;
- (2) The purpose of hearing protectors;
- (3) The advantages, disadvantages, and attenuation of various types of hearing protectors;
- (4) Instructions on selection, fitting, use, and care of hearing protectors;
- (5) The purpose of audiometric testing, and an explanation of the test procedures;
- (6) An explanation of noise operational controls, where used;
- (7) General information concerning the expected range of workplace noise exposure levels associated with major

categories of railroad equipment and operations (e.g., switching and road assignments, hump yards near retarders, etc.) and appropriate reference to requirements of the railroad concerning use of hearing protectors;

(8) The purpose of noise monitoring and a general description of monitoring procedures;

(9) The availability of a copy of this part, an explanation of the requirements of this part as they affect the responsibilities of employees, and employees' rights to access records under this part;

(10) How to determine what can trigger an excessive noise report, pursuant to 49 CFR 229.121(b); and

(11) How to file an excessive noise report, pursuant to 49 CFR 229.121(b).

#### § 227.121 Recordkeeping.

(a) *General requirements.* (1) *Availability of records.* (i) Each railroad required to maintain and retain records under this part shall make those records available for inspection and copying/photocopying to: the Administrator, upon request; and/or an employee, a former employee, or such person's representative, upon written authorization by such employee.

(ii) A regional or national labor representative may request copies of reports for specific locations. These reports will not contain identifying information of an employee unless an employee authorizes the release of such information in writing.

(2) *Electronic records.* All records required by this part may be kept in electronic form, if desired, by the railroad.

(3) *Transfer of records.* If a railroad ceases to do business, it shall transfer to the successor employer all records required to be maintained by this section, and the successor employer shall retain them for the remainder of the period prescribed in this section.

(b) *Exposure measurements.* The railroad shall:

(1) Maintain an accurate record of all employee exposure measurements required by § 227.103; and

(2) Retain these records for at least three years.

(c) *Audiometric tests.* The railroad shall:

(1) Maintain employee audiometric test records required by § 227.109, including:

- (i) The name and job classification of the employee;
- (ii) The date of the audiogram;
- (iii) The examiner's name;
- (iv) The date of the last acoustic or exhaustive calibration of the audiometer;

(v) Accurate records of the measurements of the background sound pressure levels in audiometric test rooms; and

(2) Retain these records for the duration of the covered employee's employment.

(d) *Positions and persons designated.* The railroad shall:

(1) Maintain a record of all positions or persons or both designated by the railroad to be placed in a Hearing Conservation Program pursuant to § 227.107.

(2) Retain these records for the duration of the designation.

(e) *Training program materials.* The railroad shall:

(1) Maintain copies of all training materials used to comply with § 227.119(c) and a record of employees trained.

(2) Retain these records for three years.

(f) *Standard threshold shift records.*

The railroad shall:

(1) Maintain a record of all employees who have been found to have experienced a standard threshold shift within the prior calendar year and include all of the following information for each employee on the record:

(i) Date of the employee's baseline audiogram;

(ii) Date of the employee's most recent audiogram;

(iii) Date of the establishment of a standard threshold shift;

(iv) The employee's job code; and

(v) An indication of how many standard threshold shifts the employee has experienced in the past, if any.

(2) Retain these records for five years.

#### Appendix A to Part 227—Noise Exposure Computation

This appendix is mandatory.

##### I. Computation of Employee Noise Exposure

(1) Noise dose is computed using Table A-1 of this appendix as follows:

(i) When the sound level, L, is constant over the entire work shift, the noise dose, D, in percent, is given by:  $D=100 C/T$ , where C is the total length of the work day, in hours, and T is the reference duration corresponding to the measured sound level, L, as given in Table A-1 or by the formula shown as a footnote to that table.

(ii) When the workshift noise exposure is composed of two or more periods of noise at different levels, the total noise dose over the work day is given by:  $D = 100 (C_1/T_1 + C_2/T_2 + \dots + C_n/T_n)$ , where C<sub>n</sub> indicates the total time of exposure at a specific noise level, and T<sub>n</sub> indicates the reference duration for that level as given by Table A-1.

(2) The eight-hour time-weighted average sound level (TWA), in decibels, may be computed from the dose, in percent, by means of the formula:  $TWA=16.61 \log_{10} (D/$

100)+90. For an eight-hour workshift with the noise level constant over the entire shift, the TWA is equal to the measured sound level.

(3) A table relating dose and TWA is given in section II of this appendix.

TABLE A-1

A-weighted sound level, L (decibel)	Reference duration T (hour)
80	32
81	27.9
82	24.3
83	21.1
84	18.4
85	16
86	13.9
87	12.1
88	10.6
89	9.2
90	8
91	7.0
92	6.1
93	5.3
94	4.6
95	4
96	3.5
97	3.0
98	2.6
99	2.3
100	2
101	1.7
102	1.5
103	1.3
104	1.1
105	1
106	0.87
107	0.76
108	0.66
109	0.57
110	0.5
111	0.44
112	0.38
113	0.33
114	0.29
115	0.25
116	0.22
117	0.19
118	0.16
119	0.14
120	0.125
121	0.11
122	0.095
123	0.082
124	0.072
125	0.063
126	0.054
127	0.047
128	0.041
129	0.036
130	0.031

In the above table the reference duration, T, is computed by

$$T = \frac{8}{2^{(L-90)/5}}$$

Where L is the measured A-weighted sound level.

**II. Conversion Between "Dose" and "8-Hour Time-Weighted Average" Sound Level**

Compliance with subpart B of this part is determined by the amount of exposure to noise in the workplace. The amount of such exposure is usually measured with a dosimeter which gives a readout in terms of "dose." In order to better understand the requirements of the regulation, dosimeter readings can be converted to an "8-hour time-weighted average sound level." (TWA).

In order to convert the reading of a dosimeter into TWA, see Table A-2 of this appendix. This table applies to dosimeters that are set by the manufacturer to calculate dose or percent exposure according to the relationships in Table A-1. So, for example, a dose of 91 percent over an eight hour day results in a TWA of 89.3 dB, and a dose of 50 percent corresponds to a TWA of 85 dB.

If the dose as read on the dosimeter is less than or greater than the values found in Table A-2, the TWA may be calculated by using the formula: TWA=16.61 log<sub>10</sub> (D/100)+90 where TWA=8-hour time-weighted average sound level and D=accumulated dose in percent exposure.

TABLE A-2.—CONVERSION FROM "PERCENT NOISE EXPOSURE" OR "DOSE" TO "8-HOUR TIME-WEIGHTED AVERAGE SOUND LEVEL" (TWA)

Dose or percent noise exposure	TWA
10	73.4
15	76.3
20	78.4
25	80.0
30	81.3
35	82.4
40	83.4
45	84.2
50	85.0
55	85.7
60	86.3
65	86.9
70	87.4
75	87.9
80	88.4
81	88.5
82	88.6
83	88.7
84	88.7
85	88.8
86	88.9
87	89.0
88	89.1
89	89.2
90	89.2
91	89.3
92	89.4
93	89.5
94	89.6
95	89.6
96	89.7
97	89.8
98	89.9
99	89.9
100	90.0
101	90.1
102	90.1
103	90.2
104	90.3

TABLE A-2.—CONVERSION FROM "PERCENT NOISE EXPOSURE" OR "DOSE" TO "8-HOUR TIME-WEIGHTED AVERAGE SOUND LEVEL" (TWA)—Continued

Dose or percent noise exposure	TWA
105	90.4
106	90.4
107	90.5
108	90.6
109	90.6
110	90.7
111	90.8
112	90.8
113	90.9
114	90.9
115	91.1
116	91.1
117	91.1
118	91.2
119	91.3
120	91.3
125	91.6
130	91.9
135	92.2
140	92.4
145	92.7
150	92.9
155	93.2
160	93.4
165	93.6
170	93.8
175	94.0
180	94.2
185	94.4
190	94.6
195	94.8
200	95.0
210	95.4
220	95.7
230	96.0
240	96.3
250	96.6
260	96.9
270	97.2
280	97.4
290	97.7
300	97.9
310	98.2
320	98.4
330	98.6
340	98.8
350	99.0
360	99.2
370	99.4
380	99.6
390	99.8
400	100.0
410	100.2
420	100.4
430	100.5
440	100.7
450	100.8
460	101.0
470	101.2
480	101.3
490	101.5
500	101.6
510	101.8
520	101.9
530	102.0
540	102.2

TABLE A-2.—CONVERSION FROM “PERCENT NOISE EXPOSURE” OR “DOSE” TO “8-HOUR TIME-WEIGHTED AVERAGE SOUND LEVEL” (TWA)—Continued

Dose or percent noise exposure	TWA
550 .....	102.3
560 .....	102.4
570 .....	102.6
580 .....	102.7
590 .....	102.8
600 .....	102.9
610 .....	103.0
620 .....	103.2
630 .....	103.3
640 .....	103.4
650 .....	103.5
660 .....	103.6
670 .....	103.7
680 .....	103.8
690 .....	103.9
700 .....	104.0
710 .....	104.1
720 .....	104.2
730 .....	104.3
740 .....	104.4
750 .....	104.5
760 .....	104.6
770 .....	104.7
780 .....	104.8
790 .....	104.9
800 .....	105.0
810 .....	105.1
820 .....	105.2
830 .....	105.3
840 .....	105.4
850 .....	105.4
860 .....	105.5
870 .....	105.6
880 .....	105.7
890 .....	105.8
900 .....	105.8
910 .....	105.9
920 .....	106.0
930 .....	106.1
940 .....	106.2
950 .....	106.2
960 .....	106.3
970 .....	106.4
980 .....	106.5
990 .....	106.5
999 .....	106.6

The NRR is then related to an individual worker's noise environment in order to assess the adequacy of the attenuation of a given hearing protector. This appendix describes four methods of using the NRR to determine whether a particular hearing protector provides adequate protection within a given exposure environment. Selection among the four procedures is dependent upon the employer's noise measuring instruments.

Instead of using the NRR, employers may evaluate the adequacy of hearing protector attenuation by using one of the three methods developed by the National Institute for Occupational Safety and Health (NIOSH), which are described in the “List of Personal Hearing Protectors and Attenuation Data,” HEW Publication No. 76-120, 1975, pages 21-37. These methods are known as NIOSH methods 1B1, 1B2 and 1B3. The NRR described below is a simplification of NIOSH method 1B2. The most complex method is NIOSH method 1B1, which is probably the most accurate method since it uses the largest amount of spectral information from the individual employee's noise environment. As in the case of the NRR method described below, if one of the NIOSH methods is used, the selected method must be applied to an individual's noise environment to assess the adequacy of the attenuation. Employers should be careful to take a sufficient number of measurements in order to achieve a representative sample for each time segment.

**Note:** The employer must remember that calculated attenuation values reflect realistic values only to the extent that the protectors are properly fitted and worn.

When using the NRR to assess hearing protector adequacy, one of the following methods must be used:

(i) When using a dosimeter that is capable of C-weighted measurements:

(A) Obtain the employee's C-weighted dose for the entire workshift, and convert to TWA (see appendix A, II).

(B) Subtract the NRR from the C-weighted TWA to obtain the estimated A-weighted TWA under the ear protector.

(ii) When using a dosimeter that is not capable of C-weighted measurements, the following method may be used:

(A) Convert the A-weighted dose to TWA (see appendix A).

(B) Subtract 7 dB from the NRR.

(C) Subtract the remainder from the A-weighted TWA to obtain the estimated A-weighted TWA under the ear protector.

(iii) When using a sound level meter set to the A-weighting network:

(A) Obtain the employee's A-weighted TWA.

(B) Subtract 7 dB from the NRR, and subtract the remainder from the A-weighted TWA to obtain the estimated A-weighted TWA under the ear protector.

(iv) When using a sound level meter set on the C-weighting network:

(A) Obtain a representative sample of the C-weighted sound levels in the employee's environment.

(B) Subtract the NRR from the C-weighted average sound level to obtain the estimated A-weighted TWA under the ear protector.

(v) When using area monitoring procedures and a sound level meter set to the A-weighting network.

(A) Obtain a representative sound level for the area in question.

(B) Subtract 7 dB from the NRR and subtract the remainder from the A-weighted sound level for that area.

(vi) When using area monitoring procedures and a sound level meter set to the C-weighting network:

(A) Obtain a representative sound level for the area in question.

(B) Subtract the NRR from the C-weighted sound level for that area.

**Appendix C to Part 227—Audiometric Measuring Instruments**

This appendix is mandatory.

1. In the event that pulsed-tone audiometers are used, they shall have a tone on-time of at least 200 milliseconds.

2. Self-recording audiometers shall comply with the following requirements:

(A) The chart upon which the audiogram is traced shall have lines at positions corresponding to all multiples of 10 dB hearing level within the intensity range spanned by the audiometer. The lines shall be equally spaced and shall be separated by at least ¼ inch. Additional increments are optional. The audiogram pen tracings shall not exceed 2 dB in width.

(B) It shall be possible to set the stylus manually at the 10 dB increment lines for calibration purposes.

(C) The slewing rate for the audiometer attenuator shall not be more than 6 dB/second except that an initial slewing rate greater than 6 dB/second is permitted at the beginning of each new test frequency, but only until the second subject response.

(D) The audiometer shall remain at each required test frequency for 30 seconds (+/-3 seconds). The audiogram shall be clearly marked at each change of frequency and the actual frequency change of the audiometer shall not deviate from the frequency boundaries marked on the audiogram by more than 3 seconds.

(E) It must be possible at each test frequency to place a horizontal line segment parallel to the time axis on the audiogram, such that the audiometric tracing crosses the line segment at least six times at that test frequency. At each test frequency, the threshold shall be the average of the midpoints of the tracing excursions.

**Appendix D to Part 227—Audiometric Test Rooms**

This appendix is mandatory.

Rooms used for audiometric testing shall not have background sound pressure levels exceeding those in Table D-1 of this appendix when measured by equipment conforming at least to the Type 2 requirements of ANSI S1.4-1983 (R2001), “Specification for Sound Level Meters” and to the Class II requirements of ANSI S1.11-1971 (R1976), “Specification for Octave, Half-Octave, and Third-Octave Band Filter Sets.”

**Appendix B to Part 227—Methods for Estimating the Adequacy of Hearing Protector Attenuation**

This appendix is mandatory.

For employees who have experienced a significant threshold shift, hearing protector attenuation must be sufficient to reduce employee exposure to a TWA of 85 dB. Employers must select one of the following methods by which to estimate the adequacy of hearing protector attenuation.

The most convenient method is the Noise Reduction Rating (NRR) developed by the Environmental Protection Agency (EPA). According to EPA regulations, the NRR must be shown on the hearing protector package.

TABLE D-1.—MAXIMUM ALLOWABLE OCTAVE-BAND SOUND PRESSURE LEVELS FOR AUDIOMETRIC TEST ROOMS

Octave-band center frequency (Hz) .....	500	1000	2000	4000	8000
Sound pressure level (dB) .....	40	40	47	57	62

**Appendix E to Part 227—Acoustic Calibration of Audiometers**

This appendix is mandatory. Audiometer calibration shall be checked acoustically, at least annually, according to the procedures described in this appendix. The equipment necessary to perform these measurements is a sound level meter, octave-band filter set, and a National Bureau of Standards 9A coupler. In making these measurements, the accuracy of the calibrating equipment shall be sufficient to determine that the audiometer is within the tolerances permitted by ANSI S3.6-1996, "Specification for Audiometers."

(1) Sound Pressure Output Check.

A. Place the earphone coupler over the microphone of the sound level meter and place the earphone on the coupler.

B. Set the audiometer's hearing threshold level (HTL) dial to 70 dB.

C. Measure the sound pressure level of the tones at each test frequency from 500 Hz through 6000 Hz for each earphone.

D. At each frequency, the readout on the sound level meter should correspond to the levels in Table E-1 or Table E-2 of this appendix, as appropriate, for the type of earphone, in the column entitled "sound level meter reading."

(2) Linearity Check.

A. With the earphone in place, set the frequency to 1000 Hz and the HTL dial on the audiometer to 70 dB.

B. Measure the sound levels in the coupler at each 10 dB decrement from 70 dB to 10 dB, noting the sound level meter reading at each setting.

C. For each 10 dB decrement on the audiometer, the sound level meter should indicate a corresponding 10 dB decrease.

D. This measurement may be made electrically with a voltmeter connected to the earphone terminals.

(3) Tolerances.

When any of the measured sound levels deviate from the levels in Table E-1 or Table

E-2 by 3 dB at any test frequency between 500 and 3000 Hz, 4 dB at 4000 Hz, or 5 dB at 6000 Hz, an exhaustive calibration is advised. An exhaustive calibration is required if the deviations are greater than 15 dB or greater at any test frequency.

TABLE E-1.—REFERENCE THRESHOLD LEVELS FOR TELEPHONICS—TDH-39 EARPHONES

Frequency, Hz	Reference threshold level for TDH-39 earphones dB	Sound level meter reading, dB
500 .....	11.5	81.5
1000 .....	7	77
2000 .....	9	79
3000 .....	10	80
4000 .....	9.5	79.5
6000 .....	15.5	85.5

TABLE E-2.—REFERENCE THRESHOLD LEVELS FOR TELEPHONICS—TDH-49 EARPHONES

Frequency, Hz	Reference threshold level for TDH-49 earphones dB	Sound level meter reading, dB
500 .....	13.5	83.5
1000 .....	7.5	77.5
2000 .....	11	81.0
3000 .....	9.5	79.5
4000 .....	10.5	80.5
6000 .....	13.5	83.5

**Appendix F to Part 227—Calculations and Application of Age Corrections to Audiograms**

This appendix is non-mandatory.

In determining whether a standard threshold shift (STS) has occurred, allowance may be made for the contribution of aging to the change in hearing level by adjusting the most recent audiogram. If the employer chooses to adjust the audiogram, the employer shall follow the procedure described in this appendix. This procedure and the age correction tables were developed by the National Institute for Occupational Safety and Health in a criteria document. See "Criteria for a Recommended Standard: Occupational Exposure to Noise," Department of Health and Human Services (NIOSH) Publication No. 98-126.

For each audiometric test frequency;

(i) Determine from Tables F-1 or F-2 of this appendix the age correction values for the employee by:

(A) Finding the age at which the most recent audiogram was taken and recording the corresponding values of age corrections at 1000 Hz through 6000 Hz;

(B) Finding the age at which the baseline audiogram was taken and recording the corresponding values of age corrections at 1000 Hz through 6000 Hz.

(ii) Subtract the values found in step (i)(B) from the value found in step (i)(A).

(iii) The differences calculated in step (ii) represented that portion of the change in hearing that may be due to aging.

*Example:* Employee is a 32-year-old male. The audiometric history for his right ear is shown in decibels below.

Employee's age	Audiometric test frequency (Hz)				
	1000	2000	3000	4000	6000
26 .....	10	5	5	10	5
*27 .....	0	0	0	5	5
28 .....	0	0	0	10	5
29 .....	5	0	5	15	5
30 .....	0	5	10	20	10
31 .....	5	10	20	15	15
*32 .....	5	10	10	25	20

The audiogram at age 27 is considered the baseline since it shows the best hearing threshold levels. Asterisks have been used to identify the baseline and most recent audiogram. A threshold shift of 20 dB exists

at 4000 Hz between the audiograms taken at ages 27 and 32.

(The threshold shift is computed by subtracting the hearing threshold at age 27, which was 5, from the hearing threshold at age 32, which is 25). A retest audiogram has

confirmed this shift. The contribution of aging to this change in hearing may be estimated in the following manner:

Go to Table F-1 and find the age correction values (in dB) for 4000 Hz at age 27 and age 32.

	Frequency (Hz)				
	1000	2000	3000	4000	6000
Age 32 .....	6	5	7	10	14
Age 27 .....	5	4	6	7	11
Difference .....	1	1	1	3	3

The difference represents the amount of hearing loss that may be attributed to aging in the time period between the baseline audiogram and the most recent audiogram. In this example, the difference at 4000 Hz is 3

dB. This value is subtracted from the hearing level at 4000 Hz, which in the most recent audiogram is 25, yielding 22 after adjustment. Then the hearing threshold in the baseline audiogram at 4000 Hz (5) is

subtracted from the adjusted annual audiogram hearing threshold at 4000 Hz (22). Thus the age-corrected threshold shift would be 17 dB (as opposed to a threshold shift of 20 dB without age correction).

TABLE F-1.—AGE CORRECTION VALUES IN DECIBELS FOR MALES

Years	Audiometric Test Frequencies (Hz)				
	1000	2000	3000	4000	6000
20 or younger .....	5	3	4	5	8
21 .....	5	3	4	5	8
22 .....	5	3	4	5	8
23 .....	5	3	4	6	9
24 .....	5	3	5	6	9
25 .....	5	3	5	7	10
26 .....	5	4	5	7	10
27 .....	5	4	6	7	11
28 .....	6	4	6	8	11
29 .....	6	4	6	8	12
30 .....	6	4	6	9	12
31 .....	6	4	7	9	13
32 .....	6	5	7	10	14
33 .....	6	5	7	10	14
34 .....	6	5	8	11	15
35 .....	7	5	8	11	15
36 .....	7	5	9	12	16
37 .....	7	6	9	12	17
38 .....	7	6	9	13	17
39 .....	7	6	10	14	18
40 .....	7	6	10	14	19
41 .....	7	6	10	14	20
42 .....	8	7	11	16	20
43 .....	8	7	12	16	21
44 .....	8	7	12	17	22
45 .....	8	7	13	18	23
46 .....	8	8	13	19	24
47 .....	8	8	14	19	24
48 .....	9	8	14	20	25
49 .....	9	9	15	21	26
50 .....	9	9	16	22	27
51 .....	9	9	16	23	28
52 .....	9	10	17	24	29
53 .....	9	10	18	25	30
54 .....	10	10	18	26	31
55 .....	10	11	19	27	32
56 .....	10	11	20	28	34
57 .....	10	11	21	29	35
58 .....	10	12	22	31	36
59 .....	11	12	22	32	37
60 or older .....	11	13	23	33	38

TABLE F-2.—AGE CORRECTION VALUES IN DECIBELS FOR FEMALES

Years	Audiometric Test Frequencies (Hz)				
	1000	2000	3000	4000	6000
20 or younger .....	7	4	3	3	6
21 .....	7	4	4	3	6
22 .....	7	4	4	4	6
23 .....	7	5	4	4	7
24 .....	7	5	4	4	7

TABLE F-2.—AGE CORRECTION VALUES IN DECIBELS FOR FEMALES—Continued

Years	Audiometric Test Frequencies (Hz)				
	1000	2000	3000	4000	6000
25	8	5	4	4	7
26	8	5	5	4	8
27	8	5	5	5	8
28	8	5	5	5	8
29	8	5	5	5	9
30	8	6	5	5	9
31	8	6	6	5	9
32	9	6	6	6	10
33	9	6	6	6	10
34	9	6	6	6	10
35	9	6	7	7	11
36	9	7	7	7	11
37	9	7	7	7	12
38	10	7	7	7	12
39	10	7	8	8	12
40	10	7	8	8	13
41	10	8	8	8	13
42	10	8	9	9	13
43	11	8	9	9	14
44	11	8	9	9	14
45	11	8	10	10	15
46	11	9	10	10	15
47	11	9	10	11	16
48	12	9	11	11	16
49	12	9	11	11	16
50	12	10	11	12	17
51	12	10	12	12	17
52	12	10	12	13	18
53	13	10	13	13	18
54	13	11	13	14	19
55	13	11	14	14	19
56	13	11	14	15	20
57	13	11	15	15	20
58	14	12	15	16	21
59	14	12	16	16	21
60 or older	14	12	16	17	22

### Appendix G to Part 227—Monitoring Noise Levels

This appendix is non-mandatory. This appendix provides information to help employers comply with the noise monitoring obligations that are part of this hearing conservation regulation.

#### What Is the Purpose of Noise Monitoring?

This regulation requires that employees be placed in a hearing conservation program if they are exposed to average noise levels of 85 dB or greater during an 8 hour workday. In order to determine if exposures are at or above this level, it may be necessary to measure or monitor the actual noise levels in the workplace and to estimate the noise exposure or “dose” received by employees during the workday.

#### When Is it Necessary To Implement a Noise Monitoring Program?

It is not necessary for every employer to measure workplace noise. Noise monitoring or measuring must be conducted only when exposures are at or above 85 dB. Factors which suggest that noise exposures in the workplace may be at this level include employee complaints about the loudness of noise, indications that employees are losing their hearing, or noisy conditions which

make normal conversation difficult. The employer should also consider any information available regarding noise emitted from specific machines. In addition, actual workplace noise measurements can suggest whether or not a monitoring program should be initiated.

#### How Is Noise Measured?

Basically, there are two different instruments to measure noise exposures: the sound level meter and the dosimeter. A sound level meter is a device that measures the intensity of sound at a given moment. Since sound level meters provide a measure of sound intensity at only one point in time, it is generally necessary to take a number of measurements at different times during the day to estimate noise exposure over a workday. If noise levels fluctuate, the amount of time noise remains at each of the various measured levels must be determined. To estimate employee noise exposures with a sound level meter it is also generally necessary to take several measurements at different locations within the workplace. After appropriate sound level meter readings are obtained, people sometimes draw “maps” of the sound levels within different areas of the workplace. By using a sound level “map” and information on employee locations

throughout the day, estimates of individual exposure levels can be developed. This measurement method is generally referred to as area noise monitoring.

A dosimeter is like a sound level meter except that it stores sound level measurements and integrates these measurements over time, providing an average noise exposure reading for a given period of time, such as an 8-hour workday. With a dosimeter, a microphone is attached to the employee’s clothing and the exposure measurement is simply read at the end of the desired time period. A reader may be used to read-out the dosimeter’s measurements. Since the dosimeter is worn by the employee, it measures noise levels in those locations in which the employee travels. A sound level meter can also be positioned within the immediate vicinity of the exposed worker to obtain an individual exposure estimate. Such procedures are generally referred to as personal noise monitoring.

Area monitoring can be used to estimate noise exposure when the noise levels are relatively constant and employees are not mobile. In workplaces where employees move about in different areas or where the noise intensity tends to fluctuate over time, noise exposure is generally more accurately

estimated by the personal monitoring approach.

In situations where personal monitoring is appropriate, proper positioning of the microphone is necessary to obtain accurate measurements. With a dosimeter, the microphone is generally located on the shoulder and remains in that position for the entire workday. With a sound level meter, the microphone is stationed near the employee's head, and the instrument is usually held by an individual who follows the employee as he or she moves about.

Manufacturer's instructions, contained in dosimeter and sound level meter operating manuals, should be followed for calibration and maintenance. To ensure accurate results, it is considered good professional practice to calibrate instruments before and after each use.

**How Often Is it Necessary To Monitor Noise Levels?**

This part requires that when there are significant changes in machinery or production processes that may result in increased noise levels, remonitoring must be conducted to determine whether additional employees need to be included in the hearing conservation program. Many companies choose to remonitor periodically (once every year or two) to ensure that all exposed employees are included in their hearing conservation programs.

**Where Can Equipment and Technical Advice Be Obtained?**

Noise monitoring equipment may be either purchased or rented. Sound level meters cost about \$500 to \$1,000, while dosimeters range in price from about \$750 to \$1,500. Smaller companies may find it more economical to rent equipment rather than to purchase it. Names of equipment suppliers may be found in the telephone book (Yellow Pages) under headings such as: "Safety Equipment," "Industrial Hygiene," or "Engineers—Acoustical." In addition to providing information on obtaining noise monitoring equipment, many companies and individuals included under such listings can provide professional advice on how to conduct a valid noise monitoring program. Some audiological testing firms and industrial hygiene firms also provide noise monitoring services. Universities with audiology, industrial hygiene, or acoustical engineering departments may also provide information or may be able to help employers meet their obligations under this part.

Free, on-site assistance may be obtained from OSHA-supported state and private consultation organizations. These safety and health consultative entities generally give priority to the needs of small businesses.

**Appendix H to Part 227—Schedule of Civil Penalties [Reserved]**

**PART 229—[AMENDED]**

2. The authority citation for part 229 continues to read as follows:

**Authority:** 49 U.S.C. 20102–03, 20107, 20133, 20137–38, 20143, 20701–03, 21301–02, 21304; 49 CFR 1.49.

3. Section 229.4 is amended by revising paragraph (b) to read as follows:

**§ 229.4 Information collection.**

\* \* \* \* \*

(b) The information collection requirements are found in the following sections: §§ 229.9, 229.17, 229.21, 229.23, 229.25, 229.27, 229.29, 229.31, 229.33, 229.55, 229.103, 229.105, 229.113, 229.121, 229.135, and Appendix H to part 229.

4. Section 229.5 is amended by removing paragraph designations (a) through (p), by transferring the definition of *Electronic air brake* to proper alphabetical order (immediately preceding the definition of *Event recorder*), and adding, in alphabetical order, the following definitions.

**§ 229.5 Definitions.**

\* \* \* \* \*

*Decibel (dB)* means a unit of measurement of sound pressure levels. *dB(A)* means the sound pressure level in decibels measured on the A-weighted scale.

\* \* \* \* \*

*Excessive noise report* means a report by a locomotive cab occupant that the locomotive is producing an unusual level of noise that significantly interferes with normal cab communications or that is a concern with respect to hearing conservation.

\* \* \* \* \*

*Upper 99% confidence limit* means the noise level below which 99% of all noise level measurements must lie.

\* \* \* \* \*

5. Section 229.121 is revised to read as follows:

**§ 229.121 Locomotive cab noise.**

(a) *Performance standards for locomotives.* (1) When tested for static noise in accordance with paragraph (a)(3) of this section, all locomotives of each design or model that are manufactured after January 1, 2005 shall average less than or equal to 85 dB(A), with an upper 99% confidence limit of 87 dB(A). The railroad may rely on certification from the equipment manufacturer for a production run that this standard is met. The manufacturer may determine the average by testing a representative sample of locomotives or an initial series of locomotives, provided that there are suitable manufacturing quality controls and verification procedures in place to ensure product consistency.

(2) In the maintenance of locomotives that are manufactured in accordance with paragraph (a)(1) of this section, a railroad shall not make any alterations that cause the average sound level for

that locomotive design or model to exceed 82 dB(A) if the average sound level for a locomotive design or model is less than 82 dB(A); and the railroad shall not make any alterations that cause the average sound level for that locomotive design or model to increase to 85 dB(A) if the average sound level for a locomotive design or model is between, or includes, 82 dB(A) to 85 dB(A).

(3) The railroad or manufacturer shall follow the static test protocols set forth in appendix H of this part to determine compliance with paragraph (a)(1) of this section; and, to the extent reasonably necessary to evaluate the effect of alterations during maintenance, to determine compliance with paragraph (a)(2) of this section.

(b) *Equipment maintenance.* (1) If a railroad receives an excessive noise report, and if the condition giving rise to the noise is not required to be immediately corrected under this part 229, the railroad shall maintain a record of the report, and repair or replace the item identified as substantially contributing to the noise and shall do so:

- (i) On or before the next periodic inspection required by § 229.23; or
- (ii) At the time of the next major equipment repairs commonly used for the particular type of maintenance needed, if the railroad determines that the repair or replacement of the item requires significant shop or material resources that are not readily available.

(2) Items that may lead a locomotive cab occupant to file an excessive noise report include, but are not limited to: defective cab window seals; defective cab door seals; broken or inoperative windows; deteriorated insulation or insulation that has been removed for other reasons; broken or inoperative doors; and air brakes that vent inside of the cab.

(3) The railroad has an obligation to respond to an excessive noise report filed by a locomotive cab occupant. The railroad meets its obligations to respond to an excessive noise report if the railroad makes a good faith effort to identify the cause of the reported noise and, where the railroad is successful in determining the cause, if the railroad repairs or replaces the item(s) causing the noise.

(4) *Recordkeeping.* (i) The railroad shall maintain a record, either written or electronic, of any excessive noise report, inspection, test, maintenance, replacement, or repair completed pursuant to paragraph (b) of this section and the date(s) on which that inspection, test, maintenance, replacement, or repair occurred.

(ii) The railroad shall retain these records for 92 days if they are made pursuant to § 229.21; or for 1 year if they are made pursuant to § 229.23.

(iii) The railroad shall establish an internal, auditable monitoring system that contains these records.

#### Appendices D Through G—[Reserved]

6. Appendices D through G are added to Part 229 and reserved.

7. Appendix H is added to Part 229 to read as follows:

#### Appendix H to Part 229—Static Noise Test Protocols—In-Cab Static

This appendix prescribes the procedures for the in-cab static measurements of locomotives.

##### I. Measurement Instrumentation

The instrumentation used should conform to the following:

An integrating-averaging sound level meter shall meet all the requirements of ANSI S1.43-1997, "Specification for Integrating-Averaging Sound Level Meters" for a Type 1 instrument. In the event that a Type 1

instrument is not available, the measurements may be conducted with a Type 2 instrument. The acoustic calibrator shall meet the requirement of the ANSI S1.40-1984 (R1997), "Specification for Acoustical Calibrators."

##### II. Test Site Requirements

The test site shall meet the following requirements:

(1) The locomotive to be tested should not be positioned where large reflective surfaces are directly adjacent to or within 25 feet of the locomotive cab.

(2) The locomotive to be tested should not be positioned where other locomotives or rail cars are present on directly adjacent tracks next to or within 25 feet of the locomotive cab.

(3) All windows, doors, cabinets seals, *etc.*, must be installed in the locomotive cab and be closed.

(4) The locomotive must be running for sufficient time before the test to be at normal operating temperature.

(5) The heating, ventilation and air conditioning (HVAC) system or a dedicated heating or air conditioner system must be

operating on high, and the vents must be open and unobstructed.

(6) The locomotive shall not be tested in any site specifically designed to artificially lower in-cab noise levels.

##### III. Procedures for Measurement

(1)  $L_{av}$  means the A-weighted, equivalent sound level using a 5 dB exchange rate, and the sound level meter shall be set for A-weighting with slow response.

(2) The sound level meter shall be calibrated with the acoustic calibrator immediately before and after the in-cab static tests. The calibration levels shall be recorded.

(3) Any change in the before and after calibration level(s) shall be less than 0.5 dB.

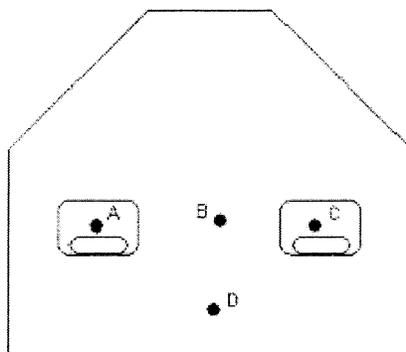
(4) The sound level meter shall be measured at each of the following locations:

(A) 30 inches above the center of the left seat;

(B) Centered in the middle of the cab between the right and left seats, and 56 inches above the floor;

(C) 30 inches above the center of the right seat; and

(D) One foot (0.3 meters) from the center of the back interior wall of the cab and 56 inches above the floor. [See Figure 1]



**Figure 1. Microphone Locations inside Typical Locomotive Cab**

(5) The observer shall stand as far from the microphone as possible. No more than two people (tester, observers or crew members) shall be inside the cab during measurements.

(6) The locomotive shall be tested under self-loading conditions if so equipped. If the locomotive is not equipped with self load, the locomotive shall be tested with no-load (No-load defined as maximum RPM—no electric load) and an adjustment of 3 dB added to the measured level.

(7) The sound level shall be recorded at the highest horsepower or throttle setting.

(8) After the engine speed has become constant and the in-cab noise is continuous,

the A weighted  $L_{av}$  sound level shall be measured using a 1 second sampling interval for a minimum duration of 30 seconds at each measurement position.

(9) The highest  $L_{av}$  of the 4 measurement positions shall be used for determining compliance with § 229.121(a).

(10) A locomotive that has failed to meet the static test requirements of this part may be re-tested in accordance with the requirements in section II of this appendix.

##### IV. Recordkeeping

To demonstrate compliance, the entity conducting the test shall maintain records of

the following data. The records created under this procedure shall be retained and made readily accessible for review for a minimum of three years. All records may be maintained in either written or electronic form.

(1) Name(s) of persons conducting the test, and the date of the test.

(2) Description of locomotive being tested, including: make, model number, serial number, and date of manufacture.

(3) Description of sound level meter and calibrator, including: make, model, type, serial number, and manufacturer's calibration date.

(4) The recorded measurement during calibration and for each microphone location during operating conditions.

(5) Other information as appropriate to describe the testing conditions and procedure, including whether or not the

locomotive was tested under self-loading conditions, or not.

(6) Where a locomotive fails a test and is re-tested under the provisions of section III(9) of this appendix, the suspected reason(s) for the failure.

Issued in Washington, DC, on June 9, 2004.

**Allan Rutter,**

*Federal Railroad Administrator.*

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