

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

[Docket No. FRA 2002–12357, Notice No. 2]

RIN 2130–AB56

Occupational Noise Exposure for Railroad Operating Employees

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

ACTION: Final rule.

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

FRA is requiring 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 (TWA) of 85 decibels. FRA is also establishing design, build, and maintenance standards for new locomotives and maintenance requirements for existing locomotives. FRA expects that this rule will reduce the likelihood of noise-induced hearing loss for railroad operating employees.

DATES: This final rule is effective February 26, 2007. The incorporation by reference of certain publications listed in the rule is approved by the Director of the Federal Register as of February 26, 2007. Any petitions for reconsideration with this final rule must be submitted no later than December 26, 2006.

ADDRESSES: *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.

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SUPPLEMENTARY INFORMATION: Note that for brevity, all references to CFR parts will be to parts in Title 49 of the Code of Federal Regulations (49 CFR), unless otherwise noted.

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I. Background**A. Statutory and Regulatory Framework****1. 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 of the United States Code). 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.¹ That policy statement is located in Appendix A to part 209.

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

¹ See 65 FR 42529 (July 2, 2000).

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).

2. FRA-OSHA Jurisdiction for Occupational Safety and Health Issues

FRA and the U.S. Occupational Safety and Health Administration² (OSHA) have a complementary relationship 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 working conditions in all types of employment, except where another Federal agency exercises statutory authority to prescribe or enforce standards or regulations covering the working conditions pursuant to § 4(b)(1) of the OSH Act. See 29 U.S.C. 653(b)(1). Section 4(b)(1) preempts OSHA's jurisdiction where another federal agency issues 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. See 43 FR 10583 (March 14, 1978). 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. See 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. See 67 FR 16032 (April 4, 2002). There, FRA promulgated regulations that address toilet and washing facilities for employees who work in locomotive cabs. See 49 CFR §§ 229.137 through 139.

FRA has also exercised this jurisdiction with regard to occupational noise in the locomotive cab. FRA issued its current standard for locomotive cab noise in 1980. While OSHA, in general, regulates occupational noise in the workplace,³ 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.

3. Federal Occupational Noise Standards

OSHA's occupational noise standard was promulgated under the Walsh-Healey Public Contracts Act of 1969⁴ 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. OSHA adopted the Walsh-Healey standard as an OSHA standard pursuant to section 6(a) of the OSH Act.

In January 1981, OSHA promulgated a Hearing Conservation Amendment (HCA) to its occupational noise exposure standard. See 46 FR 4078 (January 16, 1981). The amendment consisted of requirements for noise measurements, audiometric testing, the use and care of hearing protectors, employee training, employee education, and recordkeeping. Portions of the amendment were subsequently stayed for reconsideration and clarification. See 46 FR 42622 (August 21, 1981). In 1983, OSHA finalized the provisions of its Hearing Conservation Amendment by revoking various stayed provisions, lifting the stay on other provisions, and making other technical corrections.⁵ OSHA's revised regulation included a detailed hearing conservation program (HCP).⁶ OSHA's occupational noise standard applies, for the most part, to all industry engaged in interstate commerce.⁷ OSHA's noise standard can be found at 29 CFR 1910.95. As will be discussed in subsequent sections, FRA's standard is quite similar to OSHA's standard.

While OSHA is the primary regulator of noise in the workplace, other federal agencies, in addition to FRA, regulate specific occupational settings. FRA regulates employee noise exposure in the locomotive cab. The U.S. Air Force regulates the noise environment of Air Force personnel.⁸ 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. See

⁴ See 41 U.S.C. 35, *et seq.*

⁵ See 48 FR 9738 (March 8, 1983).

⁶ Throughout the rule, FRA uses "hearing conservation program" and HCP interchangeably.

⁷ OSHA has a separate occupational noise regulation that applies to the construction industry. See 29 CFR 1926.52.

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

² 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 workplace hazards, including noise.

³ See 29 CFR 1910.95 and 29 CFR 1926.52 ("Occupational Noise Exposure").

64 FR 49548 (September 13, 1999). 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 to 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 49550.

B. History of FRA's Treatment of Occupational Noise

1. FRA's Past 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 (49 CFR 229.121).⁹

Section 229.121 was promulgated to protect the hearing and health of cab occupants and to facilitate crew communication. It provided that noise level exposure in the cab may not exceed specific prescribed levels. The provision limited employee noise exposure to an eight-hour time-weighted average (TWA) of 90 dB(A) with a doubling rate of 5 dB(A). It also provided for an absolute upper noise limit of 115 dB(A). In addition, it established 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 1980 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." See 45 FR 21092, 21106 (March 31, 1980). 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." See 45 FR 21092, 21106 (March 31, 1980).

The then-existing § 229.121 did 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 general industry workplaces within its jurisdiction.

In 1992, Congress enacted section 10 of The Rail Safety Enforcement and Review Act (RSERA) (Pub. L. 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 required 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.¹⁰ 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.

2. Studies of Noise

In the proposed rule, FRA provided an extensive discussion on studies related to noise in the locomotive cab. This includes a 1971 study on highway-rail grade crossings¹¹ and an addendum on the sound environment in the locomotive cab,¹² a 1980 study on in-cab occupational noise exposure,¹³ an FRA Report to Congress on cab working conditions,¹⁴ the Wyle Report (the Association of American Railroads' (AAR) review of FRA's Report to Congress),¹⁵ a 1997 Technical Memorandum on the FRA Report to Congress and subsequent review,¹⁶ and an FRA Administrator's Roundtable Discussion on Noise. Copies of these documents are included in the docket. In the interest of space, FRA is not republishing its discussion here. See 69 FR 35145, 35148-35151; June 23, 2004.

C. Fundamental Principles of Sound

FRA provided an extensive discussion in the proposed rule on fundamental principles of sound. The topics covered include sound, hearing, hearing loss, and instrumentation. See 69 FR 35145, 35152-35154.

D. Occupational Noise in the Railroad Industry

Noise is one of the most pervasive hazardous agents in the American

¹⁰ See document 4 of docket number 12357 on DOT's Docket Web site (dms.dot.gov).

¹¹ John Aurelius and Norman Korebor, "The Visibility and Audibility of Trains Approaching Rail-Highway Grade Crossings," Report No. FRA-RP-71-2, May 1971.

¹² John P. Aurelius, "The Sound Environment in Locomotive Cabs," Report No. FRA-RP-71-2A, July 1971.

¹³ Roger D. Kilmer, "Assessment of Locomotive Crew In-Cab Occupational Noise Exposure," National Bureau of Standards. Report No. FRA-ORD-80/91, December 1980.

¹⁴ FRA Report to Congress, "Locomotive Crashworthiness and Cab Working Conditions." September 1996.

¹⁵ Eric Stusnick for Wyle Laboratories, "A Review of the Noise and Vibration Sections of the Federal Railroad Administration's Report to Congress Entitled 'Locomotive Crashworthiness and Cab Working Conditions.'" December 1996. See document 6 of docket number 12357 on DOT's Docket Web site (dms.dot.gov).

¹⁶ Technical Memorandum from Hugh J. Saurenman and Lance D. Meister of Harris Miller, Miller & Hanson, Inc., "Comments on AAR Review of Chapter 6, FRA Report to Congress 'Locomotive Crashworthiness and Cab Working Conditions.'" June 1997. See document 7 of docket number 12357 on DOT's Docket Web site (dms.dot.gov).

⁹ 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).

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.¹⁷ 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.¹⁸ Noise is also one of the most intrusive aspects of locomotive operations.¹⁹

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 started venting the exhaust below the cab floor. FRA noted this change in its 1980 locomotive cab noise rule. See 45 FR 21092 (March 31, 1980). 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. See 45 FR 21092, 21015 (March 31, 1980). Manufacturers continued to re-design locomotives accordingly, and today the vast majority of locomotives have their air brake exhaust 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 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.

II. 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 (ATDD)
Association of American Railroads (AAR)
Association of Railway Museums (ARM)
Association of State Rail Safety Managers (ASRSRM)
Brotherhood of Locomotive Engineers and Trainmen (BLET)
Brotherhood of Maintenance of Way Employes Division (BMWED)
Brotherhood of Railroad Signalmen (BRS)
Federal Transit Administration (FTA)*
High Speed Ground Transportation Association
International Association of Machinists and Aerospace Workers
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 Railroad Passenger Corporation (AMTRAK)
National Transportation Safety Board (NTSB)*
Railway Supply Institute (RSI)
Safe Travel America
Secretaria de Comunicaciones y Transporte (Mexico)*
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.

When appropriate, FRA assigns a task to the RSAC, and after consideration and debate, the RSAC may accept or reject the task. If the RSAC accepts the task, 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 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.

¹⁷ 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).

¹⁸ NIOSH, "National Occupational Research Agenda," National Institute for Occupational Safety and Health, DHHS (NIOSH), Pub. No. 96-115, Cincinnati, OH (1996).

¹⁹ Human Factors Guidelines for Locomotive Cabs, DOT/FRA/ORD-93/03 (November 1998).

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 judgment 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 the 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
 BLET
 BMWED*
 IBEW
 AMTRAK
 RSI (formerly Railway Progress Institute)
 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 Noise 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 Noise 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 Noise 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, FRA frequently discusses issues that the Noise Task Force and Working Group raised and views that they shared. FRA discusses 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 Noise Task Force, developed recommendations for reducing the likelihood of hearing loss for cab employees. In June 2003, the Working Group reached consensus on recommendations for the proposed rule and forwarded these recommendations

to the RSAC. On June 27, 2003, the RSAC accepted these recommendations, which had been reviewed and accepted by FRA.

On June 23, 2004, FRA published an NPRM containing the recommendations of the Working Group and the full RSAC. See 69 FR 35146. The NPRM provided for a 90-day comment period and provided interested parties the opportunity to request a public hearing. The comment period closed on September 21, 2004. FRA received comments from approximately 50 interested parties. There were a wide variety of commenters, including individual locomotive engineers; professional, scientific, and credentialing associations; congressmen; individual audiologists; an acoustical consulting firm; a commuter railroad; and a manufacturing company.

FRA reconvened the Task Force on March 1, 2005 and the Working Group on March 2-3, 2005 to discuss the comments that FRA received about the NPRM. The Task Force and the Working Group considered all the comments and again reached consensus on recommendations for a final standard. These recommendations were presented to the RSAC and on May 18, 2005, the RSAC accepted these recommendations. The RSAC voted to forward these recommendations to FRA as the basis for a final occupational noise standard. FRA has reviewed the RSAC's recommendations and has adopted the recommendations in this final rule.

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 final rule. 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 rule.

III. FRA's Noise Standard

A. 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 rule has taken into account these unique characteristics of the railroad operating environment and has modified OSHA's standard to fit the railroad industry.

Since FRA's rule is based on OSHA's rule, it is helpful to review OSHA's standard before explaining FRA's 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 places engineering and 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 at the 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. An example of Administrative Controls would be schedules for rotation of employees from tasks that are near noisy machinery to quieter areas. The objective is employee exposures with lower time weighted average levels of exposure. FRA's standard on locomotive cab noise is based very heavily on OSHA's standard. In this final rule, FRA requires railroads to limit employee noise exposure to an 8-hour TWA of 90 dB(A).²⁰ 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, an increase of 3 dB represents a doubling of sound energy.²¹ 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.²² 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,

²⁰ 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.

²¹ See discussion in § IV(A) of the background section.

²² 64 FR 49548, 49588–49589 (September 13, 1999).

[MSHA] will continue to monitor the 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 Working Group that 5 dB is most appropriate. Taking all of those factors into account, FRA has decided to use a doubling rate of 5 dB. Thus, a 5 dB increase in the time weighted average level reduces the permitted time of exposure duration by half.

FRA recognizes the same noise control measures 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 railroads and manufacturers must take when designing, building, and maintaining locomotives.

FRA's overall approach toward controls differs from that of OSHA. FRA does not explicitly 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 obtain and maintain locomotives built to meet the performance standard for maximum noise level in the cab defined by the standards in § 229.121. (This is somewhat equivalent to OSHA's "engineering controls"). FRA mandates that railroads require employees to use hearing protectors when employees are exposed to noise levels that exceed an 8 hour-TWA of 90 dB(A). (This is equivalent to OSHA's hearing protector requirement). 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. (This is equivalent to OSHA's "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. Using noise operational controls as an option rather than a requirement was done in recognition of

the nature of railroad operations and the impact of other federal laws, specifically the Hours of Service law. This law limits crew working hours to 12 hours, thus also permitting work shifts of up to 12 hours. Given the fact that administrative controls use periods of time removed from exposure to reduce the dose, and the fact that the only way to be removed from exposure on a train (except passenger trains) would be to leave the train, mandating administrative controls to reduce noise exposure would have the effect of changing the operating practices of the entire industry without regard to other issues such as where and how to get the exposed crews off the trains and how to get replacement crews on them.

The RSAC Working Group 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 feasibility of engineering controls. 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.

In developing the proposed and final rules, the RSAC Working Group participants noted that since the early 1990s, the industry has taken delivery of thousands of newer locomotives engineered to reduce noise levels. Original equipment manufacturers used a variety of strategies to sharply reduce the portion of noise dose derived from the prime mover and to filter out other noise sources. The cabs of most of these locomotives provide an environment where, for the great majority of operating circumstances, employees will not experience 8 hour TWA exposures approaching 90 dB(A), and under most circumstances, exposures are not expected to reach the action level. Railroads have also specified placement of horns in the center of the locomotive, rather than immediately over the cab, further reducing noise levels experienced by employees. Finally, as noted below, the practice of venting the airbrake system into the cab has been largely abandoned.

Accordingly, the challenges in this proceeding have principally to do with management of noise exposure in older locomotives, at least minimal standardization of hearing conservation programs that have grown up without regulation, ensuring the progress in engineering of locomotives is maintained, and addressing the needs of

employees of smaller railroads by providing basic guidance regarding noise monitoring, hearing conservation, training, and recordkeeping. To the extent that many comments filed by non-railroad parties assume a much more dire situation, those comments have missed the mark and, in many cases, have called for measures not warranted by the facts.

The RSAC Working Group also 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 recognizes that there are many benefits to using engineering and maintenance controls. First, they do not interfere with crew and radio communication, which personal Hearing Protection (HP) devices 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 may present. Engineering controls block out noise at its source, or along its transmission path, 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 don and wear the devices properly. 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. The burden was recognized when it was made clear by experts in locomotive noise reduction engineering that imposing the requirement to first use

engineering controls to reduce exposure would require re-engineering the cab structure, the suspension and other elements of the locomotive to achieve the required noise reduction at a cost approaching that of buying a new locomotive. As a compromise, rather than imposing a general engineering controls requirement on railroads, FRA identified limited and 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.

B. Responsibilities of Railroads and Employees

The primary responsibility for compliance with this regulation lies with employers, i.e., railroads. As such, railroads have several enumerated responsibilities. This regulation requires 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 operational 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 obtain and maintain locomotives that meet specified standards for limiting in-cab noise.

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 employees²³ 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

²³ In their comments, the AAR pointed out that the preamble inaccurately used the term "employers" in place of "employees." FRA has corrected that typo in this final rule.

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 hearing conservation program 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 violation²⁴ for an employee who does not report for audiometric testing. Overall, FRA expects that employees will fully comply with all of 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.

C. 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.

²⁴ Under the railroad safety laws, civil penalties may be assessed against individuals only for willful violations. See 49 U.S.C. 21304.

IV. Summary of Comments

A. In General

Overwhelmingly, the commenters to this rule applauded FRA for amending its noise standard. They commended FRA for taking the initiative to prevent noise-related hearing loss among railroad workers. They also expressed their support for FRA's effort to establish a uniform noise exposure rule for railroad operating employees, explaining that a uniform noise standard for the railroad industry will facilitate understanding of, and compliance with, regulatory requirements. One commenter was pleased to see that FRA had addressed both noise control (part 229 requirements) and hearing conservation (part 227 requirements) in this rule, because, based on their observations, the most successful hearing loss prevention programs are those that include both noise control and hearing conservation components.

The commenters acknowledged that FRA's rule would bring about some significant improvements in certain areas of hearing conservation and would significantly improve the health and safety conditions for cab occupants. However, several commenters felt that the proposed rule still fell short of an effective hearing conservation program. Chief among that concern, commenters felt that FRA was relying too heavily on OSHA's standard. Commenters agreed that OSHA's standard was a good starting point, but explained that OSHA's standard could use some updating.

They explained that OSHA's rule is over 20 years old and rooted in even older data. One commenter explained that the OSHA standard was based largely on the NIOSH recommended criteria from 1972, which was based on research in the 1950s and 1960s. The commenters went on to explain that, since that time, there have been new scientific findings (including advances in the fields of acoustics and bioacoustics), technological advancements, and years of field experience. The commenters felt that FRA should make more efforts to incorporate these advances into its standard. They explained that their comments tended to reflect this viewpoint. Along these lines, some commenters encouraged FRA to consider incorporating components of "stronger" standards such as MSHA's recent rule and the 1998 NIOSH revised criteria.

FRA was very cognizant of these issues in drafting the rule. While FRA modeled its rule after OSHA's standard

and not after an alternative standard such as NIOSH's 1998 revised criteria, FRA notes that FRA did not adopt each one of OSHA's provisions without question. FRA incorporated several new changes into its revised noise standard, including some changes at this final rule stage. Throughout the process, FRA has tried to strike a balance between deferring to OSHA, the lead federal agency in the field of occupational safety and health, and incorporating changes based on scientific advances, technological improvements, recognition of some of the unique circumstances present in the railroad operating environment, and field experiences. FRA believes that this rule strikes the proper balance at this time.

In the paragraphs below, FRA discusses several overarching comments. FRA discusses comments specific to the rule text in the section-by-section analysis.

B. Approaches Other Than the OSHA HCA

FRA modeled this rule after OSHA's Hearing Conservation Amendment (HCA). Several commenters strongly encouraged FRA to rewrite this rule based on the 1998 Revised Criteria for a Recommended Standard. They noted that NIOSH's more stringent standards, such as an exposure limit of 85 dB(A) or an exchange rate of 3 dB, will better protect railroad workers by significantly reducing their risk of noise-induced hearing loss. Once commenter wrote that FRA, by choosing the OSHA model, had proposed what amounts to a watered down "hearing loss documentation program."

Another commenter, the doseBusters Company,²⁵ questioned why FRA gave little "consideration" to other prevention strategies. The doseBusters Company argued that OSHA's HCA is a flawed approach to the prevention of hearing loss and cited several reasons why it believes that FRA should have considered other prevention strategies: (1) The HCA is based on information, analyses, thinking, and technology that is 25 years old; (2) At the time of its adoption, the HCA represented a compromised approach; and (3) The prescriptive approach of the HCA may preclude more effective and/or conservative alternatives and stifle future innovation in prevention efforts.

The doseBusters Company suggested that FRA provide a performance-oriented framework for the prevention

²⁵ FRA notes that the doseBusters Company Web site no longer exists and that FRA has been unable to find the doseBusters Company through any other means on the Internet.

of noise-induced hearing loss by either adopting, or at least allowing, alternative strategies. As one of those alternate strategies, the doseBusters Company advocated for its own solution—a program of continuous monitoring using a proprietary device that also serves as a hearing protector. The Exposure Smart Protector (ESP) system simultaneously measures a workers's actual noise exposure and provides protection to the worker. This allows the employer to routinely determine the efficacy of the personal HP for individual users in real workplaces. It also provides the employee with individual feedback on his or her own daily noise exposure.

After discussion with the RSAC Working Group, FRA decided that it would not specify such alternate prevention strategies and that it would instead continue to model its rule after OSHA's HCA. FRA has chosen to follow OSHA's lead in this matter, because OSHA is the lead agency in the field of occupational safety and health. Presumably OSHA used its expertise and resources to determine that the HCA is the most appropriate method for hearing conservation. Moreover, the HCA approach is a proven and effective method in the work place environment.

With respect to the doseBuster Company's ESP System, FRA is unaware of any peer review or other scientific evaluation of that approach. As the doseBuster Company pointed out, the approach is still undergoing testing and review. In addition, there are several fundamental issues that the doseBusters Company did not address and would need to be addressed before FRA could employ this alternate prevention strategy. Among those issues are: Under what circumstances does the railroad decide to equip the employees with these devices? Should the railroad equip all potentially exposed employees or only a predefined group? What criteria would the railroad use to identify the predefined group?

Furthermore, these devices have the potential to create an unsafe operating environment. Railroad employees need to focus their attention on their jobs and the safe operation of trains. These devices, which depend on significant employee attention, would prevent employees from focusing all their attention on their jobs. Finally, FRA does not believe it is appropriate to identify a single commercial product as a means of meeting the requirements of the rule. This is of even greater concern given that the use of the ESP devices would impose a significant, increased burden on railroads in complying with other requirements of the rule (i.e.,

noise exposure monitoring and the associated recordkeeping requirements). While the doseBuster Company's concept is interesting, FRA does not believe that there is sufficient evidence that the device would be effective in increasing the protection of employees or that the system would be either practical or affordable for employers.

As explained above, FRA modeled this rule after the OSHA HCA. FRA chose not to use alternate prevention strategies such as NIOSH's Recommended Standard²⁶ or the doseBuster Company's ESP system. While FRA has not chosen to use these alternate strategies, there is nothing in the rule that precludes a railroad employer from using any individual components of these strategies, as long as the components are consistent with the requirements of FRA's rule. For example, if a railroad wished to use doseBuster Company's ESP hearing protectors, the railroad is free to do so, as long as the railroad satisfies all the requirements of this rule.

Finally, an individual engineer suggested that FRA consider another issue as part of its approach to hearing conservation. Specifically, the commenter wrote that FRA should mandate the use of air ride seats to address the problem of bone conduction whole body vibration. He asserted that vibration has an impact on hearing. FRA is not mandating the use air ride seats in this final rule, because the issue of vibration in locomotives is out of the scope of this rulemaking. It is possible that FRA will address this issue in the future. Vibration is listed as item number 3 on RSAC Task Statement 97-2 on Locomotive Cab Working Conditions and is discussed in Chapter 10 of FRA's September 1996 Report to Congress. However, FRA is not issuing regulations on the issue of vibration at this time.

C. Hierarchy of Controls

As explained above in section III(A), OSHA and FRA differ with respect to the controls each employs. OSHA identifies a hierarchy of controls that should be used to limit noise exposure—engineering controls and/or, administrative controls, and then hearing protection. FRA recognizes the same controls but utilizes a specific strategy to ensure cost effective

implementation of the controls in the railroad industry.

Several members of Congress submitted comments about the hierarchy of controls. Each of them expressed concern that FRA was using an approach different than OSHA and MSHA with respect to engineering controls. They explained that the primary tool under the OSHA and MSHA scheme is the elimination of noise from the workplace through engineering controls. They also pointed out that both OSHA and MSHA require the use of engineering controls only if they are commercially viable and economically feasible. In urging FRA to follow the lead of the other Federal agencies, one Congressman wrote that "OSHA is well-versed in the scientific and technical capabilities of engineering controls." He also wrote that "the OSHA standard has been proven to successfully protect the hearing of workers and the adoption of the OSHA standards will allow our nation's workplaces to have a consistent standard across all industries." These Congressmen and Senators urged FRA to consider revising the proposed rule so that, consistent with the other Federal noise standards, FRA's rule would require employers to use engineering controls as the primary method of reducing employee noise exposure.

Other commenters also expressed concern about FRA's approach. Several organizations wrote that FRA should base its rule on the "widely accepted concept of a hierarchy of controls." Cooper Tire and Rubber Company ("Cooper Tire"), which specializes in the manufacturing of transportation industry products, likewise disagreed with FRA's decision not to mandate the use of engineering controls as the primary strategy to combat workplace noise. Cooper Tire noted that FRA failed to follow OSHA's and MSHA's lead "due to unspecified concerns about the burden engineering controls would impose on railroads." Cooper Tire felt that it was "unclear how the FRA came to the conclusion regarding the costs of engineering controls." Cooper Tire explained that it has scientific and technological expertise in the area of noise reduction and control and that it is aware of current, off-the-shelf technology that will adequately address low-frequency locomotive noise. As a result, Cooper Tire believes that railroads can implement engineering controls at modest cost with maximum benefit to employees.

Cooper Tire also felt that FRA's approach to engineering controls (i.e., specific prescriptive requirements)

²⁶ Please note that while FRA has not adopted NIOSH's standard in whole (e.g., exposure limit based on 85 dB(A) limit and a 3 dB exchange rate, or annual training), FRA notes that it has adopted some components of the NIOSH standard (e.g., integrating sound levels up to 140 dB and conducting audiometric tests at 8000 Hz).

stifles the advancement of technology. Cooper Tire believes that by not allowing engineering controls generally, "FRA seems to presuppose that the proposed rule reflects all current technology and that no new technology will address the problem of workplace noise-induced hearing loss." Like the above commenters, Cooper Tire recommended that FRA adopt the same approach as OSHA and MSHA, "one which does not dictate specific engineering controls * * * but instead allows the employer to evaluate various engineering controls on the basis of their effectiveness, cost, technical feasibility, as well as their implications for equipment, use, service, and maintenance." Cooper Tire advocated that FRA use an Active Noise Reduction approach and discussed information on an actual installation of an Active Noise Reduction System tested by Cooper Tire.

In contrast, FRA also received comments indicating that FRA should be less reliant on engineering controls. The doseBusters Company wrote that "the role of engineering controls is always emphasized, yet in reality their impact on prevention of hearing loss is problematic." The doseBusters Company argued that engineering controls are not superior to hearing protection; that even if successfully implemented, engineering controls only prevent hearing loss for a fraction of workers (since few exposures are reduced to the action level through the use of engineering controls); and that engineering controls are not truly that effective (as evidenced by the fact that employers tend to rely on conventional hearing protection rather than engineering controls as the principal means of preventing hearing loss).

FRA appreciates the theoretical merit of active noise control ("noise cancellation") and has researched this subject in prior years in the context of community noise impacts. FRA believes that technology for active noise control may be useful in the future for reducing noise exposure in cab environments generally or in connection with audio headsets. Nothing in this rule prohibits use of this technology either in connection with initial qualification of locomotives or with respect to railroads' providing HP to employees. However, FRA is not aware of any rigorous demonstration that existing technology is feasible and "cost effective" for this purpose. The commenter provided no economic information supporting the claim that its proprietary technology is ready for application in the railroad environment, and FRA is not aware of any other supplier making such a claim.

FRA welcomes demonstration of the technology on locomotives in service, and FRA is prepared to assist in facilitating such a demonstration. However, FRA is not prepared to mandate an abstract requirement for engineering controls based upon a single supplier's representation that the technology is available and affordable. FRA believes that the more specific requirements for engineering controls embodied in this final rule are more suitable given existing knowledge.

With regard to the issue of freezing technology as asserted by Cooper Tire, FRA does not mandate any specific approach to manufacturing quieter locomotives, only that they meet a performance standard of a maximum permitted level of noise. Manufacturers and railroads are free to use any technology they wish to meet this requirement and FRA would expect the railroads and OEMs to continue to seek better (and perhaps cheaper) ways to do this.

Throughout the rulemaking process, FRA devoted a great deal of time to considering OSHA's rule and exploring alternative options. The RSAC Working Group engaged in extensive discussions on this issue and even formed a Task Force to solely consider the issue of engineering controls. The RSAC Working Group generally agreed that engineering controls should be emphasized as the first approach where feasible, but rather than leaving determinations of feasibility to later interpretation, the Working Group recommended that FRA specify the actions to be taken (i.e., new locomotives required to meet static testing requirements, protection of sound-insulating properties in existing locomotives, repair of certain noise sources as identified by crews). The RSAC Working Group had the confidence to take this approach because, over the past decade and a half, locomotive manufacturers have produced new locomotives that protect against excessive noise levels. At the same time, the RSAC Working Group recognized that there are operational conditions where, due to the limitations of glazing material or the need to run with windows open, occasional excessive doses might be encountered and that avoiding the need to employ HP under these circumstances might not be feasible. OSHA, by contrast, generally deals with fixed work places and needs a more general approach in order to address a wide range of industrial and commercial establishments.

As a result of these discussions, FRA and the RSAC Working Group decided

that the best approach for the railroad industry was the approach proposed in the NPRM—identify those specific engineering controls which were feasible and mandate them. FRA is further convinced of the appropriateness of that approach by the fact that it evolved out of the consensus process of the RSAC Working Group, which was comprised of representatives from railroads, manufacturers, unions, and others.

Given the number and nature of comments on engineering controls, FRA is reiterating its approach toward engineering controls specifically and controls generally.²⁷ FRA's overall approach toward controls differs from OSHA. Although OSHA and FRA both have the same three controls, FRA uses different terminology for two of them: (1) OSHA uses the term "administrative controls," and FRA uses the term "noise operational controls." (2) OSHA uses the term "engineering controls," and FRA uses no comparable term. FRA does however, require specific engineering controls. Those items are found in § 229.121. (3) Finally, both OSHA and FRA use the term "hearing protector."

OSHA places controls in a hierarchy and mandates their use according to that hierarchy—first engineering controls, and/or administrative controls, and finally hearing protectors. (Occupational noise exposure standard, administrative controls and engineering controls are on equal footing. See 29 CFR 1910.95(b)(1).) FRA has no such hierarchy. FRA expects that railroads *will* comply with the requirements in § 229.121 (equivalent to OSHA's engineering controls) and that railroads *will* comply with the requirements regarding hearing protectors. FRA gives railroads the *option* of using noise operational controls (OSHA's equivalent of administrative controls).

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.

Rather than impose the general requirement to "use engineering controls," FRA has identified the specific engineering controls which railroads must use. Specifically, railroads must buy locomotives manufactured such that they do not

²⁷ For a more detailed discussion, see the preamble to proposed rule at 69 FR 35145, 35155.

exceed a certain decibel level (see § 229.121(a)(1)), must maintain those “new” locomotives in such a way that alterations do not cause the sound level to increase beyond certain decibel levels (see § 229.121(a)(2)), and must maintain all pre-existing locomotives so that they do not reach excessive noise levels (see § 229.121(b)(1)). In maintaining locomotives, railroads must be cognizant of items, including but 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 outside of the cab (see § 229.121(b)(2)).

In addition to the items unique to this rulemaking, FRA has several other pre-existing maintenance requirements that reduce cab noise levels. Conditions that can contribute to the noise dose, such as leaking manifolds, flat spots on wheels, insecurely attached components, and general conditions addressed in § 229.45 are already required to be maintained properly under FRA’s regulations or the Locomotive Inspection Act itself for other safety reasons.

In practice, all of these items, both the maintenance items listed in the final rule and pre-existing maintenance requirements in part 229, function like engineering controls, because they modify or replace equipment at the noise source so that it reduces the noise level at the employee’s ear. So, while FRA does not use the term “engineering controls,” FRA still employs engineering controls. Indeed, over the past decade and a half, the locomotive fleet has come to be dominated by cabs that are sufficiently quieter such that hearing protection is not required under most conditions of operation.

Finally, FRA’s standard is different from OSHA’s in the following way. OSHA imposes a general requirement that their regulated industries must use engineering controls where they are technically and economically feasible. By contrast, FRA imposes specific requirements with which railroads absolutely must comply. Railroads have much less leeway when it comes to these controls than do OSHA’s regulated industries.

D. Triggering Criteria

The rule has two triggering criteria levels. The first one, which is located in § 227.107, delineates when a railroad should place an employee in a hearing conservation program. It requires railroads to place employees in a hearing conservation program if employees are exposed to noise at or

above the action level (i.e., an 8-hour-TWA of 85 dB(A) with a 5dB exchange rate). The second one, which is located in § 227.105, delineates when a railroad should actively protect employee hearing. It requires railroads to provide appropriate protection to employees whose noise exposure exceeds the permissible limit of an 8-hour-TWA of 90 dB(A) with a 5 dB exchange rate.

Several commenters were displeased with these triggering criteria. They recommended that FRA lower the exchange rate to 3 dB and the criterion level to an 8-hour-TWA of 85 dB(A) and that FRA use this as the sole trigger for compliance. The commenters asserted that an exposure limit based on 90 dB(A) and a 5 dB exchange rate is not protective enough for employees. The National Hearing Conservation Association (NHCA) wrote that these limits “will expose workers to an unacceptably high risk of noise induced hearing loss.” Similarly, NIOSH wrote that the 90 dB(A) limit exposes “workers to a statistically significant increase in the risk of occupational hearing loss.” Likewise, a locomotive engineer wrote that “90 dBA over 8 hours is a ridiculously high amount of noise. Anyone exposed to this day in and day out will certainly suffer hearing loss * * *. The one thing I was hoping you would do was lower the allowable noise level in all of our locomotive cabs and you have not done that.”

NIOSH pointed to statistics, which show that there is a increased risk to employees exposed to noise at higher levels. NIOSH quoted a 1997 article by Stayner Prince and Gilbert Smith, which explained that, with at least 10 years of occupational noise exposure, eight percent of 65-year old workers would develop a material hearing impairment at 85 dB(A), twenty-two percent at 90 dB(A), thirty-eight percent at 95 dB(A), and forty-four percent at 100 dBA. A Minnesota audiologist with a 20-year career in audiology, Ted Madison, cited additional NIOSH statistics, in his attempt to show that FRA’s proposed standard would result in noise-induced hearing loss for an “unacceptably high percentage of railroad workers.” Mr. Madison wrote that the estimated excess risk of incurring material hearing impairment over a 40-year working lifetime with average daily noise exposure of 90 dB(A) is 20% while the estimated excess risk with an average daily noise exposure of 85 dB(A) is only 15%.

In addition, a number of commenters pointed out that many government, scientific, and professional organizations recommend (and in some cases, mandate the use of) an 85 dB(A)

permissible exposure limit and a 3 dB exchange rate. This includes organizations such as the U.S. Department of Defense, U.S. Environmental Protection Agency, and the National Institute for Occupational Safety and Health. The commenters also pointed out that most European countries use 85 dB(A) or less and that both the International Organization for Standards (ISO) and the American National Standards Institute (ANSI) have adopted standards that rely on a 3 dB exchange rate. One commenter asserted that “virtually all other industrialized countries use a 3 dB exchange rate.”

In suggesting a 3 dB exchange rate, commenters made several other arguments. American Speech-Language-Hearing Association (ASHA) and the American Industrial Hygiene Association (AIHA) asserted that a 3 dB exchange rate was “more appropriate and protective for railroad employees.” They rejected FRA’s decision to follow MSHA, arguing that the “noise exposure conditions, legacy of engineering controls, and other criteria surrounding MSHA’s adoption of the 5 dB rule are not necessarily germane to the railroad industry.” Theresa Schulz, who has spent more than 20 years as a hearing conservation audiologist in the U.S. military, wrote that the 3 dB exchange rate is “based on scientific principle and the physics of sound.” Cooper Tire explained that “US and international regulatory agencies have eschewed the 5 dB exchange rate because of certain inherent deficiencies * * * [and] have embraced a more scientifically-sound, worker-friendly 3 dB exchange rate that is based on much better data than existed in the 1970s when the 5 dB exchange rate was first utilized.”

Commenters proposed various alternatives. NHCA recommended that FRA revise the rule to include the Threshold Limit Values (TLVs) for noise established by the ACGIH. The TLVs are based on an 8-hour TLV of 85 dB(A) and a 3 dB exchange rate. NIOSH suggested that if FRA ultimately decided to retain the 90 dB(A) exposure limit and the 5 dB exchange rate, then FRA should include a non-mandatory appendix containing tables from the 1998 NIOSH revised criteria document. Those tables would be analogous to the existing OSHA/FRA tables, however, they would calculate the numbers with a 85 dB(A) exposure limit/3 dB exchange rate (L_{NIOSH}) in addition to calculating the numbers with a 90 dB(A) exposure limit/5 dB exchange rate (L_{OSHA}). Commenters explained that, by having both sampling protocols, railroad safety and health professionals would be able

to better understand the spectrum of hearing risks faced by railroad employees and could better choose the most relevant method for protecting employee hearing. Overwhelmingly, though, the commenters advocated for FRA to “follow the NIOSH expert advice” and adopt an 85 dB(A) exposure limit and a 3 dB exchange rate.

For several reasons, FRA has decided to leave the triggering criteria as proposed. First, with respect to the exchange rate, many commenters argue that the 3 dB rate is much more protective than the 5 dB rate that FRA proposed and now adopts. The issue, however, is not as clear as the commenters suggest. There are two major approaches that have been taken in attempts to develop a simple scheme for determining the appropriate level of protection: the equal-energy approach and the equal-TTS approach. “The equal-energy approach is an example of attempts to equate exposures on the basis of their physical characteristics directly, while the equal-TTS method is based on an assumed correlation between permanent and temporary effects of noise exposure.”²⁸

The equal energy approach “makes the assumption that damage depends only on the daily amount of A-weighted sound energy that enters the ear of the worker, and that the temporal pattern during the day is irrelevant.”²⁹ This approach ultimately leads to the “3 dB rule,” which is that one should reduce the permissible time of exposure by half for every 3 dB increase in dose level. Thus, the argument for a 3 dB exchange rate assumes that since 3 dB represents a doubling in the acoustical energy, it also represents a doubling of the damage risk based on the daily exposure rate. However, this is not necessarily true. A doubling in energy does not necessarily represent a doubling of the damage risk, because there is a serious shortcoming with this theory. This theory only applies to single steady uninterrupted exposures. This theory does not account well for exposures to noise environments where the noise levels vary widely in intensity and throughout the work shift. Where exposures vary widely in intensity and over time, there is an opportunity for some auditory recovery and so the damage risk is not

equivalent to exposures to steady state noise. The second theory is the equal-TTS theory. It “is based on the hypothesis that daily exposures that produce the same temporary effects will eventually produce the same permanent effects.”³⁰ This theory does not have the same problem as the equal-energy theory, for it does not make the mistake of ignoring temporal patterns.

Neither of these approaches, however, are well-suited for the locomotive cab noise environment. FRA experience has shown that exposures for crews of older and relatively “noisy” locomotive cabs are a mixture of periods of generally steady state noise at low to medium levels (80–90 dB(A)) interspersed with short periods with high noise levels (e.g., horn blowing, operations through tunnels and underpasses, and other relatively short term events). Given that crew exposures vary in intensity and over time, the equal energy approach (which ignores these temporal patterns) is not appropriate. As for the equal-TTS approach, it might be a seemingly more accurate method of assessing damage risk, but it is not suitable for regulatory compliance purposes, because its criteria are extremely complicated to apply.

During the development of the OSHA HCA, OSHA was likewise faced with the practical reality of these approaches. OSHA wanted a simplified approach to establishing an equivalent exposure, but one that would account for the intermittence of exposures inherent in many occupational noise settings. Accordingly, OSHA came up with the 5 dB exchange rate. They “decided that the best way to take into account the reduction of hazard associated with intermittence was to use a trading relation of 5 dB per halving of exposure time.”³¹ FRA, like OSHA, believes that the 5 dB exchange rate is the most appropriate one to use at this time.

Second, FRA does not feel comfortable changing the triggering criteria, since it would be a radical departure from the existing leading federal regulation on occupational noise exposure. The leading federal regulatory authority for occupational hearing loss is OSHA, and the leading federal regulation on occupational noise exposure is OSHA’s general industry standard. See 29 CFR 1910.95. The current OSHA permissible exposure limit, action level, and exchange rate are the same as those that FRA is using in this final rule. During this rulemaking proceeding, FRA sent a letter dated January 11, 2005 to OSHA and asked

whether OSHA’s position had changed since the issuance of the HCA and whether OSHA had any plans in the near future to modify its exchange rate. In referring to scientific and technical issues including the exchange rate, OSHA replied in a March 16, 2005 letter that “OSHA has not re-addressed these issues since [the issuance of the HCA] and our position remains essentially unchanged.” (Copies of the letters are included in the docket). In addition, FRA notes that in a 1999 rulemaking, MSHA adopted hearing conservation requirements for miners, using the same limits and exchange rate as OSHA. See 64 FR 49548 (September 13, 1999).

Third, FRA notes that the data supported by several of the commenters (to support a 3 dB exchange rate) fails to take into account the actual nature of employee exposure. Studies cited in the comments (that compare the risk of hearing loss over time based on the level of the employee’s noise exposure) presume that employees experience these exposures without any protective measures. That is not necessarily true. Employees who are included in a hearing conservation program are presumably educated about the risk of noise, have been offered HP at certain noise levels, and have been required to wear HP at certain levels. Thus, employees in a HCP are a “protected” population and their hearing loss will be less than that of the “unprotected populations” (that are cited in the studies). And so the risk of hearing loss with a 5 dB exchange rate is not as high as commenters suggest.

Fourth, even if FRA were to accept the argument that the 3 dB exchange rate is more protective and appropriate for the noise experienced by locomotive crews, FRA cannot adopt the lower limit given the implications that would result. While the railroads are subject to FRA’s noise standard for their noise-exposed employees in the locomotive cab, railroads are subject to OSHA’s noise standard for noise-exposed employees in areas outside of the locomotive cab. See § 227.101. If FRA adopted a 3 dB exchange rate and OSHA continued with its 5 dB exchange rate, railroads would have to comply with two different regulatory criteria for their employees. That would be overly burdensome, difficult, and costly. For example, it would most likely substantially increase the railroad’s recordkeeping burden and the railroad’s cost for medical services. There are limits to what technology permits and what the regulated industry can afford. FRA would be pushing those limits by imposing the 3 dB exchange rate.

²⁸ Berger, E.H. (2000). “Auditory and Non-auditory Effects of Noise” in *The Noise Manual*, 5th Edition, edited by E.H. Berger, L.H. Royster, J.D. Royster, D.P. Driscoll, and M. Layne, Am. Ind. Hyg. Assoc., Fairfax, VA, 137.

²⁹ Berger, E.H. (2000). “Auditory and Non-auditory Effects of Noise” in *The Noise Manual*, 5th Edition, edited by E.H. Berger, L.H. Royster, J.D. Royster, D.P. Driscoll, and M. Layne, Am. Ind. Hyg. Assoc., Fairfax, VA, 137.

³⁰ *Id.* at 138.

³¹ *Id.* at 139.

Fifth, the use of the 3 dB exchange rate is not as widespread as some commenters suggest. FRA believes there is a marked distinction between professional organizations that *recommend* a 3 dB exchange rate and Federal agencies that actually *enforce* a 3 dB exchange rate on a regulated community. Most of the entities that recommend the use of the 3 dB exchange rate are professional organizations like NIOSH, ACGIH, NHCA, ASHA, and the American Academy of Audiology (AAA), as well as standards organizations like ANSI and ISO. Few Federal regulatory agencies actually enforce a 3 dB exchange rate standard on a regulated community. OSHA and MSHA use a 5 dB exchange rate. DOD is one of the few federal agencies that has a 3 dB exchange rate, but even DOD is in a unique position, for they have internal guidelines, as opposed to regulations in the Code of Federal Regulations. (In addition, the Air Force is an especially unique situation since the Air Force's employees face unusually high noise levels, and so the 3 dB exchange rate is warranted). For the reasons listed above, FRA believes that the adopted triggering criteria is the best approach currently available to achieve the regulatory and occupational health objectives of this rule. Accordingly, in this final rule, FRA is using the same triggering criteria as proposed in the NPRM.

E. Weighting Filter

FRA used the A-weighted scale throughout the proposed rule. FRA explicitly acknowledges its use in § 227.105(a), where FRA writes "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." (A weighting filter is an electronic device in the sound measuring instrument that changes the way the instrument detects the intensity of different frequencies of sound. The A-weighting filter is designed to approximate the sensitivity of the human ear to the different sound frequencies.) Two commenters, Cooper Tire and an individual railroad employee, suggested that FRA should use the C-weighted scale instead of the A-weighted scale.

Cooper Tire asserts that the A-weighting scale is not appropriate for the locomotive cab noise environment. Cooper Tire explains that the noise generated by a locomotive is radically different than the noise found in other industrial environments (i.e., of a lower

frequency), and so FRA should use a weighting scale that appropriately measures low-frequency noise (i.e., the C-weighted scale). Cooper Tire explains that "A-weighted noise measurements filter out low-frequency noise content characteristic of locomotive noise prior to the noise measurement, giving an artificially low measure of an environment's likelihood of causing harm to the locomotive employee." By contrast, Cooper Tire believes that the C-weighted scale will better measure the low-frequency noise and thus "will afford railroad workers better protection against the negative hearing and health effects that low frequency noise can cause." Similarly, an individual BLET member submitted comments, requesting that FRA use a C-scale instead of an A-scale in order to better measure low frequency noise.

Consistent with its position in the proposed rule and OSHA's position in its general industry standard, FRA will require railroads to use the A-weighted scale for measuring occupational noise in the workplace. Not only is the A-weighted scale the most appropriate weighing filter for this purpose, but it is also the most widely accepted.

According to the AIHA Noise Manual, "As a result of investigations in which a variety of weighing filters have been compared, it has been concluded that empirically derived measures using A-weighting gives a better estimation of the threat to hearing * * * than do the other weightings. Because of simplicity and substantiated results, A-weighting has continued to receive wide acceptance."³² The Working Group members agreed with this position, as does FRA. Accordingly, FRA has not changed the weighting scale it uses in this rule.

F. Electronic Communication Headsets

During pre-NPRM Working Group meetings, the matter of electronic communication headsets generated extensive discussions. Railroad representatives strongly disfavor the use of these devices. They maintain that they 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 them. 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 with the resulting heat build-up under the headsets causing 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.

In the NPRM, FRA sought comment from the public on the use of different types of hearing protection, including electronic communication headsets. Several commenters, all of whom appear to be railroad operating employees, questioned why FRA did not require the railroad industry to use noise canceling headsets with built-in communication microphones. The commenters explained that the headsets work well for airline pilots, and so would probably also work well for locomotive engineers. Another commenter explained that these headsets would keep out the locomotive noise and make it easier to hear the dispatcher. Overall, these commenters felt strongly that these headsets would make a significant difference and would decrease the noise level in locomotives. One individual, in particular, wrote that "[these headsets] would not be inexpensive, but [these headsets] are worth their weight in gold in an aircraft environment and would likely be the same in a locomotive."

The AAR, however, disagreed as to the value of these headsets when used as hearing protection. The AAR noted that several of their members have had extensive experience with radio headsets and have found that their use is limited. The AAR explained that the headsets have been poorly received by most crews and that many employees found the headsets to be uncomfortable. The AAR also explained that many employees lost their headsets or left them at home. The consensus of the AAR members is that "the disadvantages and cost of radio headsets far outweigh any benefits they might offer."

FRA considered this issue and decided to leave this provision the same as in the proposed rule. As noted above, the Working Group had discussed this issue at length in past meetings and reached the same conclusion. Absent any new information or justification to support a change, neither FRA nor the Working Group saw any reason to change its position. FRA thinks, at this time, that it is most appropriate that FRA allow the use of the electronic headset technology but not require it.

³² Earshen, John J. (2000). "Sound Measurement: Instrumentation and Noise Descriptors" 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, 54.

FRA has previously examined the issue of temperature control in locomotive cabs and came to the conclusion that it was not possible to mandate use of air conditioning during hot periods of the year. In reporting these findings to the RSAC, FRA did call attention to the importance of temperature control and urge railroads to include full temperature control in its specifications for new locomotives and to maintain the systems in service. Absent firm requirements that temperature control be provided, and given the long hours that employees work in the cab setting, FRA agrees it is not practical to require use of headsets in the normal course of business.³³

In sum, FRA will not require a railroad to offer electronic (or radio) communication headsets (wired or wireless), however FRA does not intend to discourage railroads from using this technology. Railroads are welcome to use this technology if they so wish. Of course, 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. Because of the safety need attendant to good intra-crew communication, this is an accommodation that would be particularly appropriate where one member of the crew has known hearing loss and the locomotive is an older model known to have significant background noise. In this case, all crew members should cooperate in utilization of the technology. As a related aside, FRA notes that, with respect to crew members with documented hearing loss, this rule does not vary or add to the railroad's duties under the Americans with Disabilities Act.

G. Location of the Train Horn

Several individual commenters, all railroad employees, expressed concern about the location of the train horn. One commenter asserted that the location of the train horn was unsafe with respect to hearing protection for personnel on the train. Another commenter suggested that railroads with cab-roof-mounted horns should relocate their horns to the back of the cab on the engine compartment hood. This commenter also stated that cab-mounted horns create a greater safety risk, because they reduce the communication between the engineer and conductor in the cab and

because they decrease the crew's ability to hear the radio. Yet another asserted that the "biggest cause of cab noise [is] the horns mounted on top of the locomotive cab on all the older engines" and recommended that the new rule "include mandatory relocation of the roof mounted horns to the long hood area where all new locomotive horns are mounted."

FRA has a long history of working with the railroad industry on the issue of locomotive horn noise, both in the context of locomotive cab working conditions and of unwanted noise in communities through which active railroad lines pass. FRA has addressed train horn issues in depth through the rulemaking proceedings for its Final Rule on the Use of Locomotive Horns at Highway-Rail Grade Crossings ("Train Horn Rule.")³⁴ The issues ranged from setting maximum horn sound output levels to limiting horn sound (emanating to the side of the locomotive) to relocating the horn on locomotives. In order to fully consider these issues, FRA held a Technical Conference on Locomotive Horns during the comment period to the NPRM (for the Train Horn Rule), conducted tests through the Volpe National Transportation Systems Center, and reviewed the results of Transport Canada tests.

Research in support of the Train Horn Rule confirmed that placing the horn in the middle of the locomotive results in the need to have louder output from the source in order to achieve adequate warning to motorists, which, in turn, causes concern in communities along the rail line. However, the placement of the horn in the middle of the locomotive clearly reduces the impact on crews. Research conducted in Canada suggests that front-mounted horns may be more effective (than center-mounted horns) in providing warning under dynamic conditions.

In the Train Horn Rule, FRA decided not to mandate the relocation of the train horn. FRA explained that further research would be necessary before making any further regulatory changes. FRA continues to research these issues. For purposes of this rulemaking, the issue is whether employee hearing is adequately protected. The provisions of this rule will achieve that result. Accordingly, FRA, with the agreement of the RSAC Working Group, is not mandating that railroads locate the train horn in any particular location.

H. FRA Report to Congress

In the NPRM, FRA discussed the noise chapter of its 1996 Report to Congress.³⁵ The AAR commented on the data relied upon for the Report to Congress. The AAR asserted that there were problems with that data, that is "that FRA made time weighted measurements using an eight hour metric, but then reported the results as a percent of dose using a twelve hour metric as a reference. This resulted in overstating the percentage of exposures that exceeded the permissible exposure limit and also overstating the percentage of exposures that exceeded the OSHA threshold for hearing conservation programs." The AAR believes that it "could lead to overestimating the degree to which train crews are exposed to sound levels."

The AAR noted that FRA had acknowledged in the preamble discussion to the NPRM that the Report to Congress was "not rigorous." However, the AAR wants FRA to publicly correct the averages and percentages in the Report to Congress that were affected by these errors. The information that FRA endeavored to summarize in the Report is now more than a decade old and could not, even if drawn from a representative sample of assignments (which it was not), and even if re-characterized as AAR suggests, be used to describe current industry conditions in any quantitative way. However, the Report to Congress provides data supporting the proposition that excessive noise doses are possible in the worst of the older locomotives. And, industry representatives themselves pointed out during RSAC Working Group deliberations that occasional excessive doses are possible in new locomotives under challenging conditions of operations (e.g., windows open, many grade crossings, heavy loading). Industry noise monitoring has confirmed these points (see data reported in Appendix C to the Regulatory Impact Analysis for this final rule), and all parties agree that a hearing conservation approach is warranted to address potential exposures. Accordingly, FRA, having responded repeatedly and candidly to criticisms of the Report, sees no purpose relevant to this rulemaking for revisiting the details of the Report.

I. Regulatory Impact Analysis

The doseBusters Company submitted comments on the Regulatory Impact Analysis (RIA) that FRA prepared to

³³ See Pilcher, J., Nadler, E., and Busch, C., "Effects of Hot and Cold Temperature Exposure on Performance: A Meta-Analytic Review," *Ergonomics*, vol. 45, no. 10, 682-688.

³⁴ See FRA Docket No. 1999-6439, including 65 FR 2230 (January 13, 2000), 68 FR 70586 (December 18, 2003), and 70 FR 21844 (April 27, 2005).

³⁵ See 69 FR 35146, 35149 (June 23, 2004).

accompany the NPRM. FRA has responded to these comments in the final economic analysis, of which a copy can be found in the docket. FRA is addressing one comment here, however, because it is related to the reasons that FRA issued this rule and not just the RIA.

The doseBusters Company commented on Appendix C of the RIA. Appendix C of the RIA cited railroad data that FRA had reviewed before issuing the rule. A Class 1 railroad has gathered and submitted to FRA data on employee noise exposure in the locomotive cab. FRA reviewed that data, as described in Appendix C to the RIA. The doseBusters Company felt that the data readings from the dosimeter were flawed because of the placement of the dosimeter microphones during testing (*i.e.*, the microphones were placed at different locations—at the collar lapel, ball cap, or shoulder). The doseBusters Company asserted that using different microphone locations could cause substantial errors in the data.

The doseBusters Company also disagreed with FRA's conclusions from the testing about the risk of NIHL. The doseBusters Company stated that the results from the noise sampling represented the average number of workers overexposed to noise on any particular day, not the actual number of workers that may be overexposed over time. The doseBusters Company explained that, based on similar exposure data that they collected on underground coal miners, they estimate that nearly twice the number of railroad workers (than FRA identifies) are overexposed to noise.

FRA does not believe that the dosimeter data is flawed, and FRA believes that it can rely on this data which it received from a Class 1 railroad. FRA believes that the primary objective of this data collection was met placing the microphone near the employee's ear. It is widely accepted that, as long as the dosimeter microphone is located in the employee's hearing sphere (*i.e.*, a sphere with a two-foot diameter surrounding the head),³⁶ the tester will get a reasonable representation of the employee's noise exposure. In addition, FRA notes that this data was collected from field surveys, not a controlled laboratory study. As such, small variations in the microphone testing location may be expected. FRA also notes that, out of 512 valid samples, 17 samples included

a comment about the microphone location. In addition, no structural errors were observed in the data. As the variance in microphone location appears to be small from the comments, the error introduced by this variance is likely to be small as well. A small amount of error would not invalidate the study results.

The data displayed in the two tables in Appendix C to the RIA, *Locomotive Cab TWA(80) Measurements* and *Locomotive Cab TWA(90) Measurements*, were a simple count of the number of employees that fell below or above the OSHA standards. The TWA or number of employees was not arithmetically averaged. FRA agrees that a longitudinal study would have provided additional information on which employees were overexposed to noise and how their noise exposure changed over time. FRA notes that no new data was gathered for the analysis in Appendix C; rather, a previously-conducted study provided a cost effective source of data. FRA feels that the data review provides a good indication of the number of employees overexposed to noise in those environments in which the noise sampling was conducted, given that railroad routes and schedules tend to stay fairly constant. With similar work activities performed over time, the noise exposure can be expected to approximate the noise exposure measured in the study.

Without further information, FRA is uncertain whether the coal mining example cited by the doseBusters Company applies to the railroading environment. There are likely many differences between the coal mining environment and the railroading environment. For example, the noise sources, noise duration, sound frequencies, and reflective characteristics of the surroundings may all be different. Although FRA finds the coal mining comparison to be interesting anecdotally, there is no information presented that indicates how noise exposure in an underground coal mine correlates with noise exposure in a railroad cab.

V. Section-by-Section Analysis

This section-by-section analysis explains the provisions of the final rule. A number of the issues and provisions of the final rule have been discussed and addressed 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. Section 227.1(a) provides that the purpose of this part is to protect the occupational health and safety of employees involved in specified 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 rule is to protect individuals over the span of their railroad career. Section 227.1(b) states that this part prescribes minimum Federal health and safety noise standards for locomotive cab occupants.

FRA did not receive any comments on this section, and so FRA did not make any changes based on public comments or RSAC Working Group discussions. However, FRA did make a few minor changes in order to clarify this section. FRA revised the language in § 227.1(b) to reflect the fact that the rule provides “noise standards for locomotive cab occupants,” not general “health and safety standards for specified workplace safety subjects.”

Section 227.3 Application

This section identifies the applicability of this part and states that part 227 will apply to all railroads and contractors to railroads. This section identifies five 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. Aside from the exception noted below, this part will apply to rapid transit operations in an urban area that are connected to the general railroad system.

Third, this part will not apply to rapid transit (light rail) operations in an urban area that are connected to the general system and operate under a shared use waiver. This exception is a departure from the proposed rule, and one that was decided upon after the RSAC consensus. These operations are provided using electrical powered or diesel powered light rail vehicles. Most of these systems operate as street-running trolleys and over track segments shared with conventional railroads using the approach referred to

³⁶This definition comes from Appendix III(A), “Instruments Used to Conduct a Noise Survey” of OSHA's Technical Manual. See <http://www.osha.gov/dts/osta/otm/noise/exposure/instrumentation.html#dosimeter>.

as temporal separation. FRA has attempted to maintain consistency in sorting out those matters that FRA should regulate (because of interface with conventional railroads) and those that the Federal Transit Administration should regulate (under their State Safety Oversight program). FRA has used the waiver process to implement this arrangement, following the general principles set forth in FRA's relevant policy statements. See 49 CFR part 209, Appendix A "Statement of Agency Policy Concerning Enforcement of the Federal Railroad Safety Laws" and 49 CFR part 211, Appendix A "Statement of Agency Policy Concerning Waivers Related to Shared Use Trackage or Rights-of-Way by Light Rail and Conventional Operations."

With the passage of time, FRA and the affected transit authorities have found this complex of issues increasingly unwieldy. FRA believes that where FRA is issuing or revising a regulation, matters are greatly simplified both for the regulated entity and for FRA, if FRA provides for appropriate exceptions outright. This is such a case. Light rail operations are typically conducted using equipment designed for passenger and operator comfort, and FRA has received no information that any shared use light rail operation is affected by a serious noise exposure problem. Further, to the extent a transit authority needs to address hearing conservation issues among its employees, there is no reason to single out just the employees operating on the general rail system. Finally, from a practical standpoint, most shared use operations involve line segments not under FRA jurisdiction, and it would make no sense to bifurcate hearing conservation between the time the trolley operator is on the shared use segment and the time the trolley operator is on the street running segment. Accordingly, FRA has provided for an appropriate exception in this final rule.

Fourth, 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 those operations,

FRA has considered that they are often seasonal and generally use older or historic equipment.

In the NPRM, FRA solicited public comment on how to handle the employees covered in these types of operations but did not receive any comments. FRA has no evidence that employees and volunteers providing this service are at serious risk of hearing loss. Accordingly, FRA will continue to exempt these operations from this regulation. FRA notes, however, that operations utilizing steam locomotives with extended duty periods for locomotive engineers and firemen should make vigorous use of hearing protection to reduce crew doses to acceptable levels.

Fifth, this part will not apply to certain foreign railroad operations. Specifically, it will not apply to operations where employees of foreign railroads have a primary reporting point outside the U.S. but are operating in the U.S., and they satisfy the following requirements: (1) The government of the country in which the foreign railroad is based 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 will determine whether the foreign government's requirements are consistent with the purpose and scope of this part, specifically that the purpose of the foreign government's requirements are "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 and that 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.

FRA did not receive any comments on this section, and so FRA did not make any changes based on public comments or RSAC Working Group discussions. However, FRA did make two minor changes on its own. FRA realized that it had failed to state in § 227.3(a) that the rule covers contractors in addition to railroads. While the preamble to the NPRM included such a statement,³⁷ the regulatory text did not. The regulatory text now indicates that this rule covers railroad contractors. FRA also realized that there was a drafting inconsistency in § 227.3(b)(4) and corrected it. In order to provide for consistency within the section, FRA started § 227.3(b)(4) with the term "railroad operations" instead of the term "employees."³⁸

Section 227.5 Definitions

This section contains definitions for key terms. The definitions are set forth alphabetically. FRA intends these definitions to clarify the meaning of terms as they are used in the text of the final rule.

Many of these definitions have been taken from the standards issued by OSHA and MSHA and the recommendations issued by 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

³⁷ See 69 FR 35157.

³⁸ The language in the NPRM had provided: "This part does not apply to * * * 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 * * *"

“Administrator,” “FRA,” “Person,” “Railroad,” and “Tourist, scenic, historic, or excursion operations.” Several of the definitions, however, are new or fundamental concepts that are discussed below.

The term “Action Level” has been revised since the proposed rule. FRA, with the agreement of the RSAC, changed the upper limit for noise measurements from 130 dB(A) to 140 dB(A). FRA also made this change in § 227.103(c)(1). See § 227.103(c)(1) for a discussion of the revision.

The term “Audiogram” has been added to the final rule. The Council for Accreditation in Occupational Hearing Conservation (CAOHC) and AAA recommended that FRA add this definition. Since FRA uses this term throughout the rule, FRA decided, and the RSAC Working Group agreed, that it is appropriate for FRA to provide a definition.

The term “Audiologist” has been revised from the proposed rule. Several commenters suggested that FRA revise the definition, and most suggested alternative definitions. ASHA suggested a revised definition and explained it would be consistent with that contained in ASHA’s Scope of Practice in Audiology (2004). An individual commenter suggested an almost identical definition, except that it contained a different certification and licensing requirement. AAA also submitted a revised definition, explaining that their recommended definition came from the Social Security Act³⁹ and by using it, FRA would foster uniformity among Federal health programs. Finally, an individual ASHA member requested that FRA ensure that the audiologists are fully educated and trained. In particular, she suggested that an audiologist should have at least a master’s degree (or Ph.D. or Au.D), experience and training in hearing conservation, and certification from a national organization (and state licensure).

RSAC Working Group members expressed concerns about certain aspects of the comments. One member was concerned that it might be unreasonable to expect audiologists to have masters or doctoral degrees, however the other members pointed out that the vast majority of audiologists already have either masters or doctoral degrees. Another member was concerned about linking audiologist certification to a single organization. (In the NPRM, FRA had required ASHA certification for audiologists). Members were concerned that this might present

problems if that organization went out of existence or if a new licensing organization was created. As a result, the Working Group members decided not to link licensing to any one organization.

In addition, one railroad representative explained that he had reservations about AAA’s recommendation that the audiologist be licensed in the state in which the audiologist furnishes service. The railroad representative explained that since railroads operate through several states, railroad audiologists will provide services in many states. It would be impracticable to expect railroad audiologists to become licensed in each state in which the railroad operates. FRA agrees that it would be impracticable to impose such a burden on railroads, and thus FRA did not adopt AAA’s recommendation. OSHA’s rule did not require licensure in the state in which the audiologist furnishes service. FRA also does not have such a requirement. Moreover, FRA does not expect that this will present any problems. As a general matter, FRA expects that audiologists will perform broad duties associated with the hearing conservation program. Presumably, the audiologist will perform such duties from the state in which the railroad is headquartered and where the audiologist is licensed. Furthermore, FRA’s experience has indicated that most railroad audiometric testing tends to be conducted by contractor technicians hired by the railroad. As such, audiologists are unlikely to travel into the field in mobile vans (i.e., potentially other states) and provide audiological services.

As a related matter, one Working Group member suggested that FRA remove the provision in the second half the definition of audiologist, which sets the parameters for states which do not license audiologists. The Task Force member asserted that the provision was unnecessary, since the revised rule only requires audiologists to be licensed in any one state, and so therefore there was no need to make provisions for states without audiologist licensing requirements. The Task Force, as a whole, however, decided that removing this provision could create a problem for shortlines. A shortline operating in only one state which did not have licensing requirements for audiologists might have difficulty finding audiologists. With the provision removed, the rule would require audiologists to have a state license, and yet if the state didn’t require audiologists to get licensed, it would be likely that most, if not all, the

audiologists near the shortline operations would not have state licenses. Accordingly, FRA decided to retain in the definition of audiologist a provision for states which do not license audiologists.

The definition in the final rule is a hybrid of the above recommendations. It combines the description of the tasks from the ASHA (i.e., “a professional who provides comprehensive diagnostic and treatment/rehabilitative services for auditory, vestibular, and related impairments”) with the qualification requirements from AAA (i.e., requires (1) a masters or doctoral degree and (2) a state license or alternate state certification). (Note also that FRA has formatted the qualification requirements slightly different than AAA.) This hybrid definition addresses both commenters’ concerns that audiologists are adequately qualified, as well as Working Group members’ concerns that railroads are able to comply with the rule.

The term “Audiometry” has been added to the final rule. The Council for Accreditation in Occupational Hearing Conservation (CAOHC) and AAA recommended that FRA add this definition. Since FRA uses this term throughout the rule, FRA decided, and the RSAC Working Group agreed, that it is appropriate for FRA to provide a definition.

The term “Continuous Noise” is intended to clarify the use of the word in § 227.105. The term is used in OSHA’s standard,⁴⁰ though OSHA does not include a definition in its definition section. FRA decided to add a definition for the sake of clarity.

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 preventing hearing loss. FRA holds no position 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

³⁹ See 42 U.S.C. 1395x(l)(3)(b).

⁴⁰ See 29 CFR § 1910.95(b)(2).

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. As previously discussed, both OSHA and MSHA also use a 5 dB exchange rate. Regarding this definition and the definition of "Time-Weighted Average," several commenters suggested that FRA instead adopt a 3 dB exchange rate. For a discussion of those comments, see section IV(D) above.

The term "Hearing Protector" refers to "any device or material, which is capable of being worn on the head, covering the ear canal or inserted 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." At the suggestion of NHCA and with the consensus of the RSAC Working Group, FRA added the words "covering the ear canal opening" after the phrase "worn on the head" and "inserted" before "in the ear canal." FRA believes that these words make the definition more clear.

In the NPRM, FRA sought comment on inclusion of the phrase "has a scientifically accepted indicator of its noise reduction value." The RSAC Working Group had discussed this phrase during the proposed rule stage and had considered several variations. Certain Working Group members had, at one point, thought the phrase was too general and provided too much leeway. They wanted that phrase replaced with a requirement to use a specific indicator, the Noise Reduction Rating (NRR). FRA sought comment from the public, asking whether FRA should use a general description for an indicator, the NRR, or some other specific indicator.

A few commenters, including Aearo Company, ASHA, and Theresa Schulz, responded to FRA's request for comments, explaining that they felt that the phrase was too vague. Aearo Company and ASHA suggested that FRA should mandate the use of a specific rating(s) for enforcing hearing protector attenuation and include that rating(s) in this definition. They noted that there were several options, including NRR, NRR (SF), and Method B, though did not assert a preference for any individual one. Similarly, Theresa Schulz noted that there are new products and testing methods, including Fit Testing, Method B and Predicted Personal Attenuation Rating (P-PAR), that have been accepted scientifically and that provide real-world testing of attenuation.

The AAR also responded to FRA's request for comments, noting its support for the proposed definition of HP. The

AAR wrote that railroads should not be limited to the NRR for evaluating HP attenuation, because it does not provide the flexibility to employ current science. The AAR explained that there is current technology, such as in-the-ear microphones, which measure actual attenuation, and that technology would not be available if railroads were limited only to the NRR.

The Working Group discussed these comments and expressed concern that replacing that phrase with the NRR (or any other specific indicator) would ultimately be limiting. It would prevent the industry from availing themselves of advances in science and technology. By not listing any particular indicator, FRA leaves it open for the development of new standards. This is particularly important, since the EPA is currently working to develop a new standard. Given that there are several possible indicators that FRA could use and given that there is not widespread public support for any particular one, as well as the fact that listing a particular indicator might ultimately preclude the use of new technology, FRA will not mandate the use of any particular indicator in the definition of hearing protector.

The term "Noise Operational Controls" is the functional equivalent of OSHA's term "administrative controls."⁴¹ MSHA⁴² and NIOSH⁴³ also use the term. FRA proposed the use of this term in the NPRM and has decided to retain it in this final rule.

A few commenters, including the ASHA, Theresa Schulz, and Aearo Company, recommended that FRA use the term "administrative controls" instead of "noise operational controls." They acknowledged that FRA enforces noise operational controls differently than OSHA, MSHA and NIOSH; however, they thought that FRA should use the same term as the others since the terms are functionally equivalent. The commenters explained that FRA should be consistent and uniform with other Federal agencies in order to minimize confusion. They thought that it was particularly important for FRA to be clear, since OSHA and FRA share jurisdiction over certain aspects of the rail industry. Aearo Company also felt that the term itself could be potentially confusing; a newcomer might question whether the term applies to worker schedules since those could be thought of as "noise operations."

⁴¹ See 29 CFR § 1910.95(b)(1) and 29 CFR § 1926.52(a).

⁴² See 30 CFR § 62.130.

⁴³ See www.cdc.gov/niosh/hptersms.html for NIOSH Common Hearing Loss Prevention Terms.

FRA developed the term "noise operational controls" in conjunction with the RSAC Working Group during the NPRM stage. FRA re-opened the discussion on this matter during the comment period, and FRA, with the RSAC Working Group's input, has reaffirmed its decision to use this term. FRA uses a different term to distinguish it from OSHA's term. While the definition of the two terms is identical, the application of the two terms is different. Administrative controls are mandatory in OSHA's hierarchy, whereas noise operational controls are optional in FRA's hierarchy-free scheme. FRA is using this different term to make it clear that FRA treats noise operational controls differently than the way OSHA treats administrative controls.

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 rule in § 227.101. Theresa Schulz commented on this definition, noting that it is an "important but previously unrecognized element for a noise standard." She explained that this provision ensures that the focus of the HCP is on employees who are routinely exposed to noise and therefore at higher risk for noise-induced hearing loss.

The term "Periodic Audiogram" has been revised in the final rule. The new definition states that a periodic audiogram is "a record of follow-up audiometric testing conducted at regular intervals after the baseline audiometric test." FRA made this change in response to commenters who explained that the NPRM incorrectly referred to audiograms as something that is "done" or "conducted." CAOHC, for example, explained that an audiogram is a document or report of audiometric testing, and so it is not something that is "done" or "conducted." This new definition corrects that inaccuracy.

The term "Professional Supervisor of the Audiometric Monitoring Program" was added to the final rule. This definition arose in the context of qualifications for individuals who perform audiometric tests. See § 227.109(c) for a discussion of this term and of qualifications, in general.

The term "Qualified Technician" was added to the final rule. This definition was not a product of the RSAC consensus. FRA added this definition in order to simplify the rule. Rather than restate the definition several times in the rule, FRA states it in this definition section once and then uses the term throughout the rule. For a discussion of the comments that FRA received about

technicians, see the section-by-section analysis for § 227.109(c).

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, S1.4–1971 (R1976). FRA updated that standard with the current standard, ANSI S1.43–1997 (R2002), “Specifications for Integrating-Averaging Sound Level Meters.”⁴⁴

The term “Time-weighted-average eight-hour (or 8-hour TWA)” includes a reference to the 5 dB exchange rate. Regarding this definition and the definition of “Exchange Rate,” several commenters suggested that FRA instead adopt a 3 dB exchange rate. For a discussion of those comments, see section IV(D) above.

Section 227.7 Preemptive Effect

This section informs the public of FRA’s intention and views on the preemptive effect of the rule. The preemptive effect of this rule is broad, as its purpose is to create a uniform national standard. 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. Exceptions would be rare. In general, 49 U.S.C. 20106 will preempt any State law—whether statutory or common law—and any state regulation, rule, or order, that concerns the same subject matter as the regulations in this rule. FRA received no comments on this section and it remains the same as proposed in the NPRM.

Section 227.97 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 that FRA has issued.

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 \$550, 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 \$27,000 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. FRA received no comments on this section and it remains the same as proposed in the NPRM.

With respect to the penalty amounts contained in this section, the Federal Civil Penalties Inflation Adjustment Act of 1990 (Inflation Act), 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, requires agencies to periodically adjust by regulation each maximum civil monetary penalty or range of minimum and maximum civil monetary penalties. By final rule effective June 28, 2004,⁴⁵ FRA adjusted its civil monetary penalties. In this final rule, FRA has included those adjusted penalty amounts.

Section 227.11 Responsibility for Compliance

This section clarifies FRA’s position that the requirements contained in this 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 same manner as required of a railroad or be subject to FRA enforcement action. FRA received no comments on this section and it remains the same as proposed in the NPRM.

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. FRA received no comments on this section and so FRA left it the same as proposed in the NPRM.

Section 227.15 Information Collection

This section notes the provisions of this part that will be submitted to 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 and Applicability

This section identifies the individuals to whom this rule will apply. FRA did not receive any comments on this section, and so FRA did not make any changes based on public comments or RSAC discussions. However, FRA did make a few minor changes in order to clarify this section. FRA changed the name of this section, from “scope” in the NPRM to “scope and applicability” in the final rule. FRA believes that the revised name more accurately reflects the content of this section. In § 227.101(a), FRA added the words “noise-related,” to clarify that this subpart applies to noise-related working conditions, not just working conditions in general. Additionally, at the end of § 227.101(a)(1), FRA added the clause “subject to a railroad’s election in paragraph (3) of this section.” This clarifies the interplay between paragraphs (a)(1) and (a)(3) of this section. FRA believes these changes make the rule more clear and accurate.

Section 227.101(a)(1) provides that this rule covers 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

⁴⁴ For a general discussion on the use of ANSI standards in this rule, see the section-by-section analysis for § 227.103(c)(2).

⁴⁵ See 69 FR 30591 (May 28, 2004).

testing programs in this section to address the exposure that these employees experience.

With respect to the term “regularly” in § 227.101(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 scope provision that the RSAC Working Group considered at the NPRM stage, OSHA’s regulations would have applied to these employees when they were outside the cab, and FRA’s regulations would have applied to these employees when they were inside the cab. The employee would have had to switch back and forth between OSHA’s and FRA’s hearing conservation programs throughout the year. FRA believes this would have been both illogical and unworkable.

This section identifies groups of employees to whom this subpart does not apply. 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 to use the hearing protection while operating the historic equipment. (See § 227.101(a)(1)(iii)). 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 only on steam locomotives; however, FRA instead used the term “historic equipment,” thereby encompassing in the definition diesel locomotives and other antiquated equipment typically used in tourist and scenic operations, in addition to steam locomotives.

FRA added this historic equipment exception as a result of a Working Group member’s comment during a pre-NPRM 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. At the recommendation of the Working Group, FRA decided to include this 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 rule have discussed historic operations. In particular, § 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.

Section 227.101(a)(2) provides that this rule covers any direct supervisor of the persons described in § 227.101(a)(1) whose duties require frequent work in the locomotive cab.

Section 227.101(a)(3) provides that this rule covers, at the election of the railroad, any other person 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). Note that, pursuant to § 227.101(a)(3), a railroad can elect to cover an employee that would otherwise be excluded by §§ 227.101(a)(1).

Section 227.101(b) provides that 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. The MTA/Long Island Railroad (LIRR) submitted comments on this provision. LIRR believes that this rule will cause them to administer a hearing conservation program to a much larger percentage of their workforce than they currently do and that it will have a significant monetary cost and with a greatly increased administrative burden. They explained that they would probably be forced to reallocate resources to the detriment to other aspects of operations, which in turn, could affect the service it provides to the general public.

FRA believes the scope of this rule is appropriate and is leaving it as proposed in the NPRM. LIRR provided no reason why the rule would necessitate inclusion of a much larger portion of their workforce in a HCP. Based upon the typical cab environment on LIRR and similar commuter railroads, FRA does not believe that will

be the case. To the extent LIRR employees are exposed above the action level, as a Federal grantee and public benefits corporation of the state of New York, LIRR bears at least the same responsibility to its employees as other railroads. Finally, FRA notes that this rule is the product of the RSAC, of which railroad representatives including APTA, were members. The railroad representatives on the RSAC Working Group noted that most railroads already had HCPs and so as a practical matter, this rule would not be overly burdensome on railroads.

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 rule requires railroads to develop and implement a noise monitoring program by a specific date; the date varies depending on the size of the railroad. The noise monitoring program is 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 indicate that railroad should initiate a monitoring program.

FRA's noise monitoring requirements cover noise in cabs and noise in exterior environments in which employees work during their work shifts. FRA's rule involves 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 who are within the scope of this rule.

Section 227.103(a) provides the general requirement that all railroads must develop and implement a noise monitoring program. FRA used the provision from OSHA's rule as a starting point and then tailored it to suit FRA's needs. FRA identifies dates by which railroads must develop their programs. The dates are staggered based on railroad size, giving smaller railroads more time and larger railroads less time to develop a noise monitoring program.⁴⁶ FRA provides railroads with a defined purpose for the noise monitoring program—that is, “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).” Note that FRA has changed the organization of this section since the proposed rule in order to make the rule easier to understand, however, the substance of the section remains the same. FRA received several comments about the phase-in implementation dates found in § 227.103(a). The comments fell on both side of the issue. Several of the commenters, including ASHA, AIHA, NHCA, and Theresa Schulz, suggested that FRA has given railroads too much time with these implementation dates. AHSA and several individual ASHA members suggested that all aspects of the rule be phased in within 12 months of the effective date of the rule. They explained that the Small Business Regulatory Enforcement Fairness Act⁴⁷ (“SBREFA”) supports phase-in dates, but only where there is no immediate safety risk. They believe there is an immediate safety risk for railroad operating employees. Theresa Schulz wrote that there is significant evidence showing that excessive noise levels “can impair mental processes, increase fatigue, and increase the number of errors, while simultaneously decreasing vigilance.” NHCA suggested that FRA give railroads 12 to 18 months to comply with the rule. NHCA stated that 18 to 30 months appears to be an “indulgence,” given that “the

equipment, procedures, trained personnel, and reporting techniques of a noise-monitoring program have existed for decades.” By contrast, LIRR, indicated that the 12-month-period is a short time frame and recommended that FRA allow for 24 months instead.

FRA has decided to retain the phase-in dates that FRA proposed in the NPRM. FRA is providing smaller operations with extra time to comply, because FRA understands that they are in a unique situation. Smaller operations lack the resources, manpower, and money of larger operations. In addition, FRA is required, by law, to consider the impact of its regulations on smaller entities. SBREFA requires agencies to employ communication, enforcement, and regulatory systems that consider the unique aspects of small entities. SBREFA 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 SBREFA'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 done here.

The specific dates in this rule are based on FRA's assessment of the current resources and abilities of the railroad industry, as well as FRA's assessment of employee safety. FRA believes these phase-in dates are the most appropriate since they strike a balance between employee safety and the practical realities of current railroad operations. As a practical matter, too, many, if not most, railroads already have hearing conservation programs in place, and so employees will not be completely unprotected during the phase-in months. Furthermore, these dates are based upon the consensus agreement of the affected parties (e.g., union and railroad representatives) as part of the RSAC. For all the reasons discussed here, FRA has 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) (training).

Also of note regarding the phase-in implementation dates is FRA's use of an alternate size standard. Rather than use the size standard promulgated by the Small Business Administration⁴⁸ or the size standard adopted in FRA's “Final Policy Statement Concerning Entities

⁴⁶ 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 annual employee hours, but that are not a class I, passenger, or commuter railroad have 18 months to comply. Railroads with fewer than 400,000 annual employee hours have 30 months to comply.

⁴⁷ Pub. L. No. 104–121, 110 Stat. 857 (codified at 5 U.S.C. § 601 et seq.).

⁴⁸ The SBA Table of Size Standards specifies that line-haul railroads with 1,500 or fewer employees and short-line railroads with 500 fewer employees are considered small businesses. 13 CFR 121.201.

Subject to the Railroad Safety Laws,⁴⁹ FRA is using an alternate size standard that implicitly defines a small business as a railroad with fewer than 400,000 annual employee work hours. Accordingly, FRA has identified three categories of railroads and given the smaller railroads more time to comply. FRA sought approval from the SBA in a January 11, 2005 letter for the use of this alternate size standard and received that approval from SBA Administrator Hector V. Barreto in a May 12, 2005 letter. (Copies of the letters are included in the docket).

FRA has decided to use this alternate size standard for several reasons. First, the specific safety problem at issue here is employee health and specifically employee hearing. An *employee* hours definition is most appropriate given that the nature of the safety issue is protecting *employee* hearing. Second, FRA can more readily identify a railroad's size according to annual employee hours, because FRA collects data related to annual employee hours. See 49 CFR part 225. Furthermore, FRA's safety inspectors and industrial hygienists have easy access to this data through FRA's safety data Web site. By contrast, FRA does not maintain updated information identifying railroads by class. Third, FRA has successfully used this definition in its regulations in the past. See 49 CFR 217.9 and 49 CFR 220.11. Fourth, FRA believes that the SBA size standard, which would encompass 650 railroads, would be over inclusive. FRA's alternate size standard encompasses 634 railroads. Section 227.103(b) discusses sampling strategy. Aside from some minor language changes, it is identical to OSHA's provision, which is found in 29 CFR 1910.95(d)(i) and (ii). Cooper Tire commented on FRA's statistical approach, advocating that FRA employ a 100 percent monitoring program. Cooper Tire noted that 100% monitoring technology, which did not exist when FRA began proceedings for this rule seven years ago, is now available and can provide continuous weighted eight hour noise data. Cooper Tire explained that new technology permits the capturing and transmitting of data continuously. They also noted that railroads could measure all locomotives for compliance automatically, thereby relieving the railroads from having to collect the data as proposed in the rule.

Cooper Tire's comment is similar to the doseBuster Company's comment about alternative prevention strategies. As discussed above in section IV(B), the doseBusters Company advocated the use of their ESP system, which includes continuous monitoring. FRA does not believe it is necessary to mandate continuous monitoring. Sampling is a well-established and widely-accepted statistical principle. In addition, FRA does not believe it is appropriate to link any requirement (e.g., continuous monitoring) to individual commercial products. Finally, FRA believes that the costs of continuous monitoring would outweigh any benefits. If railroads were to employ continuous monitoring, their compliance with other portions of the regulation (e.g., recordkeeping) could be very burdensome.

Please note that while FRA does not require the use of continuous monitoring, FRA also does not prohibit its use. Railroads are free to employ continuous monitoring if they so wish.

Section 227.103(c) specifies how railroads should conduct noise measurements. Section 227.103(c)(1) requires all continuous, intermittent, and impulsive sound levels from 80 dB to 140 dB to be integrated into the noise measurements. FRA has changed this provision in the final rule by increasing the upper limit from 130 dB to 140 dB.

In the proposed rule, FRA used an 130 dB upper limit. FRA had adopted that limit from OSHA though with reservation. In the NPRM, FRA explained that, while OSHA's 1981 general industry noise standard used a 130 dB upper limit, OSHA wrote in the preamble that its intent was to increase the upper limit to 140 dB as dosimeters were improved and became readily available.⁵⁰ According to OSHA in the preamble to the 1981 standard, the decision to use the 130 dB upper limit was the result of technological limitations on sound level meters and dosimeters. In addition, FRA explained in the NPRM that it had looked to OSHA's 2002 Advance Notice of Proposed Rulemaking (ANPRM) for a Hearing Conservation Program for Construction Workers,⁵¹ in which OSHA noted 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."⁵²⁻⁵³

FRA sought comment on whether 130 dB or 140 dB was the appropriate upper limit for calculating railroad operating

employee noise dose. Several commenters responded in support of the 140 dB upper limit, all of whom explained that technology has improved considerably since OSHA promulgated its general industry standard and that technology now supports the 140 dB upper limit. ASHA explained that "today's dosimeters and integrating sound level meters are capable of dynamic ranges from 80 dB to 140 dB," and AAA explained that "modern sound level measurement systems now routinely integrate noise levels to 140 dB(A)." NIOSH made an additional point, explaining that "impulsive-type noise may frequently exceed 130 dB peak SPL" and so "limiting measurements to 130 dB may exclude the most harmful events in a given exposure and seriously underestimate a worker's risk of hearing loss." Wilson, Ihrig, & Associates, an acoustical consulting firm, responded that the upper limit should be at least 140 dB.

Only one commenter, the AAR, did not support the 140 dB upper limit. The AAR explained that "most AAR members already own equipment that was purchased to comply with existing OSHA rules. Some of this equipment is old enough that it will not have the increased range." Without evidence that the expanded range would yield benefits outweighing the costs, the AAR thought FRA should not increase the range.

At the RSAC Working Group meeting, the members discussed the capabilities of railroads with respect to this equipment. Members acknowledged that this change would impose neither an administrative nor an economic burden. Given OSHA's statement in its 2002 ANPRM, the RSAC consensus, and the widespread belief among commenters that modern technology supports this change, FRA raised the upper limit to 140 dB. FRA notes that noise monitoring data conducted prior to this rulemaking (i.e., with the upper limit of 130 dB(A)) is still good data.

On a related matter, Wilson, Ihrig, & Associates submitted comments on the lower limit. Wilson, Ihrig, & Associates asserted that there should be no lower limit. They explained that "there is no practical reason for limiting the lower range to 80 dB(A), as the levels below this range contribute little to the total noise dose." FRA has decided not to remove the lower limit. FRA does not believe there is any justification supporting such a change. Given that there is little contribution to dose by levels below 80 dB(A), given that eliminating the lower level is not a commonly accepted practice, and given that it could potentially result in a

⁴⁹ 68 FR 24, 891 (May 9, 2003). This Policy Statement defines a "small entity" as a railroad that meets the line haulage revenue requirements of a Class III railroad (i.e., a railroad with annual operating revenue of \$20 million or less).

⁵⁰ See 29 CFR 1910.95(d)(2)(i).

⁵¹ See 67 FR 50610 (August 5, 2002).

⁵² *dash*:⁵³ See 67 FR 50610, 50605 (August 5, 2002).

heavy financial burden (e.g., complying with this provision might require the re-design of dosimeters, SLMs, and iSLMs), FRA sees no reason to mandate such a change.

Section 227.103(c)(2) specifies that railroads shall take noise measurements under typical operating conditions using a sound level meter (SLM), integrating-averaging sound level meter (iSLM), or noise dosimeter. The instrumentation should meet the appropriate standard set forth by ANSI; these standards set performance and accuracy tolerances. An SLM used to comply with this part shall meet ANSI S1.4-1983 (Reaffirmed 2001), "Specification for Sound Level Meters." An iSLM used to comply with this part shall meet ANSI S1.43-1997 (Reaffirmed 2002). A noise dosimeter used to comply with this part shall meet ANSI S1.25-1991 (Reaffirmed 2002), "Specification for Personal Noise Dosimeters." Each instrument should be set to an A-weighted SLOW response.

Section 227.103(c)(2), for the most part, is adopted from FRA's previous noise standard (i.e., the previous § 229.121(d)). Note, however, that FRA has added the ANSI standard for noise dosimeters, updated the ANSI standard for SLMs (from ANSI S1.4-1971 to ANSI S1.4-1983 (Reaffirmed 2001)), and included a reference and citation to iSLMs. In doing so, FRA has made this regulation more current and comprehensive.

In conformance with Office of Management and Budget (OMB) Revised Circular A-119 (February 10, 1998), FRA is using voluntary national consensus standards here and in several other locations throughout the rule. FRA's use of standards established by other organizations such as ANSI is a means of establishing technical requirements without increasing the volume of the Code of Federal Regulations. See 1 CFR part 51. In this final rule, FRA has used the most current version of each ANSI standard, however FRA understands that over time, ANSI will revisit these standards and likely update them. FRA intends to regularly update the rule, most likely through the use of technical amendments, in order to incorporate ANSI's newer standards. Note that in the NPRM, FRA had proposed to adopt successor standards. Given the Federal law requires that a publication incorporated by reference be identified by its title, date, edition, author, publisher, and identification number, FRA amended this final rule to incorporate the current standards only. See 1 CFR 51.9(b)(2).

While the rule provides that a railroad may use either a noise dosimeter, SLM, or iSLM to conduct noise measurements, it also permits a railroad 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.

Section 227.103(c)(3) specifies that all instruments used to measure employee noise exposure shall be calibrated to ensure accurate measurements. This paragraph is the same as OSHA's provision, which is found in 29 CFR 1910.95(d)(2)(ii). FRA received no comments on this section and it remains the same as proposed in the NPRM.

Section 227.103(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. This paragraph is the same as OSHA's provision, which is located at 29 CFR 1910.95(d)(3). FRA received no comments on this section and it remains the same as proposed in the NPRM.

Section 227.103(e) provides that, in administering the monitoring program, a railroad shall take into consideration the identification of work environments where the use of hearing protectors may be omitted. This provision is unique to FRA's rule; no comparable provision exists in OSHA's standard. The purpose of this provision is to 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.

Aearo Company commented on § 227.103(e), asserting that it is redundant with §§ 227.103(b) and 227.115. FRA does not believe these provisions are redundant, for they serve different purposes. Section 227.103(b) addresses the sampling strategy for the noise monitoring program, § 227.103(e) identifies one of the factors that employers need to consider when administering the noise monitoring program, and § 227.115 identifies the levels at which railroads must require HP use.

In the proposed rule, FRA listed several benefits that accrue when employees refrain from over-using hearing protectors. That list included the following: reducing the danger of infection from the misuse of HP; strengthening overall employee compliance with HP use by focusing requirements where it makes a difference; and maximizing the availability of auditory cues associated with the movement of equipment among ground personnel, which results in improved personal safety.

Aearo Company commented on this preamble discussion, asserting that some of those items, specifically a reduction in the danger of infection and a strengthening of overall compliance, were not benefits of refraining from overuse of HP. Regarding infections, Aearo Company cited a 1985 monograph that found that regular wearing of HP does not normally increase the likelihood of contracting an ear infection. Regarding compliance, Aearo Company explained that compliance improves, not by "having less people wear [HPs] in less applications," but by developing a hearing conservation culture and empowering employees to believe they can make a difference in protecting their hearing.

Aearo's comments generated a great deal of discussion at the post-NPRM RSAC Working Group meeting. Aearo Company had presented data which shows it will not cause an infection. Several members presented information at the RSAC Working Group meeting suggesting that overuse of HP can cause an infection. Overuse of HP may or may not cause ear infections. Without further study or more conclusive data, FRA is unable to reach any conclusions about the danger of ear infections from HP.

With respect to compliance, FRA, in conjunction with the RSAC Working Group, has determined that there are compliance benefits from refraining from overuse of HP. Overprotection can erode compliance. Where an employee is instructed to wear HP at all times and in all circumstances, it creates the impression for the employee that the HP requirement is just a pro forma requirement, not part of a larger program designed to protect their hearing. With that mindset, the employee is less likely to wear HP. This is particularly significant for transportation employees who are not subject to direct supervision during most of their work shift.

In short, FRA has included § 227.103(e) to ensure that railroads do not overuse HP. FRA wants to ensure that there is not an excessive reduction in hearing from the use of HP such that it interferes with employee communication and with auditory cues related to job duties.

Section 227.103(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 part. This parallels OSHA's provision, which is found at 29 CFR 1910.95(f). FRA received no comments on this section and it remains the same as proposed in the NPRM.

Section 227.103(g) identifies a railroad's obligation for reporting monitoring results to employees and their representatives. There are two components to this reporting provision. The first component is § 227.103(g)(1), which requires railroads to notify each monitored employee of the results of the monitoring. This is similar, but not identical, to OSHA's notification provision located at 29 CFR 1910.95(e). Whereas 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, FRA requires a railroad to notify each *monitored employee, irrespective of his or her exposure.*

The second component of this reporting provision, which is found at

§ 227.103(g)(2), requires railroads to post 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. Theresa Schulz commented on this provision, commending FRA for requiring railroads to post noise measurements results "in an 'understandable way' so that employees are aware of the hazard and what they can do to protect themselves."

In order to make the posting meaningful and understandable to crews, railroads should include information on the following types of 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). 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 Working Group discussions. It reflects a compromise of labor and management concerns. To reach this compromise, the RSAC Working Group considered numerous proposals concerning monitoring observations and reporting. The RSAC Working Group'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 Working Group recommended, and FRA adopted, this provision which retains the observation provision contained in OSHA's provision located at 29 CFR 1910.95(f). In addition, the RSAC Working Group recommended, and FRA adopted, the requirement that railroads shall notify monitored employees of the results of monitoring (irrespective of the TWA) and shall post monitoring results at appropriate crew origination points. FRA believes this provision is the most effective one, because it 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. FRA did not receive any comments recommending that FRA revise this section and so it remains the same as proposed in the NPRM.

Section 227.105 Protection of Employees

In this section, FRA establishes the permissible noise exposures for railroad employees. These limits are the same as

FRA's previous noise standard, 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).

Section 227.105(a) prescribes the noise exposure limits and requires railroads to provide appropriate protection if employees are exposed to noise that exceeds those limits. The limits are identified in Appendix A to part 227. For purposes of clarity, FRA has slightly revised § 227.105(a). FRA replaced the phrase "as measured on the dB(A) scale as set forth in Appendix A" with "as measured according to § 227.103." FRA believes that rewording more accurately captures the requirement of that section. In addition, since Table 1 contained information that is equivalent to the information in Tables A-1 and A-2 in Appendix A, FRA has removed Table 1 from this section and referred readers to the limits in Appendix A. Related to that, FRA has taken the provision on impulsive or impact noise from the footnote to Table 1 and has put it into section I of Appendix A to this part. With respect to Appendix A, FRA has made some additional clarifying edits, e.g., use the term "work day" throughout the appendix as opposed to alternating between "work shift" and "work day;" replace "reference duration" with "duration permitted," add an entry for 140 dB in Table A-1, etc. All of these changes are drafting clarifications and as such, they were not part of the RSAC consensus.

More significantly, FRA has added a provision on deadheading in section I of Appendix A. Both Wilson, Ihrig, & Associates and NHCA had suggested that FRA add language in the rule to address deadheading. RSAC Working Group and FRA agreed with the comment. FRA addressed this issue in section (I)(D), which provides that, when calculating the noise dose, a railroad shall include any time that an employee spends deadheading. Deadheading is a practice unique to the railroad industry. It refers to the time when railroad employees are being transported (whether by van, taxi, locomotive, or other vehicle) between their home base and a point where they begin or end operation of a train. Although these employees are not operating a train when deadheading, they continue to be exposed to noise. Since noise dose is based on time of exposure as well as intensity of exposure, railroads must consider the time employees spend deadheading in locomotives when calculating an employee's noise dose.

AIHA also commented on § 227.105(a). They suggested that FRA add a requirement for a 140 dB unweighted peak limit in Table 1 to § 227.105. They asserted that "this would eliminate exposures to high-level impulse noise, which is not captured with current SLMs." As discussed in the preceding paragraphs, FRA has removed Table 1 in this final rule. Accordingly, this issue became moot. However, FRA notes that FRA did add an entry for 140 dB in Table A-1 to Appendix A.

Section 227.105(b) addresses the treatment of measurement artifacts when assessing exposures exceeding 115 dB(A). Artifacts include events such as unintentionally coughing into or brushing against the dosimeter microphone. Artifacts cause the noise level to spike, which, in turn, results in higher overall noise dose levels.

This provision has undergone several changes. The initial version required railroads to remove measurement artifacts. The sentence provided that "the apparent source of the noise exposures shall be noted and measurement artifacts shall be removed." During pre-NPRM meetings, a railroad representative explained that while he wants to remove all artifacts, he is concerned about a getting into a predicament where he tries to identify an artifact but is unable to do so. Unable to identify the artifact, he would be unable to remove it. To accommodate that concern, the version in the NPRM gave railroads the option of removing measurement artifacts. The sentence provided that "the apparent source of noise exposures shall be noted and measurement artifacts may be removed." Aearo Company submitted comments on this provision. Aearo Company acknowledged that the opportunity to remove measurement artifacts is reasonable on the surface. However, they believe it is unnecessary, and they are concerned that if done carelessly or with bias, it could materially distort the data.

In the final rule, FRA requires railroads to observe and document the apparent source of noise exposures and allows them, but does not require them, to remove measurement artifacts. This artifact removal provision addresses only those phenomena that result in peaks above 115 dB(A) as recorded by a dosimeter. Where an industrial hygienist (or other appropriately qualified individual) is present in a locomotive cab during a monitoring run and observes the noise events to which a monitored individual is subject, the industrial hygienist has the option of removing noise sources that cannot be explained by his or her record of the

run. In other words, if the industrial hygienist were to maintain a log during the run in which he documented all noise sources he observed, (e.g., horn, grade crossing bell), and he later discovered that there were additional unexplained events (over 115 dB(A)) in the noise monitoring data, he could remove those unexplained events. Of course, the industrial hygienist only has the option of removing those noise events where the records of his or her direct observations do not show a noise event at the time the artifact appears in the record.

FRA decided to retain the provision whereby railroads have the option of removing artifacts, because FRA wanted to address Working Group members' concerns. FRA does not want members to be in a predicament where they try to identify an artifact and are unable to do so. Moreover, FRA believes that, from a statistical perspective, it makes sense to remove the artifacts. It is accepted scientific practice to remove directly observed artifacts from any data set, because artifacts will affect other statistical aspects of the data such as the variance. FRA recognizes that data manipulation is a concern when data editing is allowed, however, FRA hopes that it can rely on the professionalism of the individuals testing employees and that those individuals will not manipulate the data. Finally, FRA intends to develop a compliance guide that provides direction to its inspectors on how it intends on enforcing the various elements of compliance. This guide will be available to the regulated community as well as the public when it is finalized after the final rule is published.

Practical concerns aside, FRA maintains that it is in the best interest of a railroad to remove measurement artifacts. Artifacts are not experienced as noise exposure by the employee, and so they should not be included in an employee's noise dose.

With respect to this provision, FRA has made a one additional minor change. Since FRA removed Table 1 from § 227.105(a), FRA removed the reference to Table 1 in § 227.105(b).

Section 227.105(c) provides that employee exposure to continuous noise shall not exceed 115 dB(A). Paragraph (c) contains the same requirement that had been located in FRA's previous noise regulation at § 229.121(c).

Section 227.105(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 permits

very brief exposures to continuous noise (which is defined as noise that exceeds one second) between 115 dB(A) and 120 dB(A) as long as the total daily duration does not exceed 5 seconds.

Wilson, Ihrig, & Associates commented on this provision, stating that there is no practical reason for relaxing the standard. Wilson, Ihrig, & Associates believes that “it results in a lax standard and one that does not encourage railroads to reduce the noise levels that their employees are exposed to.” They explained that this provision might be acceptable if FRA were to adopt a 3 dB exchange rate, but that is not the case. Wilson, Ihrig, & Associates believe that FRA’s logic for relaxing the standard is faulty—i.e., that FRA has no technical justification for this change “other than the fact that these noise levels occur, so these levels can be allowed to exist.”

RSAC Working Group discussions on this matter had revealed that some members did not wish to penalize the railroads for these brief unavoidable 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 Working Group members expressed the view that there may be health effects associated with longer exposures over 115 dBA, while other RSAC Working Group members contended that health effects will not occur until much higher noise levels.

At the proposed rule stage, FRA determined that it was necessary to relax OSHA’s standard because of the operational realities of railroading and the resulting safety implications. FRA stands by those reasons and thus is leaving this provision as proposed. As explained in the proposed rule, 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. FRA has concluded 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 the tables found in Appendix A and without regard to any attenuation provided by the use of hearing protectors. Since the RSAC consensus, FRA made some drafting changes to better clarify the provisions of this section. FRA divided the section into two separate paragraphs. FRA added an explanatory clause (“required by § 227.103”) when referring to the noise monitoring program. FRA revised § 227.107(a) to reflect the fact that the hearing conservation program is set forth in §§ 227.109 through 227.121, not just in § 227.121. In addition, since FRA has removed Table 1, FRA removed the reference to Table 1 in this section. The drafting changes aside, § 227.107 is the same as the comparable provision found in OSHA’s standard at 29 CFR 1910.95(c).

FRA received one comment on this section. The doseBusters Company requested that FRA clarify the meaning of the last sentence in § 227.107. The doseBusters Company asked: “Is the intent to prohibit any adjustment to the dose measurement, based on the hearing protector manufacturer’s published attenuation data? FRA believes that the language (which is the identical language which OSHA uses) speaks for itself. The relevant portion of the last sentence of § 227.107 provides that: “Noise exposure shall be computed * * * without regard to any attenuation provided by the use of hearing protectors.” This means that a professional reviewer should not adjust an employee’s exposure dose based on any attenuation provided by the employee’s hearing protection. Or as the Working Group answered the question, “You do not adjust the dose based on the hearing protection worn by the employee.” In short, the answer to the doseBuster Company’s question is, yes.

Section 227.109 Audiometric Testing Program

This section sets out the requirements for railroad audiometric testing

programs. Section 227.109(a) sets out the general requirement that each railroad shall establish and maintain an audiometric testing program as set forth in this section and include employees who are required to be included in a hearing conservation program pursuant to § 227.107. FRA has made one clarifying change to this section. Section 227.109(a) of the NPRM had contained the phrase “by making audiometric tests available to all of its employees.” Because one of the paragraphs in this section (see § 227.109(f)) specifically addressed this issue, FRA thought it was confusing and unnecessary to include this phrase here, and so FRA removed this phrase. In place of that phrase, FRA included language clarifying that the railroad shall include in the audiometric testing program all employees who are required to be included in the HCP.

Section 227.109(b) provides that audiometric tests shall be provided for employees, at no cost to employees. This paragraph refers only to the audiometric test itself. It does not refer to additional costs that an employee might incur, e.g., missed trips or missed work time as a result of the test. FRA received no comments on this section and it remains the same as proposed in the NPRM.

Section 227.109(c) requires that appropriate professionals or qualified technicians administer the audiometric test. FRA received several comments on this provision. Commenters included ASHA, AAA, AIHA, CAOHC, NHCA, Aearo Company, and Theresa Schulz. The comments were very similar in nature.

With respect to physician qualifications, the commenters stated that it is unwise to let *any* physician administer or supervise audiometric testing. Because there is a wide range of medical specialties, and because hearing testing and hearing conservation program management are not usually part of medical training programs, most physicians are not well-informed on the details of hearing, its measurement, and its impairment. Theresa Schulz went further, suggesting that FRA require physicians to attend training on how to supervise the audiometric testing portion of a hearing conservation program.

With respect to technician competency, all of the commenters shared the same basic concern. They disagreed with the second method that FRA permitted in the NPRM for qualifying technicians (i.e., allowing technicians to demonstrate their competence to a audiologist, otolaryngologist, or physician). The commenters think it contributes to the

weakening of the competence of the personnel conducting the audiometric tests. They questioned whether a technician who had merely “satisfactorily demonstrated competence” would be skilled enough to perform some of the necessary duties, e.g., problem solving for judgment calls encountered during testing or serving as a resource for employees with questions.

As an alternative, the commenters suggested that the rule only allow technicians to be qualified by the first method (i.e., successful completion of the CAOHC certification requirements). They explained that CAOHC has a board of multi-disciplinary professionals that collectively strive to maintain and increase the minimum standard of competency. By requiring railroads to use only CAOHC-certified technicians, FRA would assure a high level of quality for this component of the HCP.

Also, regarding technician qualifications, there were a few comments about FRA’s decision in the NPRM to allow a technician to be qualified by CAOHC or *any equivalent organization*. This differs from OSHA’s standard, which only allows technicians to be certified by CAOHC. CAOHC strongly opposed this provision, explaining that CAOHC is the only national accreditation program of its kind for Occupational Hearing Conservationists. CAOHC further explained that § 227.109(c)(2) should not include the words “equivalent organization, because there is no equivalent to CAOHC’s unique capabilities.” CAOHC pointed out that MSHA recognized CAOHC’s uniqueness in its 1999 rule.⁵⁴

Finally, regarding technician qualifications, Theresa Schulz commended FRA for removing OSHA’s “unsupported exemption [from CAOHC certification] for technicians using microprocessors.”

FRA made three changes to this provision. Two were the product of RSAC consensus, and one was a drafting clarification that FRA added on its own. First, with RSAC consensus, FRA added a qualification requirement for physicians. According to § 227.109(c)(1), audiometric tests shall be performed by an audiologist, otolaryngologist, or other physician *who*

has experience and expertise in hearing and hearing loss. (Italics indicate revised language). “Experience and expertise” means that the individual has the knowledge and skills to conduct audiometric tests, has experience conducting audiometric tests, and has demonstrated success in audiometric conducting tests.

FRA did not, however, add a provision requiring physicians to attend training on how to supervise the audiometric testing portion of a HCP. FRA did not think it was necessary to require that training, especially given the addition of the “experience and expertise” requirement. By requiring that physicians have “experience and expertise,” FRA ensures that the doctors are knowledgeable about hearing conservation and so there is no point to also require those doctors to attend training.

Second, subsequent to the RSAC consensus, FRA added a definition for “qualified technician” to § 227.5. FRA used language from § 227.109(c)(2) of the proposed rule for the definition (though with some modifications, which are discussed below). FRA believes this change simplifies the rule. Rather than repeat the definition throughout the rule, FRA states it once in the beginning. According to § 227.5, audiometric tests shall be performed by a qualified technician who can become qualified in one of two ways: (1) By successfully completing a course designed for the training and certification of audiometric technicians, or (2) by satisfactorily demonstrating competence to the Professional Supervisor of the Audiometric Monitoring Program in administering audiometric exams and in the use and care of audiometers. Qualified technicians might include trained specialists, industrial hygienists, and nurses who have the appropriate qualifications. A technician (of either qualification type) must be responsible to the Professional Supervisor of the Audiometric Monitoring Program.

Third, with RSAC consensus, FRA modified the qualification requirement for technicians. Technicians must be responsible to a Professional Supervisor of the Audiometric Program, instead of simply an “audiologist, otolaryngologist, or a physician.” A Professional Supervisor of the Audiometric Monitoring Program is “an audiologist, an otolaryngologist, or a physician *with experience and expertise in hearing and hearing loss.*” As explained above, “experience and expertise” means that the individual has the knowledge and skills to conduct

audiometric tests, has experience conducting audiometric tests, and has demonstrated success in audiometric conducting tests. Consistent with this change, FRA added a definition of Professional Supervisor to the Definitions section (§ 227.5). However, FRA used a different definition than that suggested by commenters. Several commenters had suggested that FRA define a Professional Supervisor as “an audiologist, an otolaryngologist, or a physician who supervises the audiometric testing program, reviews audiograms, and reviews audiometric tests.” Rather than focus on the tasks involved in being an audiologist, FRA instead chose to focus on the qualifications of an audiologist.

Despite several commenters’ suggestions, FRA did not eliminate the second method for qualifying technicians (i.e., satisfactorily demonstrating competence). FRA adopted this provision from OSHA’s rule. FRA does not know of any problems with weakened competence among technicians performing under OSHA’s rule, and so FRA believes it is appropriate to use it here. Furthermore, if FRA were to remove this provision at this point in time, FRA would potentially disqualify an entire group of individuals who have been performing these tasks (and presumably well) under OSHA’s rule for years. However, acknowledging that technicians must be adequately qualified, FRA revised this second method. As explained above, FRA now requires a technician to be responsible to a Professional Supervisor who must have experience and expertise in hearing and hearing loss. FRA anticipates that this will ensure that technicians are fully qualified.

FRA also retained the provision allowing technicians to be certified by an “equivalent organization.” FRA wants the rule to be forward looking. At the time of this final rule, CAOHC is the only national accreditation program for hearing conservationists, however, in coming years, there may be additional organizations comparable to CAOHC. FRA wants to ensure that the rule has the flexibility to accommodate such changes. FRA notes that MSHA included a comparable phrase in its Final Rule on occupational noise exposure of miners.⁵⁵

Section 227.109(d) is intentionally left blank. The proposed § 227.109(d) had addressed audiometric instrumentation, providing that instruments used for audiometric testing must meet the requirements of the Appendix C “Audiometric Testing Requirements.”

⁵⁴ In contrast, Aearo Company and CAOHC asserted that MSHA recognized the uniqueness of CAOHC “(with no equivalent organization).” That does not appear to be the case. In 29 CFR 62.101, MSHA defines a “qualified technician” as “a technician who has been certified by the Council for Accreditation in Occupational Hearing Conservation (CAOHC), or by another recognized organization offering equivalent certification.” (Italics added).

⁵⁵ See 29 CFR 62.101 and footnote 54 supra.

Since FRA has removed Appendix C: "Audiometric Testing Requirements" from the rule, this regulatory provision is now unnecessary. For a discussion of FRA's decision to remove the proposed Appendix C, see the section-by-section analysis for Appendix C.

Section 227.109(e) provides the requirements for baseline audiograms. 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. Note that FRA has changed some of the formatting of this section since the proposed rule in order to make the rule easier to understand, however, the substance of the section remains the same. Section 227.109(e)(1) sets out the requirements for establishing baseline audiograms for new employees. A railroad has six months from a new employee's first tour of duty to establish a valid baseline audiogram for that employee. See § 227.109(e)(1)(i). Where a railroad uses a mobile test van, a railroad has one year from a new employee's first tour of duty to obtain a valid baseline audiogram. See § 227.109(e)(1)(ii). Pre-employment audiometric tests can be used as baseline audiograms.

Regarding § 227.109(e)(1), ASHA, AIHA, and Theresa Schulz submitted virtually identical comments and opposed several of the provisions. Contrary to FRA's 6 month allowance for new employees, they recommended that FRA require railroads to complete an audiometric test before the employee works in an environment where sound levels are going to be equal to or greater than 85 dBA or pre-placement. Similarly, contrary to FRA's 1 year allowance for new employees tested on a mobile test van, ASHA, AIHA, and Theresa Schulz suggested that FRA require railroads to obtain baseline audiograms in 90 days for new employees who are tested on mobile test vans. They explained that "it is in the employer's best interest to obtain an accurate measurement of an employee's hearing levels as soon as possible."

FRA and the Working Group did not adopt these recommendations and is leaving the language as proposed in the NPRM. While FRA agrees that it is in the employer's best interest to obtain a measurement as soon as possible, FRA also realizes that the commenters' recommendation is not practical, given the mobile nature of railroad operating work and the large size of the railroad workforce. Railroad operating employees are constantly moving throughout the country. It is hard to

know what noise environment any individual employee is going to encounter on any given day since the noise level can vary greatly depending on several variables, e.g., which locomotive, which run, what time of day, what geographical characteristics, etc. As such, it would be difficult for railroads to know when they would have to test any given employee. Exacerbating the situation further, it would be administratively difficult, and potentially very costly, for railroads to have to plan, schedule, and arrange for each individual audiometric test as an employee moves across company locations throughout the country. FRA found, and the RSAC Working Group agreed, that it is necessary and reasonable to give railroads six months to obtain a new employee's baseline audiogram and to give them one year for new employees tested on mobile test vans.

FRA also found this allowance for new employees to be reasonable because a railroad may not know that a newly hired employee has exposures that require baseline audiometric testing until the employee is assigned to, or bids certain jobs. Once the jobs the employee is doing are known the fact that those jobs have triggering exposures requiring inclusion in the Hearing Conservation program, and thus a baseline audiometric test will be known. In addition, FRA would note that the employees covered by the scope of the rulemaking are not highly dosed workers, which are more likely to be found in other industries.

Furthermore, the concern underlying the comment is that employees need to have adequate protection for their hearing. As a practical matter, employees are going to be adequately protected, because most of them will have had audiometric tests during their pre-employment tests. At the post-NPRM Working Group meeting, Class 1 railroad representatives explained that it is common practice for their railroads to use pre-employment tests as baseline audiograms.

Furthermore, the commenters' concern is also addressed by another provision in the rule. According to § 227.115(c)(2), a railroad must require the use of hearing protectors when: an employee is exposed to sound levels that meet or exceed the action level and the employee has not yet had a baseline audiogram. ASHA, AIHA and Theresa Schulz had made another recommendation, suggesting that when a railroad does not obtain an audiogram before placing an employee on the job and if that employee's noise exposure meets or exceeds the action level, the

railroad should require that employee to wear hearing protection until the railroad can obtain an audiogram. As explained at the beginning of this paragraph, FRA has already adopted that requirement but located it elsewhere in the rule.

Section 227.109(e)(2) sets out the requirements for establishing baseline audiograms for existing employees. Section 227.109(e)(2)(i) covers existing employees who have not had a baseline audiogram as of the effective date of the rule. Class 1, passenger, and commuter railroads, and railroads with 400,000 or more annual employee hours have two years from the effective date of the rule to establish a baseline audiogram for this group of employees. Railroads with 400,000 or fewer annual employee hours have three years from the effective date of the rule to establish a baseline audiogram for this group of employees. For a further discussion on allowances for small entities, see the section-by-section analysis for § 227.103(a).

ASHA and AIHA did not like the two year allowance that FRA gave railroads for existing employees. They suggested that railroads treat existing employees without baseline audiograms as if they were new employees. NHCA likewise did not like this allowance, suggesting that FRA phase in all aspects of the rule within 12 to 18 months. NHCA wrote that SBREFA, which FRA cited to support the phase-in implementation, only applies where no immediate safety risks exist. NHCA believes there is an immediate safety risk here, and so it is not appropriate to phase in implementation dates.

FRA, along with a Working Group recommendation, decided to leave that provision as proposed in the NPRM. At the NPRM stage, FRA made a decision to distinguish between new employees and existing employees and to give railroads more time to test existing employees. That was one of the big differences between OSHA's rule and FRA's rule with respect to baseline audiograms. FRA had specifically deviated from OSHA and extended the time frame for compliance in order to accommodate the unique aspects of the rail industry. FRA recognizes that there are serious administrative difficulties, and potentially high costs, of testing a large number of mobile employees in a short period of time. This extra time was intended to give railroads an opportunity to "catch up" on their testing. Also, contrary to NHCA's assertion, FRA does not believe there is an immediate safety risk. FRA expects that many of the rail employees will be tested well before the end of the two-year period. Moreover, as a practical

matter, FRA expects that many railroad employees will already have been tested as part of existing railroad hearing conservation programs. Accordingly, FRA did not adopt the commenters' suggestions.

Sections 227.109(e)(2)(ii) and (iii) cover existing employees who have had a baseline audiogram as of the effective date of the rule. FRA has decided to grandfather many of these baseline audiograms. This is in line with OSHA, which had adopted a lenient policy on accepting baseline audiograms that were produced before the promulgation of the hearing conservation amendment. OSHA had noted that it was flexible in grandfathering old baseline audiograms, because in most cases, this would be more protective of employees.

For the same reasons, FRA is grandfathering baseline audiograms. FRA believes that the grandfathered baseline audiograms will provide a more accurate picture of an individual's hearing ability. A grandfathered baseline audiogram will show an employee's initial hearing level and so, when compared with subsequent audiograms, it will be possible to determine the extent of an employee's hearing loss. Also, by allowing railroads to grandfather baseline audiograms, FRA eliminates unnecessary costs for the railroad, because railroads do not need to re-test employees that have already been tested. Whether or not a railroad can grandfather a particular baseline audiogram depends on how the railroad conducted that baseline audiogram.

Per § 227.109(e)(2)(ii), 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 satisfied 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 similar to the requirements that are now found in FRA's rule at § 227.109.

FRA notes that many locomotive engineers will have baseline audiograms that were obtained as part of the hearing acuity⁵⁶ testing for FRA's Locomotive

Engineer Qualification. See 49 CFR 240.121. FRA expects that the majority of these audiograms will have met OSHA's 29 CFR 1910.95(h) requirements. FRA notes that railroads must accept these baseline audiograms if they were obtained in compliance with the requirements found in 29 CFR 1910.95(h)(1)–(5).

Per § 227.109(e)(2)(iii), 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 satisfied 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 Professional Supervisor of the Audiometric Monitoring 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.

At the suggestion of AAA and CAOHC, FRA revised this section by replacing the phrase "individual administering the Hearing Conservation Program" (which was used in the NPRM) with "Professional Supervisor of the Audiometric Monitoring Program." Professional Supervisor of the Audiometric Monitoring Program is defined in § 227.5. While the RSAC Working Group agreed to add a definition in the final rule for "Professional Supervisor of the Audiometric Monitoring Program," the RSAC Working Group did not specifically address the substitution in this situation. FRA has made this change, because it ensures that the determination in § 227.109(e)(2)(iii) is made by a qualified professional who understands hearing loss. FRA made a similar change in § 227.109(i).

ASHA, AIHA, and Theresa Schulz commended FRA for grandfathering these pre-existing baseline audiograms. They also agreed with FRA that it should be the responsibility of the professional supervising the hearing conservation program to determine which pre-existing audiograms are acceptable and which should be chosen as the baseline.

An issue closely related to grandfathering baseline audiograms is recordkeeping. During pre-NPRM Working Group meetings, many railroad representatives 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 plus thirty years. 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. At the NPRM stage, railroads explained that they will not be able to provide all the required information for grandfathered baseline audiograms.

FRA is fully aware of the railroads' concerns and so FRA reiterates in this final rule what FRA explained in the proposed rule. 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.

Section 227.109(e)(3) addresses one of the details of baseline audiogram tests, specifically, that baseline audiograms must be preceded by a 14-hour quiet period and that HP may be used in place of the 14-hour quiet period. Aearo Company submitted comments on the second part of this subparagraph. Aearo Company has concerns about allowing employees to substitute hearing protection in place of a 14-hour quiet period. Aearo Company asserts that hearing protectors do not provide high levels of protection and do not always prevent noise-induced hearing loss. They explain that hearing protectors fail to prevent permanent threshold shifts, and so they must also fail to prevent temporary threshold shifts. In essence, then, Aearo Company doesn't think hearing protectors are an effective substitute for a quiet period. However, Aearo Company recognizes that it would be impossible and impracticable to require employees to rely solely on the 14-hour quiet period, because, for example, it is not always possible for an employer to obtain an audiogram prior to a workshift.

Aearo Company proposes that FRA continue to allow the use of the 14-hour quiet period, but with stipulations. An employee would be able to use hearing protectors as long as, within 5 days prior to the audiogram: (1) The employee received individual refresher training on the use of his or her hearing protector, (2) the condition of the employee's hearing protector is checked

⁵⁶ Aearo Company commented that FRA used the term "hearing acuity" incorrectly in the preamble and suggested that FRA use "sensitivity" instead. FRA used the term "hearing acuity" in the preamble, and again in this final rule, to refer to an existing regulatory provision that contains the term. See § 240.121 "Criteria for vision and hearing acuity data." Moreover, FRA's use is consistent with OSHA's use. See 66 FR 52031, 52032 (October 12, 2001).

and found to be satisfactory, (3) the hearing protector to be used is either an earmuff or a foam earplug or is a device that has been fit-tested and shown to provide adequate protection to reduce exposure to levels equivalent to less than 80 dB(A), and (4) an employee exposed to sound levels about 100 dB(A) would be required to wear an earplug with an earmuff for the 14-hour quiet period.

FRA and the Working Group considered Aearo Company's suggestion but decided to leave the rule as proposed. FRA believes this change would impose very rigorous standards that would greatly increase the requirements of the rule and are not justified. In addition, there are practical problems with this approach. For example, regarding #1, FRA's standard already requires training whenever an employer provides an employee with HP, so it is unnecessary to duplicate that requirement. Regarding #2, it is unclear who would check the employee's HP and whether there would be a record made of the check. If so, there would then be an additional recordkeeping burden on employers. Regarding #3 & 4, this specific standard contradicts the performance standard that FRA uses in § 227.115(a)(4) for giving employees an opportunity to select from a "variety" of HPs with a "range" of attenuation levels. Finally, FRA pulled this provision directly from OSHA's general industry noise standard. See 29 CFR 1910.95(g)(5)(iii). As OSHA is the lead agency in this area, and FRA does not see any compelling reason to veer from OSHA's rule, FRA is leaving the rule the same as FRA's proposed rule and OSHA's general industry standard.

Since the post-NPRM RSAC Working Group meeting, FRA realized that there were some drafting errors in this section and corrected them. Section 227.109(e)(3) referred to "the level specified in § 227.115" and yet there are several levels listed in § 227.115 and so it was not clear to which level in § 227.115 the rule was referring. To clear up this type of confusion which can result from cross-referencing, FRA has revised § 227.109(e)(3) such that it refers directly to the specified level, i.e., the action level. In addition, FRA changed the term "workplace" to "occupational" in the second sentence of § 227.115, so that the terminology is consistent throughout the paragraph. Accordingly, § 227.115 now provides that "testing to establish a baseline audiogram shall be preceded by at least 14 hours without exposure to occupational noise in excess of the action level. Hearing protectors may be

used as a substitute for the requirement that baseline audiograms be preceded by 14 hours without exposure to occupational noise."

Section 227.109(e)(4) provides that "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." FRA did not receive any comments on this section and so it remains the same as proposed in the NPRM.

Section 227.109(f) provides the requirements for periodic 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.

This section has undergone several permutations. The starting point was OSHA's rule. OSHA requires an employer to obtain a new audiogram at least annually for each employee exposed at or above the 8-hour TWA of 85 dB(A). See 29 CFR 1910.95(g)(6). During RSAC Working Group meetings, labor representatives tended to disfavor mandatory hearing testing and railroad representatives tended to favor mandatory hearing testing. The RSAC Working Group members reached a compromise position that was used in the proposed rule. It required railroads to test employees at least once every three years but to offer a test at least once a year.

FRA received several comments on this provision. The commenters, including ASHA, AAA, AIHA, NHCA, CAOHC, Aearo Company, Theresa Schulz, and 12 individual ASHA members, overwhelmingly supported an annual audiometric testing requirement. Theresa Schulz wrote that the annual audiogram is a "critical tool to determine the effectiveness of a hearing conservation program." NHCA wrote that "annual audiometric monitoring will allow for early identification, leading to early intervention, and thus the potential to prevent noise-induced hearing loss." Aearo Company explained that, with triennial audiometric testing, an employer's ability to catch changes in time and to halt the progression [of hearing loss] will be substantially diminished. ASHA and AIHA went on to explain that a significant amount of irreversible hearing loss can occur in 3 years. Theresa Schulz and NHCA added that the progression of hearing loss is more aggressive in early years of an employee's career, especially the first 3 to 6 years of noise exposure.

The commenters identified several other reasons why FRA should require annual testing. Aearo Company wrote that the test data is of less value when spread out over 3 year periods. Aearo Company explained that audiometric test results can be very variable, and so a doctor reviewing data for potential shifts might want to review additional test results spanning a period of years. With triennial tests, it would take too long to develop a database of periodic audiograms. Aearo Company also wrote that the annual audiogram is the best training opportunity that a professional hearing conservationist has to educate and motivate employees. Having a triennial testing requirement means there are much fewer training opportunities. In addition, ASHA, AIHA, and Aearo Company noted that it would more logical for FRA to be consistent with other Federal noise standards (OSHA, MSHA, DOD) and have an annual audiometric test requirement. CAOHC and Aearo Company acknowledged that the mobile railroad workforce presents some logistical challenges and recognized FRA's desire to reduce that burden for railroads, yet still thought that FRA should require annual audiometric tests. Finally, ASHA and AIHA also stated that it will be administratively more difficult for FRA to track compliance if there is as much as 3 years between audiograms.

There was one commenter who took a different position. Attorney/audiologist Michael Fairchild of Michael Fairchild and Associates wrote that "OSHA and MSHA do not make the hearing test mandatory which results in some individuals 'slipping through the cracks' until it is far too late to preserve their hearing." He felt that obtaining triennial hearing tests would help to alleviate that problem to at least some extent.

At the post-NPRM RSAC Working Group meeting to discuss comments to the proposed rule, the AAR raised a new concern. They noted that they had not raised this concern in their comment submission but that it followed the same logic as their comment submission regarding calendar days in the training requirement. The AAR argued that the testing should be based on a calendar year, not 365 days from the last test. The AAR explained that they had not contemplated the issue when the RSAC Working Group was drafting recommendations for the NPRM, but at this stage, they had realized that it would be too difficult for them to comply with the proposed requirement. They explained that it would be virtually impossible to offer testing to each

covered employee every 365 days, given their large workforce, mobile nature of the workforce, and lack of clinics in certain rural communities. The railroad representatives explained that they needed more time and more flexibility to meet the testing requirement. In turn, the labor representatives pointed out that a calendar year requirement raised some serious practical concerns. For example, a railroad could offer testing to an employee in January 2008 and would not have to offer testing again to that employee until December 2009. In effect, then, employees could go as long as 23 months without having the railroad offer them a test.

There was a great deal of discussion on this topic during the post-NPRM Working Group meeting. The RSAC Working Group members were faced with various sets of competing positions. There was the railroad-labor difference of opinion as to the time frame. The railroad wanted the requirement based on the calendar year but labor thought that allowed for far too much time between tests. There was also a railroad-commenter difference of opinion. On one hand, commenters rejected a triennial testing requirement and instead recommended an annual audiometric testing requirement. On the other hand, the railroad representatives adamantly asserted that they were unable to comply with the proposed triennial testing requirement, no less an annual requirement.

In the end, the RSAC Working Group recommended, and FRA adopted, a variation on the provision that was used in the proposed rule. The final rule requires a railroad to offer an audiometric test to each employee included in the hearing conservation program at least once every calendar year, however, the rule qualifies the time frame. For any individual employee, the interval between the date offered for a test in a calendar year and the date offered in the subsequent calendar year shall be no more than 450 days and no less than 280 days. See § 227.109(f)(1).

The provision giving railroads up to 450 days to offer a test to any individual employee is important, because it will provide railroads with sufficient time to offer testing to their large, mobile workforce. This provision was part of the RSAC recommendation for this rulemaking.

The provision that requires railroads to offer audiometric tests at least 280 days apart was not a product of the RSAC consensus. FRA added this provision after the RSAC Working Group meeting. Without this provision, railroads would have been able to offer

tests to employees virtually back-to-back. For example, a railroad could test an employee in December 2006 and again in January 2007. To prevent that, FRA has established a minimum time period between tests of 280 days, or 9 months. FRA chose 9 months, because it allows for equal increments of time in relation to the 450 day requirement. The final rule also requires railroads to require each employee included in the hearing conservation program to take an audiometric test at least once every 1095 days. See § 227.109(f)(2). 1095 days is the equivalent of 36 months or 3 years. This triennial requirement is consistent with the triennial hearing acuity requirement for locomotive engineers. See 49 CFR 240.201(c).

Contrary to some of the comments received, FRA believes that these provisions are, in fact, comparable to OSHA provisions because they mandate employers' offering testing annually and require employee's participation not less than triennially.

Section 227.109(g) provides the requirements for the evaluation of audiograms. Paragraph (g)(1) provides 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. The second sentence of paragraph (g)(1) provides that this comparison may be done by a technician. AAA and CAOHC commented on this second sentence, suggesting that FRA require this comparison to be done by a technician "under the supervision of a Professional Supervisor of the Audiometric Testing Program." FRA adopted that change, though not in the precise manner the commenter suggested. Instead of adding that phrase here, FRA added that phrase elsewhere—i.e., in the definition of "qualified technician" located in § 227.5. FRA believes it important to have the Professional Supervisor oversee these determinations, because it will ensure consistency of application across all determinations.

Paragraph (g)(2) states that if the periodic audiogram demonstrates a STS, a railroad may obtain a retest within 90 days and use the retest as the periodic audiogram. This provision differs from OSHA's regulation. OSHA gives an employer 30 days to obtain a re-test if an annual audiogram shows that an employee has experienced a standard threshold shift. See 29 CFR 1910.95(g)(7)(ii).

Several commenters opposed the 90-day retest period, suggesting that FRA follow NIOSH's recommendation for an immediate retest if an STS has occurred.

If the retest audiogram does not show the same shift, the retest audiogram becomes the test of record and there is no need for a confirmatory test within 30 days. ASHA and AIHA also recommended that FRA require employers to conduct confirmation audiograms within 30 days of any monitoring or retest audiogram that continues to show an STS. They believe that the 90-day window permits too much time to lapse to permit effective comparison of tests, and they believe that 30 days is more appropriate. One commenter supported this provision. Michael Fairchild and Associates, noted that the 90-day retest period "makes sense given the mobile nature of the target worker population and the fact that some conditions that may cause a spurious STS may not resolve within the 30 days required by OSHA and MSHA."

FRA and the Working Group discussed the issue and decided to leave the retest period at 90 days. Most importantly, this 90-day retest period accommodates the mobile nature of the railroad work force. OSHA's 30-day retest period would not be appropriate here. OSHA regulates employers that tend to have employees at fixed facilities, and so it is practically possible to retest those employees within 30 days. Railroad employees, by contrast, are not at fixed facilities, but are widely dispersed, constantly moving throughout the country, and often work irregular hours. As well, many are subject to the Hours of Service laws, which further limits the railroad's ability to test employees on certain dates and at certain times. In addition, FRA and the Working Group believe that the 90-day period might allow for a better retest than the 30-day period. For example, medical conditions that are likely to interfere with the audiometric test, such as the common cold, are more likely to resolve themselves in 90 days than 30 days.

Section 227.109(g)(3) provides that the audiologist, otolaryngologist, or physician shall review problem audiograms and shall determine whether there is a need for further evaluation. A railroad shall provide various pieces of information to the person performing this review. That information includes: The baseline audiogram of the employee to be evaluated, the most recent audiogram of the employee to be evaluated, measurements of background sound pressure levels in the audiometric test rooms, and records of audiometer calibrations.

As used in this paragraph, "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.⁵⁷

NHCA commented on this paragraph, noting that FRA had not required railroads to provide the worker's most recent noise exposure. NHCA thinks this information is critical to the professional reviewer in making appropriate follow-up decisions. NHCA also wrote that "although it can be difficult to obtain this information from the worker, it is not impractical especially since FRA has a requirement to keep a list of employees or positions in the hearing conservation program."

FRA is not sure what the NHCA is recommending here. NHCA seems to be implying that the employee provide this information to the railroad, which does not make sense. Moreover, OSHA requires employers to retain a record of the employee's most recent noise exposure assessment (see 29 CFR 1910.95(m)(2)(e)), but FRA, in the recordkeeping section, made a conscious decision not to include this requirement in FRA's rule.

FRA specifically excluded, and continues to exclude, the employee's most recent noise exposure, because the workforce in question typically experiences a relatively wide range of exposures. Thus, there is no reason to believe that any individual's last exposure data will be particularly relevant to the evaluation of an audiogram. Further, this rule authorizes monitoring of exposures on a sampling basis, so for any given employee, the last exposure may not be available or may be months or years out of date.

Section 227.109(h) provides the follow-up procedures for subsequent audiograms. Section 227.109(h)(1) provides that a railroad shall notify an employee if the railroad determines that the employee has experienced a standard threshold shift (STS). The employer will be able to identify that a STS has occurred by comparing the employee's baseline audiogram with the employee's periodic audiogram. A railroad shall inform the employee in

writing within 30 days of the determination. FRA's rule gives railroads 30 days while OSHA's rule gives employers 21 days. See 29 CFR 1910.95(g)(8)(i). FRA's rule provides railroads with more time, because FRA is taking into account the mobile railroad workforce and railroads' difficulty in providing notice to that mobile workforce. Moreover, FRA believes there is no substantial harm if the railroads have an additional nine days to notify employees.

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 and specifies further notification procedures for subsequent audiometric testing. It provides that "if subsequent audiometric testing of an employee whose exposure to noise is less than an 8-hour TWA of 90 dB 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."

Several commenters, including Theresa Schulz, ASHA, AAA, AIHA, CAOHC, and NHCA strongly opposed the language in § 227.109(h)(3). Before summarizing their comments, it is necessary to provide a context for their comments. According to § 227.115(c)(2), a railroad must require the use of HP when an employee is exposed to sound levels that meet or exceed the action level, and the employee has experienced a STS and is required to use HP under § 227.109(h). However, according to § 227.109(h)(3), the railroad may discontinue the required use of HP if an employee's STS resolves, i.e., is not persistent. In other words, if the railroad finds that an employee's STS was only a TTS (temporary threshold shift), then the railroad need not require that employee to continue wearing HP.

The commenters were opposed to language in § 227.109(h)(3), and several requested that FRA delete it. They stated that it is illogical to discontinue the use of HP if an STS is not deemed persistent. They explained that a TTS is an indication that intervention is necessary, not that intervention should be discontinued. AAA explained that "If a retest indicates that hearing may have improved due to the use of HP prior to the retest, individuals should be aware of the need to continue use of HP when exposed to noise, rather than simply ignore this early warning and continue with the sloppy use of [personal protective equipment]." Similarly, AIHA wrote that a TTS may be an early indication of a noise-susceptible

employee. Rather than discontinue the use of HP, the employer should see it as an indicator that they need to intervene and promote the effective use of HP by offering a different selection of devices.

These commenters overwhelmingly emphasized that to discontinue intervention is to allow a TTS to become a permanent threshold shift (or permanent hearing loss) and that does not further the goal of preventing hearing loss. They wrote that the current language in the rule means that employers are merely documenting the TTS, but not doing anything to prevent further hearing loss. As Theresa Schulz wrote, this provision "makes the hearing conservation program an *hearing loss documentation* program!"

CAOHC recommended a variation, specifically that FRA require employees who show a STS that is not persistent but who are exposed to noise levels between 85 and 90 dB(A) to use HP. AAA also recommended a very similar variation, suggesting that employees who (1) show a STS that is not persistent and (2) are exposed to <90 dBA TWA not be allowed to terminate use of HP.

FRA, with the consensus of the RSAC Working Group, has decided to leave this provision as presented in the proposed rule. FRA does not believe it makes sense to change this provision according to the commenters' recommendations. If FRA adopted the commenters' recommendations, FRA would create a "new class" of noise-exposed employees—that is, employees who are exposed to noise below an 8-hour TWA of 90 dB(A) and who do not have an STS upon retest. Also, FRA would require that "new class" of noise-exposed employees to wear hearing protection all the time. As long as these employees continued in the same job and experienced the same noise exposure, they would have to wear hearing protection for the rest of their working careers. That would be illogical given that the STS could have been caused by one or more conditions other than hearing loss, e.g., poor technique, an undetected illness that suppresses hearing, an intentional effort to test poorly, or some other non-noise related condition. In addition, in order to ensure that this "new class" of exposed employees were in compliance, FRA would have to require a new set of records, which would impose an additional recordkeeping burden on railroads. Finally, this change would be a significant departure from OSHA. FRA adopted this provision from OSHA's general industry noise standard. See 29 CFR 1910.95(g)(8)(iii). Throughout this rulemaking, FRA has followed OSHA's

⁵⁷ OSHA Interpretation Letter from OSHA to Mr. J. Christopher Nutter dated May 9, 1994.

lead and veered from it only when FRA thought it was necessary to accommodate the unique aspects of the rail industry or when there have been advances in technology that warranted a change. As OSHA is the lead agency in this area and FRA does not see any compelling reason to veer from OSHA's rule in this case, FRA is leaving this provision as proposed.

Section 227.109(i) identifies the methods which railroads should use to revise baseline audiograms. The first method, which is provided in § 227.109(i)(1), should be used by railroads for the two years immediately following the effective date of this rule. It states that there are two situations where a Professional Supervisor of the Audiometric Monitoring Program 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, or (2) the hearing threshold shown in the periodic audiogram indicates significant improvement over the baseline audiogram. FRA adopted this concept from OSHA's general industry noise standard. See 29 CFR 1910.95(g)(9).

At the suggestion of AAA and CAOHC, FRA revised this section by replacing the phrase "audiologist, otolaryngologist, or physician" (which was used in the NPRM) with the more specific phrase "Professional Supervisor of the Audiometric Monitoring Program." Professional Supervisor of the Audiometric Monitoring Program is defined in § 227.5. While the RSAC Working Group agreed to add a definition in the final rule for "Professional Supervisor of the Audiometric Monitoring Program," the RSAC Working Group did not discuss the substitution in this situation. FRA has made this change, because it ensures that the substitution in § 227.109(i) is made by a qualified professional who understands hearing loss. FRA made a similar change in § 227.109(e)(2)(iii).

The second method, which is provided in § 227.109(i)(2), should be used by railroads for the period of time after the date that this rule has been in effect for two years. This method is virtually identical to the NHCA Professional Guide for Audiometric Baseline Revision (NHCA Guidelines).

NHCA recommended that FRA adopt the NHCA Guidelines and use it to better explain what OSHA meant in 29 CFR 1910.95(g) and what FRA now means in § 227.109(i). AAA, CAOHC, and Aearo Company also endorsed the use of the NHCA Guidelines. According to the commenters, NHCA developed

these guidelines in 1996 in response to frustrations among hearing conservationists who wanted clarification of what OSHA intended for baseline audiograms in its general industry standard.⁵⁸ The commenters explained that the OSHA guidelines lack precision. They explained that the NHCA Guidelines, in contrast, provide specific recommendations concerning when audiometric baselines should be revised. The NHCA Guidelines offer a standardized method of determining when baselines will be revised, and so they assure consistency and uniformity among professional reviewers. Several commenters also noted that these guidelines "have been commonly accepted."

FRA agrees with the commenters that, from a technical and programmatic point of view, the information contained in the NHCA Guidelines is very useful information. OSHA is silent on this issue, and these NHCA Guidelines provide much-needed guidance in this area. The NHCA Guidelines create a consistent methodology for revising baselines and in the process, make FRA's rule more clear. They fill the gap that has developed since OSHA issued its rule. And it fills the gap with a document created by and widely supported by the hearing conservation community.

Accordingly, with the consensus of the RSAC Working Group, FRA added the NHCA Guidelines as Appendix C to this final rule: "Audiometric Baseline Revision." FRA has made some edits to the document to tailor them for FRA's use (e.g., changing "OSHA" to "FRA" and changing the "30-day retest" to a "90-day retest"). The appendix is initially non-mandatory, but the appendix will become mandatory two years from the effective date of the final rule. The RSAC Working Group agreed that this two-year period is a fair and reasonable amount of time. It should provide railroads with sufficient time to make any necessary administrative changes.

Section 227.109(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."

⁵⁸ The Executive Council of the National Hearing Conservation Association approved these guidelines on February 24, 1996.

Appendix F is a non-mandatory appendix that employers can use to calculate and apply age correction to audiograms. Consistent with their 1998 criteria document, NIOSH submitted comments, recommending that FRA should not provide employers with the option of using age-corrected hearing levels to determine the presence or absence of a STS. NIOSH explained that "it is statistically inappropriate to apply aggregate data to individuals." In addition, NIOSH asserted that the Appendix F tables are racially biased and are discriminatory against persons older than 60 years old. NIOSH explained that the data sources for the age correction tables in Appendix F were surveys conducted in the late 1960s and early 1970s. The tables are representative of Caucasian male and female hearing thresholds from age 20 to 60 and therefore not of people of other races and above 60 years old.

NIOSH went on to suggest that FRA should make some changes to the age-correction charts if FRA decides to use age correction tables. Specifically, NIOSH suggested that FRA make the following adjustments—compute age corrections based on hearing levels of the 84th or 98th percentiles, i.e., mean minus 1 or 2 standard deviations; use tables that have representative age-related changes for both genders of all major ethnic groups; and use tables that accurately represent age-related hearing changes for workers over age 60. NIOSH also recommended that, if FRA wishes to use age correction tables, FRA should use tables derived from the National Health and Nutrition Examination Survey (NHANES), a joint National Institutes of Health (NIH)—Centers for Disease Control (CDC) effort, in order to ensure that the racial, gender, and age specific corrections are valid.

AAA and NHCA also submitted comments on this matter. Similar to NIOSH, AAA and NHCA do not support the use of the tables in Appendix F, because they are racially biased and discriminatory against persons greater than 60 years old. AAA raised a separate issue too. AAA asserts that the OSHA method for permitting use of age corrections (when computing STSs) is not a best practice for identifying meaningful changes in hearing. AAA believes that age correction of individual audiograms is counterproductive to the goal of detecting temporary hearing changes before they become permanent hearing losses. AAA asserts that a STS should be a sentinel for identifying significant changes in hearing.

On one hand, FRA understands that there are problems with the historical

data used to create the tables in Appendix F. It is older data that fails to take into account racial differences or the fact that people now have longer life spans. On the other hand, FRA does not have a viable alternative to use in place of the tables in Appendix F.

NIOSH did not present FRA with a viable alternative option. NIOSH did recommend that FRA use data from NHANES, but the NHANES effort is still pending, so there is nothing conclusive to use. There is no good scientific data available yet. NIOSH also offered that its scientists could provide technical assistance to FRA. However, that is not a feasible option for FRA either. FRA has neither the resources nor the expertise to conduct its own studies, obtain the new data, and create new age correction tables, even with NIOSH's technical assistance.

Since there is no viable replacement for the Appendix F tables, FRA considered the option of removing the age correction charts completely. Essentially, the age correct decision would be left up to the professional judgment of the Professional Supervisor of the Audiometric Monitoring Program. However, FRA decided that might do more harm than good. Without these tables, there would be absolutely no guidance for Professional Supervisors, and FRA would have created a gap.

Finally, OSHA, not FRA, is the lead federal agency on this matter and OSHA continues to use age correction charts. FRA is reluctant to make such a radical departure from OSHA at this time. Given the above reasons and the fact that these tables are non-mandatory, FRA and the Working Group decided to leave these tables as proposed in the NPRM. When, and if, OSHA decides to change these tables, FRA will consider a change.

Section 227.111 Audiometric Test Requirements

This section sets out the requirements for audiometric tests. FRA used OSHA's standard at 29 CFR 1910.95(h) as a starting point and then tailored the provisions for FRA's use.

Section 227.111(a) provides that audiometric tests shall be pure tone, air conduction, hearing threshold examinations with test frequencies including 500, 1000, 2000, 3000, 4000, 6000, and 8000 Hz. Tests at each frequency shall be taken separately for each year.

In the proposed rule, FRA sought comment on whether FRA should add the 8000 Hz frequency. Several commenters, including AAA, CAOHC, Aearo Company, NHCA, and NIOSH recommended that FRA require

audiometric testing at the 8000 Hz frequency. They explained that the information provided by the 8000 Hz threshold is valuable in determining the classic "noise notch" pattern. It enhances clinical decisions about the probable etiology of hearing losses. In order to determine that hearing loss is related to noise exposure and is a "work-related hearing loss," clinicians must observe an audiometric notch at 4000 Hz or 6000 Hz. This notch cannot be calculated without observing hearing thresholds at 8000 Hz. In addition, commenters noted that the cost, time, and effort of adding one frequency per test is negligible, particularly when compared to the reviewer time lost when a case's status regarding work-related, noise-induced hearing loss is unclear.

Accordingly, FRA has decided, and the RSAC Working Group has agreed, to require audiometric testing at the 8000 Hz frequency. It is important to include this frequency, because it will allow employers to identify hearing loss sooner. It is possible to include this frequency because the technology to test it is available while the time and effort necessary to test it is negligible. Moreover, railroads with hearing conservation programs are probably already testing at this frequency. It is important to note that all existing tests (i.e., tests conducted prior to this rule and which did not include the 8000 Hz frequency) are still considered to be valid tests.

Section 227.111(b) provides that audiometric tests shall be conducted with audiometers that meet the specifications of and are maintained and used in accordance with ANSI S3.6-2004, "Specification for Audiometers."⁵⁹ Aearo Company brought to FRA's attention the fact that FRA had published an outdated ANSI standard in the proposed rule (i.e., ANSI S3.6-1996), FRA has since updated the standard.

Section 227.111(b)(1) addresses the requirements for pulsed-tone audiometers. In the proposed rule, the requirement for pulsed-tone audiometers was found in § 227.111(c). FRA has substantially revised this requirement since the proposed rule. For a discussion of the changes, see the section-by-section analysis for Appendix C to this part.

Section 227.111(b)(2) is new to this final rule. This provision allows railroads to use insert earphones while conducting audiometric testing. Some

commenters asserted that FRA had allowed for the use of insert earphones by adopting the updated ANSI standard for audiometers (ANSI S3.6-2004) in § 227.111(b). They explained that ANSI S3.6-2004 includes, among other things, requirements for the use of insert earphones and so therefore, FRA must implicitly be allowing for the use of insert earphones in § 227.111(b).

The commenters also discussed OSHA's position on insert earphones. OSHA does not explicitly permit the use of insert earphones in its standard (although, as one commenter pointed out, that is probably because this technology did not exist at the time OSHA promulgated its standard). In fact, as indicated in a August 31, 1993 interpretation letter, OSHA considers the use of insert earphones to be a violation, albeit a de minimis one. Employers who wish to use insert earphones under OSHA standards can do so and avoid a citation, however, if they satisfy specified conditions (which are listed in the August 31, 1993 letter). Commenters concurred that OSHA's position on insert earphones is difficult with which to contend. One commenter specifically wrote that OSHA has made the use of insert earphones difficult in industrial settings.

Overwhelmingly, commenters praised the idea of permitting the use of insert earphones. Commenters pointed out that insert earphones are increasingly used in hospital-based and clinical practices, and so it is logical to permit their use in the regulation. Aearo Company wrote that insert earphones not only provide the same level of test validity and reliability as supra-aural headphones but eliminate several of the most vexing limitations of supra-aural earphones. AAA noted that it is desirable to use insert earphones since they provide better isolation of the stimulus (than supra-aural headphones) from the ambient room noise. AAA also wrote that insert earphones provide significant advantages in testing patients with background noise levels, with asymmetrical hearing loss, and with collapsing canals, and for reducing cross-contamination in cases of external ear canal infections.

The RSAC Working Group considered the issue of insert earphones. The members felt strongly that FRA should not require the use of insert earphones. The Working Group members explained that there were logistical problems with their required use. Railroad contractors who perform hearing tests do not generally use insert earphones, because, among other things, they have to keep several different types of tips and that becomes too difficult when they are

⁵⁹For a general discussion on the use of ANSI standards in this rule, see the section-by-section analysis for § 227.103(c)(2).

operating out of mobile vans. As well, there are data problems with using insert earphones. The data from tests with insert earphones and tests with supra-aural headphones would not be comparable since the testing conditions for each vary. Despite these problems, the Working Group agreed that insert earphones are a useful and emerging technology and wanted to provide railroads with the option of using them. The Working Group recommended that FRA permit their use but left it to FRA to work out the details.

Consistent with the Working Group's recommendation, FRA is allowing railroads to avail themselves of this new technology. FRA could have relied on the implication in § 227.111(b) that permits the use of insert earphones, but FRA believes that is too ambiguous. To avoid ambiguity, § 227.111(b)(2) of this rule explicitly permits the use of insert earphones. Although FRA is not mandating the use of insert earphones, when they are in fact used, they must be used consistent with the requirements listed in Appendix E: "Use of Insert Earphones for Audiometric Testing." In drafting the requirements for Appendix E, FRA used the conditions from OSHA's August 31, 1993 letter as a starting point and tailored them to meet FRA's needs. Of note are the background sound level requirements for insert earphones. They are discussed below in the section-by-section analysis for § 227.111(c).

Section 227.111(c) provides that railroads should administer audiometric examinations in rooms that meet the requirements listed in Appendix D: "Audiometric Test Rooms." Appendix D specifies that employers shall use rooms that do not have background sound pressure levels that exceed the levels in Table D-1 of Appendix D. Railroads are required to measure sound pressure levels with equipment conforming to at least Type 2 requirements of ANSI S1.4-1983 (Reaffirmed 2001), "Specification for Sound Level Meters" and to the Class 2 requirements of ANSI S1.11-2004, "Specification for Octave-Band and Fractional-Octave-Band Analog and Digital Filters."⁶⁰ Note that FRA has updated the octave-band filter ANSI standard from the outdated standard used in the proposed rule, ANSI S1.11-1971 (R1976) "Specification for Octave, Half-Octave, and Third-Octave Band Filter Sets."

Several commenters asserted that the background noise levels in Table D-1 of

Appendix D are too high. The commenters explained that excessive background noise levels in the room can interfere with an individual's ability to detect stimuli. As a result, clinicians do not know whether hearing shifts are valid or are caused by interfering background noise. In addition, Aearo Company explained that the Appendix D levels, which FRA adopted from OSHA, are outdated. Aearo Company explained that the OSHA requirements were based on a 1960 ANSI standard and its values were based on audiometric zero as defined in 1951. The 1951 threshold values are about 10 dB less sensitive than today's values, and the science behind the 1960 permissible noise standard was not as well developed.

The commenters proposed various alternatives. Theresa Schulz recommended that FRA adopt the background noise levels specified by the DOD in their Instruction 6055.12 (DOD, 1996). AAA, NHCA, ASHA, and Aearo Company recommended that FRA adopt the compromise position established by NHCA—that is, adopt the latest ANSI standard on background noise levels, ANSI S3.1-1999, "Maximum Permissible Ambient Noise Levels for Audiometric Rooms" but with a 5 dB relaxation at 500 Hz.⁶¹ NIOSH suggested that FRA adopt the ANSI S3.1-1999 standard for testing frequencies of 1000 to 8000 Hz but did not assert a position on how FRA should handle 500 Hz.

With respect to the ANSI S3.1-1999 standard, the commenters were concerned about railroads' "real world" ability to comply with ANSI S3.1-1999, specifically the maximum noise level at 500 Hz. They pointed out that studies have shown that a large percentage of audiometric booths and test vans would fail those requirements at 500 Hz. Mobile facilities did not fail, however, when the requirement for 500 Hz was relaxed. Aearo Company also pointed out that the 5 dB relaxation has minimal negative effect. Aearo Company explained that ambient background noise is typically high at 500 Hz and at the same time, occupational noise exposure has little measurable effect on the hearing thresholds that are masked (i.e., elevated) by those background noise levels.

By contrast, one commenter, Michael Fairchild and Associates suggested that the proposed Appendix D is a workable solution. He asserted that the proposals from the various professional organizations are "neither workable in a

real world environment nor necessary." He explained that the very low ambient sound levels suggested by the professional organizations are necessary for clinical diagnosis and research but not for occupational hearing conservation screening tests. He also explained that audiometric testing in a rail yard can be difficult under the current OSHA standards. Given the noise in the rail yard environment, clinicians often have to stop and re-start the test or move the test away from the work area. Both increase employee travel time and costs.

The RSAC Working Group discussed this issue of background sound levels at the post-NPRM meeting. The Working Group identified three options: (1) Use the OSHA background sound levels found in Appendix D, (2) use the more stringent standards (i.e., lower levels) found in ANSI S3.1-1999 or (3) use a modified version of the ANSI S3.1-1999 standard (i.e., relax 500 Hz by 5 dB).

Railroad representatives of the Working Group were concerned that they would experience substantial administrative difficulties if they had to comply with ANSI S3.1-1999 standard. One representative explained that, when this rule goes into effect, some railroad employees will be covered by the OSHA HCA while others will be covered by FRA. If FRA adopted the ANSI standard, railroads would have to test some employees with existing equipment that meets the OSHA standards and others with new equipment that meets the ANSI standard. There would also be difficulties with mobile test vans. Mobile test vans are already set to the OSHA standards, so all vans would have to be re-worked to accommodate the ANSI standards. AAR representatives stated that they do not know of any vans currently available on the market that are set to the new ANSI standard. In addition, some Working Group members pointed out that, given the noise environment in a rail yard, it is often difficult to perform audiometric tests using OSHA's background sound levels. To change the requirements to ANSI's more stringent standard would be even more difficult. Overall, the Working Group felt strongly that it was difficult to expect employers to switch between the standards in Appendix D and the latest ANSI standard. As a result, FRA decided to leave the requirements as proposed—that is, railroads should comply with the background sound levels that FRA adopted from OSHA and placed in Appendix D.

A related issue is the background sound levels for insert earphones. As several commenters pointed out, insert

⁶⁰ For a general discussion on the use of ANSI standards in this rule, see the section-by-section analysis for § 227.103(c)(2).

⁶¹ This relaxes the 1991 ANSI requirements by 3.5 dB (and the current 1999 ANSI standard by 5 dB) to a value of 24.5 dB.

earphones provide more attenuation than supra-aural headphones and so the background sound levels can be higher when hearing tests are performed with insert earphones. Accordingly, the relevant ANSI standard (ANSI S3.1–1999) sets higher background levels for insert earphones. The RSAC Working Group members discussed this issue at the post-NPRM meeting. The Working recommended that FRA allow the use of insert earphones but left it to FRA to implement the requirements for their use.

FRA considered two options for background sound levels for insert earphones: (1) the Appendix D levels which FRA adopted from OSHA (and which apply to supra-aural headphones) or (2) the levels in ANSI S3.1–1999. FRA has decided to use the background noise levels specified in ANSI S3.1–1999. Note, however, that FRA is not adopting ANSI S3.1–1999 in whole (and specifically not the background noise levels for supra-aural headphones). FRA is merely adopting the background noise levels from ANSI S3.1–1999 as they relate to insert earphones. FRA has placed the noise levels for insert earphones in a new row in Table D–1 of Appendix D. The background noise levels for insert earphones are higher than the background noise levels for supra-aural earphones. This is due to the fact that insert earphones provide higher attenuation.

Section 227.111(d) addresses the calibration of audiometers. Section 227.111(f)(1) requires a check of the audiometer's functional operation before each day's use. This requirement is slightly different than the related provision in OSHA's standard. In OSHA's rule, the audiometer must be checked by testing a person with known, stable hearing thresholds. In FRA's rule, the audiometer can be checked by either a person or with an appropriate calibration device.

Section 227.111(d)(2) requires an acoustic calibration annually. This section also directs railroads to perform the acoustic calibration in accordance with ANSI S3.6–2004.⁶² Just as FRA replaced ANSI S3.6–1996 with ANSI S3.6–2004 in § 227.111(b), so FRA has done here. FRA made this change at the recommendation of a couple of commenters and with the agreement of the RSAC Working Group.

Upon replacing the information in Appendix E with the requirement to comply with an ANSI standard, FRA realized that most of the information in

the proposed Appendix E: "Acoustic Calibration of Audiometers" was outdated and unnecessary. The information in the proposed Appendix E had come from OSHA's Appendix E, and most of that information, in turn, appears to have come from ANSI S3.6–1969. FRA deleted that outdated information. FRA has placed in § 227.111(d)(2) the requirement that railroads comply with ANSI S3.6–2004. FRA has also included some particularly salient parts of the ANSI standard and provided them in § 227.111(d)(2).

FRA notes that this updated ANSI standard includes procedures for the calibration of audiometers with insert earphones. FRA expects that railroads who elect to use insert earphones will follow those calibration procedures.

Section 227.111(d)(3) requires an exhaustive calibration, performed in accordance with ANSI S3.6–2004, once every two years for audiometers not used in mobile test vans and once a year for audiometers used in mobile test vans. This stricter requirement for mobile vans is necessary because of the nature of mobile service work. Mobile vans are constantly in movement, and thus 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. Because of that, FRA concluded that the minimal cost of this stricter requirement would be easily offset by the assurance of more accurate test data.

Theresa Schulz commented on this stringent mobile van requirement, noting that it helps to maintain quality in a difficult-to-control environment. She went further, suggesting that FRA require "daily listening checks" that railroads should conduct whenever they move equipment or turn it on or off. While FRA believes it's important to have more stringent standards for mobile test van audiometers, however, FRA does not believe it is necessary to go so far as to require daily listening checks. FRA believes the exhaustive annual calibration for mobile test vans is sufficient.

Section 227.113 Noise Operational Controls.

This section addresses noise operational 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 the 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 the employee to protect himself or herself.

Noise operational controls are the functional equivalent of OSHA's term "administrative controls." Unlike OSHA, FRA does not mandate the use of controls. This difference is rooted in practicality. In general industry, if an employee's noise exposure is too high, an employer can often simply move the employee to a different location. That option is not necessarily available in the railroad industry. Certain railroad employees, by the nature of their job, are limited as to their ability to be moved to a quieter location. For example, locomotive engineers have to work in a locomotive, which can be noisy. Management can rotate employees through a quieter locomotive or a quieter route, but even those options are limited, given that locomotives are constantly moving throughout the country and a quieter locomotive might not be available or a quieter route might not exist on a particular day for a particular employee. Because there are far fewer options in the railroad industry for employing operational controls, FRA did not mandate the use of noise operational controls in this rule.

This section provides that railroads may use noise operational controls to reduce noise exposures to levels below those required by Table A–1 of Appendix A of this part and that railroads are encouraged to use noise operational controls when employees are exposed to sound exceeding an 8-hour TWA of 90 dB(A). This section has been revised slightly since the proposed rule. The revision does not make any substantive changes; it merely ensures that the regulatory language accomplishes what FRA had intended and what FRA had expressed in the preamble to the proposed rule. In particular, railroads may consider noise operational controls at any point in time. The proposed rule provision had implied that railroads should wait until sound reaches an 8-hour TWA of 90 dB(A) before using or considering noise

⁶² For a general discussion on the use of ANSI standards in this rule, see the section-by-section analysis for § 227.103(c)(2).

operational controls, and that is not the case.

As stated above, railroads have the *option* of using noise operational controls. Railroads can use noise operational controls, by themselves, to lower the total noise exposure (as long as the total noise exposure does not exceed 90 dB(A) as an 8-hour TWA, in which case the railroad must also require hearing protection). Railroads can also use noise operational controls in combination with the other controls. Those other controls include 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 noise 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.

A couple of commenters, including ASHA and AIHA, submitted comments, supporting FRA's decision to make noise operational controls optional rather than mandatory. The commenters point out that administrative controls have proven to be problematic in general industry. They explain that administrative controls tend to take a secondary role to production requirements and that they have been difficult to administer and enforce."

Section 227.115 Hearing Protectors

This section addresses hearing protectors (HP), another measure that can be used to minimize employee exposure to noise in the locomotive cab. The term "hearing protector" is defined in § 227.5. Hearing protectors can be divided into three main categories: (1) Ear plugs that are placed in or against the entrance of the ear canal to form a seal and block sound; (2) ear muffs that fit over and around the ears to provide an acoustic seal against the head; and

(3) helmets that encase the entire head.⁶³

FRA has reorganized § 227.115 since the proposed rule. The content remains the same; however, the section is structured differently. This was brought about by Aearo Company's comment that the proposed §§ 227.115(a) and 227.115(c)(1) were redundant. By reorganizing the section, FRA believes it has removed the redundancy and also made this section more clear. Paragraph (a) contains the general requirements for hearing protectors, while paragraphs (b) through (d) address employee use of hearing protectors.

Section 227.115(a) contains the general requirements for hearing protectors. Railroads are required to provide hearing protectors to employees at no cost (§ 227.115(a)(1)) and replace hearing protectors as necessary (§ 227.115(a)(2)). These requirements are similar to the comparable provision in OSHA's standard, which is found at 29 CFR 1910.95(i).

Section 227.115(a)(3) is unique to FRA's rule; there is no comparable provision in OSHA's rule. This provision 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 overuse of hearing protection may be counter-productive, especially for employees with existing hearing loss. For example, an employee who is exposed to a TWA of 85 or 86 dB(A) should not wear HP that provides 30 dB in noise reduction, because that 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 cues is critical to avoiding train accidents and incidents.

FRA specifically sought comments from the public on this issue. In general, commenters supported this provision. ASHA, Theresa Schulz, and AIHA submitted similar comments, applauding FRA's recognition of the potential adverse impacts of overprotection. They explained that overprotection is prevalent because "purchasing authorities often * * * operate under the false assumption that higher noise reduction is better—regardless of local exposure conditions and need." They noted that a "one size fits all" approach for HP is inappropriate. They explained that

employers instead need to consider several factors—including an employee's comfort, an employee's ability to understand and respond to voice and radio communication, and an employee's ability to hear and respond to audible warnings—when selecting HP for an employee. Theresa Schulz noted that these two new considerations that FRA added (*i.e.*, an employee's ability to hear and respond to (1) voice communication and (2) audible warnings) are important considerations that directly address the problem of overprotection." Overall, these commenters expressed their belief that employees will be safer and more satisfied with HP if overprotection is limited or eliminated.

NHCA also applauded FRA for including this language. NHCA suggested that the use of low-attenuating devices or flat-attenuating devices may be an option to address the problem of employees' inability to understand and respond to voice radio communications and audible warnings. Likewise, an individual railroad operating employee with 35 years of engine service submitted comments applauding FRA's efforts with this rule. While he didn't specifically link his comment to this provision, he raised a point directly related to it. He acknowledged that he sometimes has difficulty hearing the alerter when he is wearing his hearing protection.

Another commenter, Aearo Company, initially explained that, based on their experience, the problem is usually inadequate use of HP, not overuse of HP. While responding to the preamble discussion on avoiding excessive reflexive use of HPs, Aearo Company asserted that the "problem is truly one of getting those in need to be protected without focusing undue attention on the few who may be wearing hearing protection that need not be." However, further in their comments, Aearo Company noted that "FRA's interest in accommodating hearing loss and use of HPs in moderate noise is well founded." Aearo Company pointed to data supporting FRA's provisions; Aearo said that the studies have found that the use of HPs in lower-level noise increases the likelihood that the HPs "will interfere with the audibility of warning signals and communication, especially for the hearing impaired." Similar to the comments mentioned above, Aearo Company noted that "simple blanket recommendations are not possible." Aearo Company suggested that it is generally necessary to do case-by-case analyses for each critical communication scenario and that such an analysis might include speech

⁶³ Berger at 383.

intelligibility or signal detection testing in a simulated occupational noise environment, as well as the services of a consulting audiologist.

Similarly, Wilson, Ihrig, & Associates had a mixed reaction. They agreed with FRA that employees with existing hearing loss will have more problems communicating with HPs and that a 30 dB noise reduction for an employee with existing hearing loss would be inappropriate. However, Wilson, Ihrig, & Associates then asserted that a 30 dB noise reduction is unlikely even if the NRR rating indicated such. Wilson, Ihrig, & Associates explained that "FRA should assume the reduction indicated in the NIOSH recommended standard document. [Accordingly,] it would appear that over protection would be a minor problem and that the main problem is outfitting a population of workers who already have hearing loss, where it is a problem of bad signal to noise ratio that precludes proper communication."

In addition to the above comments, Aearo Company had an organizational suggestion. Aearo Company suggested that the concept in § 227.115(a)(3) (which requires consideration of communications ability) would work better as the latter part of the proposed § 227.115(a)(4) (which requires railroads to provide a variety of hearing protectors). While FRA did not merge the two concepts, FRA has re-organized the section. As part of that reorganization, these two concepts are now back-to-back. FRA believes that change addresses the intent of Aearo Company's comment; it makes these concepts more understandable.

In the NPRM, FRA sought comment from the public on a related matter—the potential use by railroads of a mandatory hearing protection provision as a disciplinary tool. During pre-NPRM Working Group meetings, some labor members of the RSAC Working Group stated that they were uneasy with the HP requirement in § 227.115(a)(3). They worried that railroads might use a mandatory HP provision as a disciplinary tool or as a means for harassing an employee. They were also concerned that compliance could ultimately erode as a result of this provision and employees would encounter even worse noise exposure, i.e., if railroads were to unnecessarily mandate the use of HP, employees who find HP uncomfortable would stop wearing them altogether and receive even less hearing protection.

The commenters on this subject did not seem to think this would be a problem. ASHA and AIHA noted that the use of HPs should be considered in

the same light as all other mandatory personal protective equipment. They also noted that "enforcement of this policy should be uniform and consistent" and that neither labor nor management should view the use of HP as punitive or as a disciplinary tool. Aearo Company was surprised by this statement, explaining that it is unsupported by literature. Aearo Company explained that "discipline may certainly be needed for those who fail to wear their safety products, but viewing the required use of safety products as discipline is counterproductive." Aearo Company went on to explain that individuals who have studied and written on this topic emphasize the need for "strong enforcement, good motivation, and the development of a safety culture within an organization."

The AAR also submitted comments similar to those they had made at the RSAC Working Group meetings. They wrote that they supported these requirements; however, they disagreed with a comment made by FRA in the preamble discussion accompanying this provision in the NPRM. The AAR noted that during Working Group meetings, there was an open exchange of ideas and opinions, some of which were ultimately rejected by the Working Group. With respect to labor's concern that a mandatory HP provision could be used as a disciplinary tool, the AAR says they explained, during the Working Group discussions, that most railroads have had mandatory HP requirements and many of the requirements have been in place for 20 years. The AAR says they invited FRA or labor "to provide examples of any abuse of these rules, and none were forthcoming." "Given this background, AAR believes that it is inconsistent with the history and spirit of the RSAC process to include a comment like this in the NPRM."

Given FRA's belief that § 227.115(a)(3) is a valuable addition to FRA's noise standard, coupled with the overwhelming positive response that FRA received from the public, FRA is leaving this provision as proposed in the NPRM. FRA believes there are many beneficial aspects to the use of HP especially when employers carefully select an employee's HP (i.e., consider the employee's ability to understand and respond to communications and warnings).

Section 227.115(a)(4) provides 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." The first sentence of

this paragraph is identical to OSHA's rule. See 29 CFR 1910.95(i)(3). The second sentence is unique to FRA's rule. The requirements in both sentences underscore the importance of railroads offering employees with sufficient options—a variety of hearing protectors with a range of hearing attenuation levels. FRA believes that providing a choice of suitable devices increases the likelihood that the employee will use the device as required.

FRA received various comments about the phrase "variety of suitable hearing protectors" in the first sentence. Overwhelmingly, commenters noted that the rule does not define the term "variety" and requested that FRA provide a definition. Aearo Company pointed out that OSHA's regulation did not adequately define "variety" and as a result, OSHA has had to issue subsequent interpretations.

Several commenters provided specific suggestions as what a "variety" should be. Aearo Company wrote that a choice between two protectors, as per OSHA's HCA, is inadequate because "it fails to provide sufficient choice to assist in persuading the employee that they are a welcome participant in the HCP, and hence to encourage their 'buy-in' to the program." Aearo Company noted that a 2000 study and MSHA both recommend a minimum of four devices. ASHA, Theresa Schulz, and AIHA submitted similar comments, all suggesting that FRA require employers to provide a minimum number of HPs, i.e., "at least four different models of HPs with an appropriate range of attenuation levels including at least two types of earplugs and one type of earmuff." ASHA explained that the effectiveness of a HCP is dependent on the workers' willingness to wear HPs. By ensuring that workers have sufficient options, it increases the likelihood that workers will willingly wear their HP. NHCA made a similar suggestion, though with slightly different language. NHCA wrote that railroads should be required to "offer a minimum of four hearing protection devices (HPDs), including at least two different styles of plugs (e.g., foam and flanged), and at least one type of earmuff."

Aearo Company went further, explaining that "suitable variety" refers to more than just providing HPs with a range of potential levels of protection; it also means that an employer should provide HPs with differing feels and ergonomic characteristics. As Aearo Company wrote, "a 'menu' of options from which to choose conveys to employees that their opinion counts, and this in turn will enhance their feelings of self-efficacy and the

likelihood of wearing their HPs consistently and properly.”

At the meeting to discuss public comments, the Working Group considered these recommendations. The Working Group recommended that the rule should remain as stated in the NPRM, i.e., to refrain from specifying a minimum number of HPs which an employer must offer. FRA agrees and is reluctant to specify a minimum number as representing a “variety,” because FRA is concerned that employers may interpret that number as a maximum rather than a minimum. In addition, FRA wants to provide employers with the flexibility to consider the specific working environment of their employees. By specifying a number, FRA would be greatly limiting the employer’s flexibility.

FRA, however, would like to clarify the meaning of “variety.” When offering hearing protectors, employers should offer employees several different types, whether ear plugs, ear muffs, and/or electronic headsets. Within any given type, the employer should offer several different designs and models. For example, with respect to ear plugs, there are several options, including, but not limited to, roll down foam earplugs, push-in foam earplugs, premolded-flanged earplugs, premolded-unflanged earplugs, banded ear protectors. The employee should have the opportunity to try a variety of devices, so that he can determine what fits best and most comfortably.

Railroad industrial hygiene representatives of the Working Group indicated that a lack of variety of HP has not been a problem in the past, and they do not foresee that it will be a problem in the future. Several of the major railroads indicated that they have developed practices that seem to work. One railroad industrial hygienist noted that he tries to keep a large variety of hearing protectors readily available for employees. Another railroad industrial hygienist explained that he tries to work with employees on an individual basis if the employee has a special need, such as a STS.

As further guidance, FRA is including the hearing protector selection criteria set forth in the report of the NHCA Task Force on Hearing Protector Effectiveness in 1995. FRA included this information at the suggestion of the NHCA. “No single HPD characteristic, such as attenuation (as represented by the present NRR), or any other feature, should be the sole arbiter influencing selection of an HPD. The most critical consideration in selecting and dispensing a hearing protector is the ability of the wearer to achieve a

comfortable noise-blocking seal, which can be consistently maintained during all noise exposures. Additional important issues include: The noise reduction of the device, the wearer’s daily equivalent noise exposure, variations in noise level, user preference, communication needs, hearing ability, compatibility with other safety equipment, the wearer’s physical limitations, climate and other working conditions, and HPD replacement, care and use requirements.”

FRA also received a comment about the “range of attenuation levels” language found in the second sentence of § 227.115(a)(4). Aearo Company explained that the provision “range of attenuation levels” is helpful but too vague. Aearo Company is concerned that an employer “could easily interpret a range of attenuation values as being only 27–33 dB, just as likely as being from 12–33 dB,” and so they suggested some alternative language. FRA decided not to adopt Aearo Company’s suggested language. The Working Group agreed, but recommended that FRA include more guidance in the preamble.

As used in this paragraph (a)(4), a “range of attenuation levels” means that an employer should provide HP types with ranges that are sufficient to protect the employee from the level of noise expected but still permit the employee to communicate effectively for the job. In addition to offering devices with high attenuation, railroads should offer devices with low or moderate attenuation. Low or moderate attenuation devices further safety by facilitating communication and the detection of audible cues in the workplace. FRA expects that railroads will employ or consult professionals, such as industrial hygienists, who can guide employees in their selections and ensure that employees are adequately protected.

Section 227.115(a)(5) provides that railroads shall provide training in the use and care of all hearing protectors provided to employees. This section sets out the general requirement that railroads must train employees on the use and care of HP. Section 227.119 addresses this issue further. It requires railroads to have a training program that includes, among other things, instructions on selection, fitting, use, and care of hearing protectors. See § 227.119(c)(4). FRA did not receive any comments on § 227.115(a)(5), and accordingly FRA has left this provision as proposed.

Section 227.115(a)(6) provides that railroads shall ensure proper initial fitting and supervise the correct use of all hearing protectors. NHCA

commented on this provision, noting that the initial fitting is critical. NHCA explained that employers often gloss over the HPD fitting and simply tell employees to “follow the directions on the package.” NHCA wrote that “the employee should be given the opportunity [at the proper fitting] to sample a variety of HPDs to determine the proper fit, comfort, preference, appropriateness, and ability to use correctly.” FRA agrees that it is important that employers take the time and effort with employees at their initial fitting to ensure that the employees have the proper HP.

Sections 227.115(b) through (d) address the use of hearing protectors by employees. Section 227.115(b) requires railroads to make hearing protectors available to all of its employees exposed to noise at or above the action level. Section 227.115(c) provides that railroads shall require the use of HP where employees are exposed to sound levels that meet or exceed the action level, and the employee has not yet had a baseline audiogram established pursuant to § 227.109 or the employee has experienced a STS and is required to use HP under § 227.109(h). Section 227.115(d) provides that railroads shall require the use of HP when an employee is exposed to sound levels equivalent to an 8-hour TWA of 90 dB(A) or greater. The HP should be used to reduce sound levels to within the levels required by § 227.105 and Appendix A to § 227.105. Note that, since FRA has removed Table 1 (to § 227.105) from the rule, FRA has removed the reference to Table 1 here in § 227.115(d). FRA received some comments suggesting that FRA reorganize the proposed §§ 227.115(a) and (c). FRA has done so and believes that this section is now easier to understand.

Section 227.117 Hearing Protector Attenuation

Section 227.117(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: derating by type, Method B from ANSI S12.6–1997 (Reaffirmed 2002), and objective measurement.

This is a change from the proposed rule. In the NPRM, FRA had adopted OSHA’s Appendix B to 29 CFR 1910.95, which provided for the following methods: Noise Reduction Rating (NRR), and NIOSH methods #1, #2, and #3. There were two main issues with respect to the changes to this section:

the inclusion of Method B as an acceptable method and the overall revision of Appendix B.

In the NPRM, FRA had not included Method B but had sought comment on whether FRA should include it. Method B refers to the use of "subject-fit" attenuation data measured according to Method B from ANSI S12.6-1997 (Reaffirmed 2002). That ANSI standard, "Methods for Measuring Real-Ear Attenuation of Hearing Protectors," "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."⁶⁴ 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."⁶⁵

Several commenters responded to FRA's request for comment, stating that FRA should allow railroads to use Method B as a method for evaluating hearing protector noise reduction. The president and principal of Wilson, Ihrig, & Associates explained that, based on his experience as a consultant, of those individuals who had filed hearing loss claims, most who used HP had done so without any explicit training. Thus, Wilson *et al.* explained, "determining the attenuation without training or with only verbal training would provide a very valuable tool with respect to the actual attenuation achieved under actual field conditions."

Similarly, ASHA and AIHA agreed with FRA's assessment that Method B more closely resembles the real-world performance of hearing protectors and supported its inclusion in Appendix B. They explained that hearing protector ratings included in the NRR are based on data obtained under optimal laboratory conditions and therefore differ greatly from the noise reduction that employees actually experience on the job. They pointed to a few studies, including one that "demonstrated that having untrained subjects fit their own hearing protectors provided much better estimates of the hearing protectors' noise attenuation in the workplace than having the experimenter fit them." Theresa Schulz went further, explaining that there are other methods available to test the "real world" performance of

hearing protectors (e.g., the "fit-check" and the Predicted Personal Attenuation Rating) and recommending that FRA also encourage the use of those methods.

Other commenters, such as NHCA and Aearo Company, acknowledged that the Method B "subject-fit" attenuation data provides a better estimate of the average real world attenuation but expressed concern about using Method B. Both noted that there is "still wide debate about Method B and questions about whether it will be adopted or widely used." NHCA, along with some other commenters, recommended that railroads have the option to follow the NIOSH recommendations for derating HPs for the purpose of estimating the average workplace protection attainable by groups of HP users. The Aearo Company suggested a more complex scheme, whereby the use and type of attenuation varies based on the employee's level of exposure.

FRA and the Working Group considered this issue and decided to allow railroads to use Method B as a method of evaluating hearing protector attenuation. It provides railroads with an additional option, thereby giving railroads more flexibility to choose the method which is most appropriate for them.

The other issue related to HP attenuation was the overall revision of Appendix B. Aearo Company had submitted comments, asserting that it was "regrettable" that FRA chose to adopt OSHA's Appendix B without change. Aearo Company explained that Appendix B is confusing and misleading and recommended that FRA rewrite and clarify it in the final rule. The RSAC Working Group discussed Aearo Company's comment at the post-NPRM meeting and decided that it was most appropriate to leave Appendix B as proposed, with the exception that, FRA would add Method B as an option for estimating the adequacy of HP attenuation. The Working Group also noted that Aearo Company had not provided FRA with any viable alternatives to use in place of Appendix B.

As FRA attempted to incorporate Method B into Appendix B, FRA encountered difficulty. FRA found that the proposed appendix was, in fact, confusing. Given the confusion and complications, FRA is unable to simply add Method B, and so FRA is revising Appendix B. While the decision to add Method B to Appendix B was part of the RSAC Working Group consensus, the revision of Appendix B was not. FRA has modified Appendix B as explained below.

In the interest of simplicity, FRA provides for three methods of estimating real world HP protection levels. Using the first method, one subtracts 7 dB from the published NRR and then derates based on a percentage of the remainder. This is similar to NIOSH recommendations based on type. The justification for derating by device type has to do with the potential effect HP fit has on the attenuation level, with muffs being the least prone to fitting poorly and non-formable ear plugs being the most prone to fitting poorly. Using the second method, one would derate based on ANSI S12.6-1997 (Reaffirmed 2002) Method B. And finally, using the third method, one uses objective measurement. One conducts testing in user environments that measure actual levels inside the users HPs. FRA wants to emphasize that it recognizes that all of the methods mentioned, with the possible exception of the objective measurements, are estimates and may not precisely reflect the true level of protection. FRA acknowledges that the level of protection is as much related to the quality of training, practice and motivation of the users as it is to the NRR of the devices used.

Finally, with respect to HP attenuation, NHCA submitted further comments, specifically that FRA should include cautions about HP attenuation in the rule text. The cautions are based on conclusions of the NHCA Task Force on Hearing Protector Effectiveness. The Working Group, along with FRA, did not think it was necessary to include this information in the rule text but did think it was useful to include it here in the preamble. Accordingly, FRA encourages railroads to be cognizant of the following when evaluating HP attenuation:

When comparing hearing protectors, differences between hearing protector ratings of less than 3 dB are not important.

The labeled values of noise reduction are based on laboratory tests. It is not possible to use these data to reliably predict levels of protection achieved by a given individual in a particular environment. To ensure protection, those wearing hearing protectors for occupational exposures must be enrolled in a hearing conservation program.

The remaining provisions in § 227.117 are identical to FRA's proposed rule and to OSHA's standard at 29 CFR 1910.95(j). Section 227.117(b) provides that hearing protectors shall attenuate employee exposure to an 8-hour TWA of 90 decibels or lower, as required by § 227.115.

Section 227.117(c) provides that hearing protectors for employees who have experienced a STS must attenuate exposure to an 8-hour time-weighted

⁶⁴ Council for Accreditation in Occupational Hearing Conservation "Hearing Conservation Manual," Fourth Edition, 114 (2002).

⁶⁵ *Id.*

average of 85 decibels or lower. During pre-NPRM RSAC Working Group 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.

Section 227.117(d) provides 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 governs a railroad's training program. FRA's training requirements are based heavily on OSHA's training requirements found at 29 CFR 1910.95(k), however there are some differences, which are noted below. Section 227.119(a) sets forth the basic requirement that railroads must institute an occupational noise and hearing conservation training program for all employees included in the hearing conservation program.

LIRR submitted comments about the training requirement generally. They noted that they already have a four-day process to re-certify/re-qualify crews (on rules, air brakes, and parts 238 and 239). To add hearing training would extend the process to five days, which LIRR asserts would be at a significant cost and with added administrative burdens. As FRA has noted earlier in preamble, this rule evolved out of the RSAC process, of which several railroad representatives were members. Those members felt that this rule would not be overly burdensome on railroads, especially considering that most railroads already have HCPs in place. Moreover, the RSAC Working Group and FRA, as well as the majority of other commenters, feel that hearing conservation is an important enough issue to warrant this rulemaking and its associated training. In fact, one commenter, a consultant who has consulted on over 200 hearing loss claims, wrote that, based on his observations, he believes that one of the two main reasons for cab employees'

hearing loss is a lack of adequate training. He asserts that railroad HCPs have "not been comprehensive or thorough enough with respect to educating on both the need for and how to properly use appropriate hearing protection devices."

Sections 227.119(a)(1) and (2) have evolved through the rulemaking process and therefore a discussion is warranted. In the NPRM, FRA proposed that railroads shall offer training annually and shall require each employee to complete training triennially. This differed from OSHA's requirement, which requires employees to complete a hearing training program at least once a year.

FRA received numerous comments on this matter. On one end of the spectrum was the AAR, which suggested that the training requirements should be based on a calendar year, not 365 days from the last training. They explained that this would provide flexibility in offering and completing the training but would not substantially change the intervals for any given employee. So, for example, if a railroad offered training to an employee in June 2006, the railroad would be required to offer the next training session any time in 2007 up until December 2007.

On other end of the spectrum were ASHA, AIHA, AAA, NHCA, CAOHC, NIOSH, Aearo Company, and Michael Fairchild and Associates, all who advocated for FRA to require annual, not triennial, training. They all noted that training is very important, explaining that motivation and education of employees is a key element to hearing conservation success and is one of the most effective and critical components of a HCP. Michael Fairchild and Associates doubted that employees would retain information if not reinforced annually. Similarly, NIOSH asserted that training would be more effective if presented annually, based on the acquisition, retention, and application of new knowledge and skills. The commenters also noted that the success or failure of HCPs has been shown to depend on the "buy-in" of employees. They explained that training not only educates employees but it serves to reveal problems that employees face in complying with components of a HCP. The commenters also pointed out that an annual requirement would be consistent with OSHA's general industry standard as well as with other federal agencies such as MSHA and DOD. Aearo Company, acknowledging FRA's desire to minimize intrusion into the mobile railroad workforce, suggested that if FRA had to reduce training frequency,

FRA should compromise at requiring training at least every 2 years.

The RSAC Working Group discussed this matter at length. The AAR, an active member of the RSAC Working Group present during the proposed rule discussions, raised a new issue in their comments to the proposed rule. The AAR asserted that railroads would have great difficulty complying with a 12 month period. Faced with factors such as a highly mobile workforce and a lack of clinics in certain rural communities, railroads would be unable to offer training once every 12 months. Other RSAC Working Group members, however, were concerned that a calendar year requirement would create the potential for very large gaps between training. In a worst case scenario, an employee offered training in January 2006 might have to wait until December 2007 to be offered training again, a period of almost 2 years. Or, an employee offered training in December 2006 could next be offered training in January 2007, a period of only two months.

In the spirit of compromise, the RSAC Working Group decided on the provision that is now in the final rule. Each railroad shall offer training to each employee at least once each calendar year. As to any employee, the interval between the date offered for a test in a calendar year and the date offered in the subsequent calendar year shall be no more than 450 days and no less than 280 days. See § 227.119(a)(1). The railroad shall require each employee to complete the training at least once every 1095 days. See § 227.119(a)(2). These provisions are identical to those in § 227.109(f)(2) on audiometric testing.

With respect to the 450-day provision, FRA is trying to give railroads sufficient time to train the large number of railroad employees spread through the country while also trying to ensure that the training sessions are appropriately spaced. This section requires that every employee be offered training every calendar year but to prevent training in two calendar years from being too far apart, is providing that the training interval may not exceed 450 days.

In order to prevent railroads from offering training too close together, FRA has established a minimum interval of 280 days (or 9 months). This provision prevents railroads from offering training to an employee back-to-back, e.g., offer training in December 2006 and again in January 2007. FRA chose 280 days, because it allows for equal increments of time in relation to the 450 day requirement. This 280 day provision is not a product of the RSAC Working Group consensus. FRA added this

provision after the RSAC Working Group meeting.

Section 227.119(b) is new to FRA's rule; no comparable provision exists in OSHA's standard. Section 227.119(b) identifies the times when a railroad should initiate training for employees. For new employees, a railroad shall provide training within six months of the employee's first tour of duty in a position identified within the scope of this part. For existing employees, a railroad shall provide training within two years of the effective date of this rule, except for railroads with 400,000 or less employees hours, who shall provide training in three years.⁶⁶ Note that FRA has changed some of the formatting in this section. The substance of the provision remains the same.

FRA received several comments on this paragraph. One comment was to change the word "after" to "of" before the words "employee's first tour of duty." FRA took that suggestion and changed the rule accordingly. The revised provision now permits an employer to provide the training before, in addition to after, the employee's first tour of duty.

FRA sought, and received, several comments on the start date. FRA asked 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). ASHA, AIHA, NHCA, NIOSH, Aearo Company, and Theresa Schulz all responded that it is best to train employees and to fit hearing protection *before* employees enter noise-hazardous areas. AIHA wrote that the 6-month and 2-year windows were "unnecessary and counterproductive." The commenters explained that there are negative consequences of allowing employees to work in noise hazardous environments for up to the proposed time periods in that it provides a substantial time frame for employees to develop bad habits and to experience incipient hearing loss. Theresa Schulz wrote that, at the very minimum, railroads should have to train new employees within 6 months. The commenters also pointed out the importance of training. Aearo Company explained that HCP training should be viewed and treated as equally as important as the other pieces of safety information that a new employee receives.

The RSAC Working Group discussed this issue and recommended to FRA to leave this provision as proposed. The RSAC Working Group felt that it was not necessary to require early training, since the important issue is employee protection and employees are otherwise protected during this interim, initial period through the operation of other provisions of the rule. Other provisions of the rule ensure that the employee is protected. Specifically, if a new employee has not yet received a baseline audiogram and is exposed to sound exceeding an 8-hour TWA of 90 dB(A), the employee is required to use HP. See § 227.115(c)(2)(i). Plus, the railroad is supposed to ensure "proper initial fitting and supervise the correct use of hearing protectors." See § 227.115(f). Thus, a new employee, if exposed to hazardous noise, will receive HP and basic instructions on its use. Moreover, railroad members of the RSAC Working Group felt that this issue was moot given standard practice. They explained railroads typically provide new employees with initial training covering all topics when they start their jobs, and therefore new employees are generally trained before they are exposed to noise. Some employees might even receive their noise training as part of their pre-employment training.

Section 227.119(c) lists the items that a railroad should address in its hearing conversation training program and include in its training materials. This is a list of the minimum items that a railroad should address; railroads are free to include additional items if they so wish. The first five items listed in §§ 227.119(c)(1) through (5) are the same items that OSHA requires in its standard. See 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 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.

The remaining six items found in §§ 227.119(c)(6) through (11) are additional items which FRA has added to its standard, and which do not exist in OSHA's standard.

Given that FRA has added these additional training requirements, it is not sufficient for railroads to use only a "canned" OSHA training program (although a "canned" OSHA training program does suffice as training for the OSHA-related elements in the FRA training program). A "canned" OSHA 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. These items were added to address the unique aspects of the railroad operating environment—e.g., the mobile nature of the employees' work, the variety of noise sources to which they are exposed, etc. These items are discussed in the following paragraphs.

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. As originally conceived, this provision required railroads to provide employees with workplace noise exposure levels, including examples of where hearing protectors are, or are not, necessary; the types of equipment that emit excessive noise; and the types of operations that produce excessive noise. During meetings at the proposed rule stage, 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 RSAC Working Group recommended that the requirement be expressed in more general terms. FRA accepted that recommendation. The general language addresses the railroad's administrative concerns and also addresses FRA's intention that railroads 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 should address railroad representatives' concerns about the timing of this training. Some railroad representatives asserted that this material was already

⁶⁶ For a discussion on small entities, see the section-by-section analysis for § 227.103(a).

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. Railroads do not 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. Because FRA mandates that employees participate in the audiometric testing program specified in this rule, it is important that the railroads, at a minimum, explain this rule's requirements as they affect their 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.

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 excessive 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 NPRM consensus document that the RSAC forwarded to FRA. Rather, these two elements were added after OSHA's review of the NPRM during the pre-publication clearance process.

FRA sought comment on these two items which FRA added as a result of OSHA's review of the proposed rule. Most commenters, including ASHA, AIHA, and Theresa Schulz, supported FRA's decision to include these additional items. One commenter wrote that the additional requirements were "excellent." The commenters went on to explain that these requirements will allow an employee to recognize excessive noise and use HP, which will provide an early intervention to prevent hearing loss. The AAR requested that FRA clarify what would be adequate to satisfy § 227.119(c)(10) (i.e., train employees on how to determine what can trigger an excessive noise report). During the post-NPRM RSAC Working Group meeting, the AAR withdrew this comment, noting that definition in the rule and preamble language in the NPRM (much of which is reproduced in this final rule) sufficiently defines excessive noise report. The AAR also noted that training should include the definition of excessive noise. FRA agrees and encourages railroads to share not only the definition of "excessive noise" with employees but also the information contained in the preamble discussion on "excessive noise."

Another issue which arose in the context of training is delivery method. The NPRM did not specify the delivery method for training. FRA noted that traditional classroom training is the most beneficial, followed by interactive (e.g., computer) training, and then video training. It is FRA's understanding that most class I railroad employees are generally trained by viewing a video presentation or by operating an interactive computer program.

Railroad representatives felt strongly that FRA should not mandate classroom training. They felt that any requirement that departs from a standardized OSHA training program might result in significantly increased costs with questionable additional benefit. FRA sought comment as to whether railroads should conduct training through the use of traditional classroom methods, video presentations, or computer training.

The AAR replied, objecting to FRA's conclusion "on the desirability of classroom training over training by video or computer." The AAR stated that there was no empirical data presented to the Working Group that would support the proposition that traditional teaching methods are more effective than video or computer training. The AAR pointed out that there are benefits to video and computer training, such as avoiding distractions inherent to teaching groups and potentially maximizing the attention to the training by allowing the employee to choose the time of the training. The AAR explained that computer and video training are well accepted by professional educators and felt that they should be maintained as options.

Several other commenters, including ASHA, AAA, and AIHA, were in favor of interactive training. They stated that interactive training is usually more effective, if not the "most effective way to communicate the message." They explained that live training permits employees to interact with the instructor and to ask questions. Several mentioned that it provides a "teachable moment," where an employee is open to receiving information. ASHA and AIHA acknowledged, however, that face-to-face training can be "burdensome and costly" and so ASHA suggested an alternative whereby employers would provide resources for answering employee questions as they arose, instead of conducting face-to-face training.

In this final rule, FRA does not specify a delivery method for training. A railroad can provide the training information through any medium it chooses. Given the nature of the mobile railroad workforce and the cost of this type of training, FRA recognizes that traditional classroom/live training could be costly and administratively burdensome. However, FRA reiterates its belief that traditional classroom training (i.e., face-to-face or live) is an excellent and often highly effective method of training. Traditional classroom training is beneficial, because it allows employees to ask questions and receive immediate feedback. Similarly, training with interactive components (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 than training without those components.

FRA recognizes that there are many creative training options, especially given today's technological capabilities. For example, a railroad could use on-

line interactive training. Or a railroad could supplement a computer or video presentation with content experts that are available through e-mail or phone. It is FRA's belief that these methods, while not necessarily exactly equivalent to classroom training, can be effective in conveying necessary information to employees.

Section 227.121 Recordkeeping

This section contains the recordkeeping requirements for this regulation. Section 227.121(a) sets out some general recordkeeping provisions, and §§ 227.121(b) through (f) specify the records which railroads must maintain and retain. FRA is granted authority to inspect records by 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) addresses the availability of records. Section 227.121(a)(1) provides that a railroad shall make all records available for inspection and copying/photocopying to representatives of FRA upon request; make an employee's records available for inspection and copying/photocopying to that employee, former employee or such person's representative upon written authorization by such employee; make exposure measurement records for a given run or yard available for inspection and copying/photocopying to all employees who were present in the locomotive cab during the given run and/or who work in the same yard; and make exposure measurements for specific locations available to regional or national labor representatives, upon request.

This section has been revised since the proposed rule. FRA has formatted it slightly differently and has better clarified who can have access to which records. Along those lines, FRA revised the provisions found in § 227.121(a)(1)(i), (ii), and (iv) and added § 227.121(a)(1)(iii). The proposed rule seemed to permit an individual employee to obtain any records (including audiometric testing/medical records) required under this part of another individual employee. FRA did not think that was appropriate since it raises privacy concerns. What FRA intended in the NPRM and what is more explicit in this final rule is that individual employee would be able to receive the records of a monitored run if the employee was in the cab during the monitoring and/or if the employee

works in the same yard where the monitoring occurred. However, FRA never intended for an individual employee to be able to obtain the individual testing records of another employee. FRA notes that it realized the need for this change after the RSAC Working Group meeting and so this change was not the result of the RSAC consensus recommendation.

Section 227.121(a)(2) permits records to be kept in electronic form. FRA has added language to this section since the proposed rule. FRA added this language since the post-NPRM RSAC Working Group meeting, and so it is not a product of the RSAC consensus recommendation. With this additional language, FRA has clarified the requirements for the use of electronic records. These requirements are almost identical to the electronic recordkeeping requirements found in FRA's existing track safety standards, § 213.241(e), though FRA has tailored them slightly to fit the nature of noise records. Section 227.121(a)(2) allows each railroad to design its own electronic system as long as the system meets the specified criteria in §§ 227.121(a)(2)(i) through (v), which is intended to safeguard the integrity and authenticity of each record. Section 227.121(a)(3) discusses the transfer of records from a railroad that ceases to do business.

Section 227.121(b) requires railroads to maintain and retain employee noise exposure measurement records. In the NPRM, FRA proposed to require railroads to retain employee exposure measurement records for three years. Several commenters voiced strong opposition to this proposal. NHCA wrote that it was "unrealistic," and Theresa Schulz wrote that it was a "questionable practice." Many commenters noted that there was a marked inconsistency between this requirement (i.e., retaining exposure records for 2 years) and § 227.121(c)(2) (i.e., retaining audiometric test records for the duration of the covered employee's employment).

Wilson, Ihrig, & Associates noted that the three-year requirement could be detrimental to an employee's ability to file a Federal Employers Liability Act (FELA) claim. According to Wilson et al., an employee's FELA claim is supported or refuted using previously obtained-noise exposure information. If employers aren't required to keep those records, they won't keep them, and then employees will have great difficulty making a hearing loss claim because they will not have information they need. Several other commenters, including ASHA, Theresa Schulz, AIHA, and NHCA, recommended that

FRA require employers to retain both sets of records for the duration of the employee's employment plus 30 years. They explained that this would be consistent with other health record maintenance standards.

FRA notes that the three-year-retention period in the proposed § 227.121(b)(2) was an oversight. FRA and the Working Group had sought to track OSHA's requirement and in doing so, FRA failed to take into account the connection between OSHA's general industry standard in 29 CFR 1910.95(m)(3)(i) and OSHA's access to employee exposure and medical records standards in 29 CFR 1910.1020(d)(1)(ii). While OSHA's general industry standard requires employers to retain noise exposure measurements for 2 years, OSHA's access to records standards requires employers to retain employee exposure records for at least 30 years. FRA should have tracked the retention requirements in 29 CFR 1910.1020, because FRA employee exposure measurement records more closely resemble employee exposure measurement records. Accordingly, FRA is correcting its original mistake. Section 227.121(b)(2) requires railroads to maintain employee exposure measurement records for the duration of the covered employee's employment plus thirty years. FRA notes that the Working Group members indicated that most major railroads are already retaining these documents for this time period, so this requirement will be consistent with current practice.

Section 227.121(c) requires railroads to maintain employee audiometric test records. Consistent with the retention period for § 227.121(b), FRA requires railroads to maintain these records for the duration of the covered employee's employment plus thirty years. In § 227.121(c)(1), FRA specifies the items which railroads must include in the audiometric test records. FRA included in the NPRM all of OSHA's items (see 29 CFR 1910.95(m)(2)(ii)) except for one, "the employee's most recent noise exposure assessment." NHCA, AIHA, Theresa Schulz, and ASHA indicated that they think FRA should have the same recordkeeping requirements as OSHA, including the provision which FRA eliminated in the NPRM. In addition, as NHCA explained, "this important piece of information provides assistance to the professional reviewer who must make follow-up decisions based on the audiometric record."

FRA agrees that this information is important, however, FRA believes that the rule already provides for the retention of this item. The railroad will

already have a copy of the employee's most recent noise exposure assessment pursuant to § 227.121(b). As such, there is no need to duplicate the requirement in § 227.121(c). In addition, as FRA pointed out in the NPRM, it is impracticable to expect railroads to store the employee's most recent noise exposure assessment with the audiometric test records. Realistically speaking, the individual performing the employee's audiometric test would not have access to the noise measurement data and thus would not be able to enter it on the audiogram.

With respect to § 227.121(c), several commenters, including AIHA, ASHA, and Theresa Schulz, recommended that FRA require railroads to include additional information in the audiometric test records. Specifically, they suggested that railroads record: (1) The model and serial number of the audiometer used for testing; (2) the measurements of the background sound pressure levels in the audiometric test room; and (3) the name of the individual supervising the hearing conservation program. FRA, in conjunction with the Working Group, decided to require railroads to include the first item but not the second and third item.

With respect to the first item, there was consensus among the members of the Working Group that there was value in including the model and serial number of the audiometer. That information can help an employer to easily and readily identify a problem audiometer. This is especially the case where an employer uses several audiometers and has intermittent problem results. The Working Group members also noted that, practically speaking, the burden of including this information on the audiometric test record is minimal. Most audiometers already automatically include this information on the audiogram. Accordingly, FRA, with the Working Group consensus, added a provision whereby railroads must include the model and serial number of the audiometer used for testing on the audiometric test record. See § 227.121(c)(1)(vi).

With respect to the second item, the Working Group noted that this issue was already addressed elsewhere in the rule. Section 227.121(c)(1)(v) requires railroads to maintain in the audiometric test records "accurate records of the measurements of the background sound pressure levels in audiometric test rooms." As such, FRA thought it was unnecessary to include this additional item in the audiometric test record.

With respect to the third item, the Working Group felt that it was

unnecessary to include the name of the individual supervising the HCP. It is important to include the name of the individual conducting the test; therefore, the rule, in § 227.121(c)(1)(iii), requires railroads to include that information. Moreover, it is important to ensure that the individual conducting the test is qualified, and so the rule addresses that issue in § 227.109(c). However, neither the Working Group nor FRA saw the need to require railroads to record the name of the individual supervising the HCP, and so FRA does not require railroads to include this additional item in the audiometric test record.

FRA is "grandfathering" certain pre-existing baseline audiograms depending on the conditions under which the audiometric test for that baseline audiogram was conducted. For a complete discussion of the grandfathering provisions, see the section-by-section analysis for § 227.109(e)(2). In short, FRA expects railroads to make a good faith effort in obtaining the audiometric test records for grandfathered baseline audiograms. At the same time, FRA understands that, in certain cases it might be very difficult, if not impossible, since the baseline audiograms were, in many cases, 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.

Section 227.121(d) requires railroads to maintain a record of all positions and/or persons designated by the railroad to be placed in a HCP. The rule requires railroads to retain these records for the duration of the designation. LIRR wrote that, because of the their bidding and bumping process, it would be administratively burdensome and costly for them to comply with this requirement. The preamble to the NPRM (see 69 FR 35169) had been missing the word "or," which may have been what generated this comment. Given the "and/or" nature of this provision, a railroad is compliant with this provision if they simply list the positions that are required to be placed in a HCP (although they can also, or in addition, list the persons that are required to be placed in a HCP). Neither FRA nor the Working Group believe that this is overly burdensome, and so FRA is retaining the proposed requirement in the final rule.

Section 227.121(e) requires railroads to maintain copies of the training materials required by § 227.119 and a record of all employees trained. The final rule requires railroads to retain

these copies and records for three years. This is a requirement that is new to FRA's rule; it is not in OSHA's general industry standard for noise. ASHA, AIHA, and Theresa Schulz suggested that it might be too burdensome for railroads to have to keep copies of all the training materials, and so they suggested that FRA instead require railroads to document the date, content, attendees, and faculty for each training program. The Working Group considered this recommendation but decided not to adopt it. FRA agrees and accordingly, FRA is leaving this provision as proposed in the NPRM.

Section 227.121(f) requires railroads to maintain a list of employees who have experienced a standard threshold shift (STS) within the prior calendar year. 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. The final rule requires railroads to retain this list for five years. Although OSHA does not require employers to maintain this information, FRA requires this information, because it can help assess the effectiveness of a railroad's HCP over time. This information is not reportable per se, under part 225. However, it triggers an evaluation as to work-relatedness⁶⁷ and if it is work-related, then the railroad would have to record/report it as required by part 225. With respect to § 227.121(f), FRA sought comment as to whether five years was an appropriate amount of time for railroads to retain a list of STSs. FRA did not receive any comments and accordingly is leaving it as proposed.

Appendices to Part 227

In the proposed rule, FRA had adopted appendices A–F from OSHA's noise standard. For the most part, FRA's proposed appendices were virtually identical to the appendices for OSHA's general industry standard. FRA has since made a number of substantive changes to the appendices. Those changes are discussed below and/or in the relevant section-by-section analysis above. Also please note that FRA has re-numbered much of the appendices that were carried over from the proposed rule so that the numbering is consistent across appendices.

With respect to appendices in general, one commenter suggested that FRA add a non-mandatory appendix that contains

⁶⁷ For purposes of the § 227.121(f) list, a railroad must maintain a list of all STSs regardless of work-relatedness. For purposes of part 225, a railroad must report STSs that meet the reporting criteria (*i.e.*, among other things, only those that are work-related). See § 225.5 for the definition of "occupational hearing loss" and § 225.19(d).

two tables, Tables 1-1 and 1-2, from the 1998 NIOSH Revised Criteria Document.⁶⁸ The NIOSH tables are analogous to Tables A-1 and A-2 in mandatory Appendix A in FRA's rule. The difference is that the NIOSH tables are based on an 85 dB(A) exposure limit and a 3 dB exchange rate, and the FRA tables are based on a 90 dB(A) exposure limit and a 5 dB exchange rate. NIOSH believes that the additional non-mandatory appendix would supply additional materials to help users make informed decisions about preventing hearing loss among railroad employees. FRA and the Working Group decided not to add these tables based on the view that including several conflicting tables is more likely to create confusion than provide assistance.

Appendix A to Part 227

Appendix A is a mandatory appendix that provides tables with which an employer can compute an employee's noise dose. FRA has made some changes to Appendix A, most of which are discussed above in the section-by-section analysis for § 227.105. FRA also made a purely cosmetic change, which is discussed here. At the suggestion of Aearo Company and with the agreement of the RSAC Working Group, FRA italicized all levels above 115 dB(A) in Table A-1. FRA (and OSHA, from whom FRA adopted this appendix) included these levels, not because they are permitted levels, but because they can be necessary for the computation of noise dose. The commenter pointed out that OSHA had written in the preamble to their 1981 Hearing Conservation Amendment⁶⁹ that they were italicizing these levels, however, there were no italics in the regulatory text of OSHA's final rule. By italicizing these levels and including a footnote to Table A-1, FRA makes it clear that these levels are different from the others. It allows FRA to avoid giving the impression that these levels are permitted.

Appendix B to Part 227

Appendix B is a mandatory appendix. FRA identifies the methods which railroads should use for estimating the adequacy of HP attenuation. FRA has revised this appendix since the proposed rule. For a discussion of the changes, see the section-by-section analysis for § 227.117.

Appendix C to Part 227

Appendix C is a mandatory appendix that contains procedures for revising baseline audiograms. Appendix C as

proposed in the NPRM was adopted from OSHA's general industry noise standard. Proposed Appendix C discussed self-recording audiometers and also included one sentence addressing a requirement in the event that pulsed-tone audiometers are used. Several commenters recommended that FRA delete all references in the rule to self-recording audiometers. The commenters explained that self-recording audiometers are no longer produced, supported, or used, and so there is no point to reference them. Another commenter explained that it was unnecessary to discuss the "possibility" of using pulsed-tone audiometers, since they are routinely used.

FRA and the RSAC Working Group agreed to incorporate these technical changes in the final rule. FRA removed all references to self-recording audiometers, including references in the proposed § 227.111(c) and the proposed Appendix C. With the self-recording audiometer discussion removed, there was almost nothing left in Appendix C. FRA modified the remaining sentence to address the commenter's concern by removing the phrase "in the event that pulsed-tone audiometers are used" and moved the modified sentence to § 227.111(b)(1).

FRA further revised the requirement for pulsed-tone audiometers, as a result of CAOHC's comments. CAOHC recommended that FRA's specifications for pulsed stimuli should be 200 milliseconds on and 200 milliseconds off. They explained this would be consistent with audiometric instrumentation. FRA agreed that requirement should be expanded but chose to do so in a different manner. Using the requirement from ANSI S3.6-2004, FRA wrote that "Pulsed-tone audiometers, where used, should be used with the following on and off times: F-J and J-K shall each have values of 225 ± 35 milliseconds."

Because FRA had removed proposed Appendix C, FRA also removed the language in the proposed § 227.109(d) that referred to Appendix C. Rather than renumber the remaining paragraphs of § 227.109, FRA has intentionally left § 227.109(d) blank in the final rule.

In this final rule, FRA has inserted a new Appendix C. For a discussion of new Appendix C, please see the section-by-section analysis for § 227.109(i).

Appendix D to Part 227

Appendix D addresses the requirements for audiometric test rooms; it is a mandatory appendix. FRA has added a row to the Table in

Appendix D. It sets the background noise levels for hearing tests conducted with insert earphones. For a discussion of the changes made in the final rule, see the section-by-section analysis for § 227.111(e).

Appendix E to Part 227

The proposed Appendix E addressed the acoustic calibration of audiometers. Most of the information in that appendix was based on an outdated ANSI standard, and so FRA removed the appendix. FRA put the relevant requirements for calibration in § 227.111(f)(2). For a discussion of the changes in the final rule, see the section-by-section analysis for § 227.111(f)(2).

In this final rule, FRA has placed the requirements for insert earphones in Appendix E. Appendix E is a mandatory appendix that establishes the requirements that railroads must use if they choose to conduct hearing tests with insert earphones. For a discussion of this appendix, see the section-by-section analysis for § 227.111(c).

Appendix F to Part 227

Appendix F is a non-mandatory appendix that employers can use to calculate and apply age correction to audiograms. For a discussion of the comments that FRA received related to Appendix F, see the section-by-section analysis for § 227.109(j).

Appendix G to Part 227

In the final rule, FRA has placed in Appendix G the schedule of civil penalties that FRA will use in connection with part 227. This is different than the Appendix G that was proposed in the NPRM. The proposed Appendix G was an informational index that provided employers with basic information on complying with the noise monitoring provisions contained in the rule. It was the same as OSHA's Appendix G. In the proposed rule, FRA sought comment on whether or not FRA should adopt this appendix. FRA did not receive any comments on that issue. FRA has since removed the proposed Appendix G from this final rule. It addressed conventional workplaces, rather than the railroad industry. As such, it did not accurately characterize the noise environment in the locomotive cab. In addition, much of the general material in that appendix is also covered in the preamble discussion of this NPRM, and so it is unnecessary to repeat in an appendix.

⁶⁸ See § III(D) above for a related analysis.

⁶⁹ 46 FR 4078-1 (January 16, 1981).

Part 229—Railroad Locomotive Safety Standards

Section 229.4 Information Collection

This section notes the provisions of this part that have been submitted to 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.

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).”⁷⁰ 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 or her 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 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 occupant-related medical conditions such as tinnitus (i.e., a ringing, buzzing, roaring, or other sound in the ear). This 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.

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

⁷⁰ “Speech Communications and Signal Detection in Noise,” G.S. Robinson & J.G. Casali in *The Noise Manual*, 569 (2000).

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 commends, railroads and manufacturers for their efforts in making locomotives quieter. In recent years, locomotive manufacturers have built 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: Horn placement in the center of the locomotive; insulation of the cab; insulation of the cab floor; venting the exhaust from the air brake system outside of the cab; and installation of 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. 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 rule, these units are not yet pervasive throughout the industry.

Section 229.21(a)(1) establishes a design requirement for all locomotives that are manufactured by a specified date. That date is 12 months after this rule is published in the **Federal Register**. The proposed rule had set that date at January 1, 2005. Given that time has passed, FRA decided to extend that date. This section 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 substantial burden on railroads or locomotive manufacturers. FRA has specifically chosen to use 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 a more complete understanding of this provision.

FRA received two comments on this requirement. First, an individual BLET member suggested that FRA require railroads to check all locomotives in a fleet, not just a percentage. It is a common industry practice and an accepted statistical practice to use a sampling strategy, and FRA does not see any reason to veer from that practice. In this rule, FRA specifies a quality control process that is consistent with good practice in modern manufacturing. FRA proposed a 99% upper confidence limit for determining that new locomotives are being produced in accordance with the following characteristics: Where the mean noise level equals 85 dB and the upper limit equals 87 dB, there is a 1% chance that sample of locomotives will exceed a mean noise level of 87 dB (1 in 100 samples of appropriate size). This procedure is desirable, because it allows a quality control check on the manufacture of the locomotives with regard to the rule without imposing undue expense on the manufacturer. There would surely be undue expense on the manufacturer if the manufacturer had to test all locomotives.

Second, Wilson, Ihrig, & Associates wrote that the design requirement of 85 dB(A) with an upper 99% confidence limit of 87 dB(A) should be a minimum requirement. They assert that locomotives that have been tested to lower levels should be required to maintain those lower levels. They further explained that locomotives with isolated cabs are well known to achieve noise levels well below 85 dB(A), and they believe those locomotives should be required to maintain that lower level. The RSAC Working Group has recommended, and the FRA has agreed, to leave this provision as proposed. FRA and the Working Group is satisfied with the previous consensus that was achieved and do not see any reason at this point to revise this provision.

Section 229.121(a)(1) also includes requirements for a build provision. 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.

Section 229.121(a)(2) discusses the issue of alterations on locomotives 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 82 dB(A) to 85 dB(A), inclusive, 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). 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. Please note that FRA has re-formatted this section slightly since the proposed rule and after the post-NPRM RSAC Working Group meeting. The changes are intended to better clarify this provision and do not change the substance of this section.

For purposes of the maintenance conducted pursuant to § 229.121(a), replacement in kind is not considered to be 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.

In developing this provision, the RSAC Working Group 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). An alteration could not increase the noise level by more than 3 dB and where the noise level was 83 dB(A), an alteration could not increase the noise level by more than 2 dB. If the noise level was 84 dB(A), an alteration could not increase the noise level by more than 1 dB. In all cases, the maximum permissible noise level

would be 85 dB(A). Certain railroad representatives of the Working Group opposed 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.

The AAR was not pleased with this maintenance provision for newly-built locomotives and suggested that FRA instead set the maintenance limit at the same level as the level for new equipment level, 85 dB(A). The AAR believes that 82 dB(A) is "an artificial number that is not grounded in hearing science" and that ignores other potentially important realities. As example, they explained that if there was a new technology that permitted increased safety to occupants or increased fuel efficiency but resulted in sound levels about 82 dB(A), railroads could buy this new technology on newly-built equipment but could not modify existing newly-built equipment to include it. The AAR stated that their experience has shown that "reducing sound levels cannot be permitted to drive design changes focused on a single issue (in this case, noise) at the expense of reliability and other safety issues."

The AAR, an active participant in the RSAC Working Group throughout the entire process for this rulemaking, was present during the post-NPRM Working Group meeting. The AAR reiterated the point above, stating that they believe 85 dB(A) is a "safe level" from a noise perspective, and so they believe it should be the standard for the design and the maintenance of locomotives. Other Working Group members expressed serious reservations about that change, explaining that this proposed rule was a compromise document, of which the 85 dB(A) provision represented a great deal of compromise. The Working Group had initially considered, among other things, setting the noise level for newly built locomotives at 75 dB(A), but had lowered that level as a result of concerns of Working Group members. To attempt to change the terms now would veer from the spirit of the compromise and from what the RSAC Working Group had decided was the most appropriate level. Given that background and given the fact that there was no new information upon which to act, the Working Group decided to leave this level as proposed.

Section 229.121(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 paragraph (a)(1) and may conduct static testing to determine compliance with paragraph (a)(2) if they find it is needed. FRA did not receive any comments on this provision and therefore it remains as proposed in the NPRM.

(b) Maintenance of Locomotives

Section 229.121(b) governs the noise-related maintenance requirements for locomotives. Please note that FRA has made some minor editorial changes in this section since the proposed rule and after the post-NPRM RSAC Working Group meeting. These changes are meant to clarify the language in the rule. They are minor in nature and do not change any of the substantive provisions.

Upon receiving an excessive noise report pursuant to § 229.121(b)(1), 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 loose handholds that are hitting the car body. For all other items, the railroad can allow the locomotive to operate until that locomotive's next 92-day periodic inspection (as per § 229.23). At that time, the railroad must 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 will be held to the standard of a reasonably prudent and competent mechanical employee. When the railroad can identify that item, FRA expects that the railroad will repair and/or replace that item. FRA understands that there might be situations in which 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 are discussed further in § 229.121(b)(4)).

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.

A few commenters suggested that FRA should require railroads to perform regular, routine maintenance on locomotives (such as adding window seals or installing minor installation) as a means of noise control. One locomotive engineer wrote that he believes that maintenance would greatly reduce the noise levels in locomotive cabs. Another engineer wrote that he believes that interior noise, such as "worn bearing in the refrigerator" is the most harmful to one's ears, followed by "'undercarriage squeaks'" at certain speeds and over certain bumps in the track." The RSAC Working Group, along with the FRA, considered this recommendation, but decided to leave the language as proposed. The Working Group put a great deal of time and thought into developing these maintenance standards. Without any new information upon which to act, the FRA and RSAC Working Group do not think it is appropriate to revise this provision.

Section 229.121(b)(2) identifies specific conditions which might lead a locomotive cab occupant to file an excessive noise report. This list is not meant to be exhaustive; other items not on this list may also lead an employee to file an excessive noise report. These listed maintenance items, along with the design and build requirements in § 229.121(a), FRA believes, embody the concept of OSHA's engineering controls. Whereas OSHA imposes a general requirement 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 RSAC Working Group.⁷¹ 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 the list of 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. One of FRA's existing regulations, § 229.7, addresses 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.

While some of the other listed items might appear duplicative of other regulatory provisions, 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, and insulation—are not currently covered in this context in any of FRA's existing regulations.

Section 229.121(b)(3) prescribes the railroad response to an excessive noise report. The rule provides that a railroad has an obligation to respond to an excessive noise report that a locomotive

⁷¹ See § III(C) for a discussion of the engineering controls task force.

cab occupant files with the railroad. This sentence, which was not contained in the RSAC's recommendation for the NPRM, makes explicit a railroad's obligation to make an appropriate response to cab occupant noise concerns. FRA added this sentence as a result of OSHA's review of the NPRM. The rest of this section was part of the consensus document from the RSAC.

The rule also provides that a railroad meets its obligation to appropriately 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 items causing the noise.

Section 229.121(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.

Section 229.121(b)(4) contains the recordkeeping requirements for this section. The basic requirement is located in § 229.121(b)(4)(i). Railroads shall maintain a record of any excessive noise report, inspection, test, maintenance, replacement, or repair that occurred pursuant to § 229.121(b)(1). In that record, the railroad shall include the date on which the employee filed the excessive noise report; and the date on which the railroad conducted the inspection, test, maintenance, replacement, and/or repair. The railroad shall note any attempts to identify conditions and any attempts to correct conditions. The railroad may maintain these records in written or electronic form. If a railroad elects to maintain the records electronically, the railroad must satisfy the conditions listed in § 227.121(a)(2)(i) through (v). These conditions are almost identical to the electronic recordkeeping requirements found in FRA's existing track safety standards, § 213.241(e). These conditions are intended to safeguard the

integrity and authenticity of each record.

Pursuant to § 229.121(b)(4)(ii), railroads shall retain these records for 92 days if they are made pursuant to § 229.21; or for one year if they are made pursuant to § 229.23. During RSAC Working Group 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 Working Group discussed this two-year retention option and instead decided to recommend the 92 day/1 year retention proposal. FRA adopted the RSAC Working Group'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 locomotive inspection regulations at § 229.21 ("Daily Inspection") and § 229.23 ("Periodic inspection: General").

There were commenters on both sides of the issue regarding the record retention period. Wilson, Ihrig, & Associates wrote that the proposed retention periods were too short and that FRA should require railroads to keep these records for the life of the locomotive. With those records, railroads could then follow a trail of noise problems and identify locomotives with chronic noise problems. Wilson et al pointed out that proposed retention period is particularly inadequate given current computer technology.

During RSAC Working Group discussions, some members noted that they do retain repair records for extended periods of times. However, Working Group members felt that they did not want to require railroads to keep records for extended periods of times. Because they believe it makes the most sense to treat repairs items related to noise the same as other related items in part 229, the RSAC Working Group, and FRA, decided to leave this requirement as proposed.

On the other side of the issue, LIRR asserted that the retention requirement was too long and that it would result in an administrative burden and significant cost for their commuter railroad. In addition, LIRR asserted that the re-creation of potential noise reports of crews might be impossible during static testing, thereby resulting in an additional maintenance burden. For example, the crew scenario might include an Automatic Speed Control warning sound while the whistle is blowing, the bell is ringing, and the engine is in high throttle position, but

that would not necessarily be replicable during static testing.

The RSAC Working Group, with FRA, again concluded that it is best to retain the proposed language. Railroad interests are represented on the RSAC by several railroad representatives, who had agreed to this position. Moreover, this recordkeeping requirement is consistent with existing requirements under §§ 229.21 and 229.23. Presumably, railroads have a framework in place for maintaining records for this time frame and so railroads should easily be able to add these excessive noise reports to that framework. Finally, FRA notes that there is no static testing requirement associated with the requirements in § 229.121(b). The static testing requirements apply to § 229.121(a).

Section 229.121(b)(4)(iii) requires railroads to establish an internal, auditable monitorable 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 § 227.121(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 § 227.121(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.

Appendix B to Part 229

FRA has amended the existing schedule of civil penalties in Appendix B to Part 229 and listed the penalties that FRA will use in connection with § 229.121.

Appendices F–G to Part 229

Appendices F through G are being reserved for future use.

Appendix H to Part 229

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 § 229.121(a). In formulating this protocol, FRA looked to several sources, including the procedures used by General Electric and General Motors' Electric Motor Division, other regulations concerning railroad noise measurement,⁷² and various measurement manuals and technical reports on transportation noise measurement and analysis.⁷³

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. With the exception of changing the measurement metric, FRA did not make any changes to this appendix between the proposed rule and final rule.

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.

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.⁷⁴

⁷² 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."

⁷³ 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).

⁷⁴ 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

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. 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 the testing entity should use when conducting measurements. This testing entity shall use an integrating sound level meter (iSLM) that meets the requirements of ANSI S1.43-1997 (Reaffirmed 2002), "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 (Reaffirmed 2001), "Specification for Acoustical Calibrators." The testing entity should

SLM should be used with a 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 (Reaffirmed 2002), "Specifications for Integrating-Averaging Sound Level Meters."

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 Working Group suggested the removal of these specific requirements. As one RSAC Working Group 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.⁷⁵ At the request of an RSAC Working Group member, FRA removed these citations. The RSAC Working Group member had explained that ISO and IEC standards were unnecessary and that the ANSI standards were sufficient.

FRA sought comment from the public on whether FRA should include ANSI standards only or whether FRA should also include reference to these ISO and/or IEC standards. The AAR submitted comments, reiterating its support for using ANSI standards only. ASHA and AIHA also noted its approval of using ANSI standards only. Given that response, FRA decided not to add cites to the additional standards. In this final rule, FRA has cited only to ANSI 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

⁷⁵ 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).

instruments, because they are more precise instruments and because they are used by other U.S. DOT modes.⁷⁶ Some RSAC Working Group 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.⁷⁷ After extensive discussions, the Working Group agreed to the proposal in its current state. The RSAC Working Group 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.

FRA had considered more specific requirements for numbers 1 and 2. FRA considered an initial draft listed types of large reflective surfaces from which the test site should be free (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 Working Group 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 drafted this provision with this current language.

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 meters (iSLM). FRA has made a change to this provision since the NPRM. FRA changed the metric here and in two other locations (§§ III(8) and (9)). In the proposed rule, FRA used L_{av} . L_{av} is a non-ANSI metric that was developed for this regulation in order to accommodate certain RSAC Working Group members' desire to use a 5 dB exchange rate for this measurement. In this final rule, FRA is using the $L_{Aeq, T}$. $L_{Aeq, T}$ is a standardized metric defined in ANSI S1.1-1994, “Acoustical Terminology” and is a commonly used acoustic metric.

One commenter explained that the L_{av} was an inappropriate measure. He stated that most sound level meters do not have the capability to measure the L_{av} ; they instead measure the $L_{Aeq, T}$. Under the requirement in the proposed rule, railroads would have had to purchase completely new equipment, which would be very costly. Another commenter wrote that use of the L_{av} was not justified technically, since the acoustical community would normally use $L_{Aeq, T}$. FRA, and the Working Group, agreed with these commenters and changed Appendix H accordingly.

Numbers 2 and 3 address 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.

⁷⁶ 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.

⁷⁷ See e.g., 49 CFR 393.94(c)(4); 40 CFR 201.22(a); and 49 CFR 229.129(b).

Number 4 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 Working Group 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 did not include those two measurement positions.

Number 5 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 6 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 while under self-load. 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.

After considering the RSAC Working Group recommendation, FRA decided to use a three decibel adjustment. However, FRA 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 § IV, number 5).

Number 7 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 8 specifies the metric, sampling rate, and measurement duration for in-cab static measurements. FRA has changed the metric from L_{av} to $L_{Aeq, T}$, as discussed in § III(1) above. $L_{Aeq, T}$ 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.

For this rulemaking, the following equation should be used to calculate $L_{Aeq, T}$.

$$L_{Aeq, T} = 10 \times \log_{10} \left\{ \frac{1}{T} \sum_{i=1}^N t_i \times 10^{L_i/10} \right\}$$

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.: = $t_1 + t_2 + * * * + t_N$),
 and
 L_i = the A-weighted sound level of the I-th interval.

$L_{Aeq, T}$ should be measured, either directly or by using a one second sampling interval, for a minimum duration of 30 seconds ($L_{Aeq, 30s}$). 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.

The $L_{Aeq, T}$ equation obtained from the relevant ANSI standard (ANSI S1.1–1994, “Acoustical Terminology”) is a calculus equation while the $L_{Aeq, T}$ equation used in FRA’s rule is a non-calculus equation. The two equations are equivalent, as described below.

The $L_{Aeq, T}$ equation from the relevant ANSI standard is as follows:

$$L_{Aeq, T} = 10 \times \log_{10} \left\{ \frac{1}{T} \sum_{i=1}^N t_i \times \frac{p_{A_i}^2}{p_o^2} \right\}$$

Where:

T = the total time duration of the measurement;
 $p_A(t)$ = instantaneous, A-weighted sound pressure as a function of time (t); and
 p_o = the reference pressure.

This equation deals with a continuous sound pressure as a function of time ($p_A(t)$), and the integral of that continuous sound pressure over the measurement interval divided by the duration represents an average of that sound pressure. When looking at discretely sampled sound pressure data, this average may be represented by a sum of the discrete samples divided by the measurement duration. See below.

$$L_{Aeq, T} = 10 \times \log_{10} \left\{ \frac{1}{T} \int_0^T \frac{p_A^2(t)}{p_o^2} dt \right\}$$

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.: = $t_1 + t_2 + * * * + t_N$);
 p_{A_i} = the A-weighted sound pressure of the I-th interval.

Sound pressure level is related to sound pressure by the following equation:

$$\frac{p_{A_i}^2}{p_o^2} = 10^{L_i/10}$$

Where: L_i = the A-weighted sound level of the I-th interval.

The combination of the two above equations produces the equation for calculating $L_{Aeq, T}$ presented in this rulemaking.

Number 9 specifies the standard for determining compliance with 49 CFR 229.121(a). It provides that the highest (i.e., loudest) measurement of the four $L_{Aeq, 30s}$ 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 $L_{Aeq, 30s}$ standard' has the advantage of requiring little processing. In addition, locomotive manufacturers currently use the 'highest $L_{Aeq, 30s}$ standard.' Please note that, as discussed in § III(1) above, FRA has changed the metric from L_{av} to $L_{Aeq, T}$.

While drafting the NPRM, FRA had 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. Accordingly, FRA chose not to energy-average across the four positions.

Number 10 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 Working Group 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 Working Group 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 Working Group 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 § IV, number 7).

IV. Recordkeeping

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 § 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 Working Group 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 Working Group 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 Working Group 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 Working Group 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 effected 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 Working Group's recommendation.

VI. 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 significant under both Executive Order 12866 and DOT policies and procedures (44 FR 11034; February 26, 1979). FRA has prepared and placed in the docket a regulatory analysis addressing the economic impact of this final rule. For access to the docket to read the regulatory analysis, 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 am and 5

pm, Monday through Friday, except Federal holidays.

As part of the regulatory impact analysis, FRA has assessed quantitative measurements of costs expected from the adoption of this final 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 for this final 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 final rule.

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

The major benefit anticipated from implementing this final 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; 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 a review of proposed and final rules to assess their impact on small entities. FRA has prepared and placed in the docket a Regulatory Flexibility Assessment (RFA) which assesses the small entity impact. For access to the docket to read the RFA, 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 am and 5 pm, Monday through Friday, except Federal holidays.

Executive Order No. 13272, "Proper Consideration of Small Entities in Agency Rulemaking," requires a Federal agency, *inter alia*, to notify the Chief Counsel for Advocacy of the U.S. Small Business Administration (SBA) of any of its draft rules that would have a significant economic impact on a substantial number of small entities, 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 including such material would not serve the public interest. See 67 FR 53461 (August 16, 2002).

The SBA stipulates in its Table of Size Standards⁷⁸ that the largest a "for-profit" railroad business firm can 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." "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 in consultation with the SBA and in conjunction with public comment. Pursuant to that authority, FRA has published a final policy which formally establishes "small entities" as being railroads which meet the line haulage revenue requirements of a Class III railroad. See 68 FR 24891 (May 9, 2003). Currently, the revenue requirements are \$20 million or less in annual operating revenue. The \$20 million limit is based on the Surface Transportation Board's (STB's) threshold of a Class III railroad carrier, which is adjusted by applying the railroad revenue deflator adjustment.⁷⁹ The same dollar limit on revenues is established to determine whether a railroad shipper or contractor is a small entity. However, in this rule, FRA is using a different size standard. Consistent with FRA's proposal in the NPRM, FRA is defining small entities as those having "less than 400,000 annual employee hours." FRA has used this standard in the past⁸⁰ to alleviate reporting requirements. By using this standard for small railroads, FRA is capturing most small entities that would be defined by the SBA as small businesses. Since FRA published this alternate standard in the NPRM, FRA has sought and received written permission from the SBA to use the alternative size standard for purposes of this rulemaking. FRA did not receive any comments during the public comments related to this issue or request.

For this rulemaking there are approximately 410 small railroads that could potentially be affected by this

⁷⁸ 13 CFR part 121.

⁷⁹ For further information on the calculation of the specific dollar limit please see 49 CFR Part 1201.

⁸⁰ See 49 CFR parts 217, 219, and 220.

regulation.⁸¹ FRA does not expect this regulation to impose a significant burden on these small railroads. Tourist, Steam and Historic operations are not required to meet any of the requirements. Thus, approximately 220 very small railroad operations will incur no burden from this rulemaking.

This final rule will also 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. Most of these type of contractors are very small businesses operated by self-employed current, former, or retired railroad employees. These operations would certainly be classified as a small business. FRA does not know how many of these types of operations could potentially be affected by this final rule. Since this regulation is not extending coverage to these operations, none of them would be impacted.

FRA's final 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 data⁸² 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 final rule contains a few reporting and recordkeeping requirements. The requirements that do exist primarily involve records that are needed for medical purposes, compliance assessment, and program evaluation.

The impacts from this final rule are primarily a result of complying with the requirements for establishing hearing conservation programs and the elements

of these programs. In general, the costs are proportional to the number of employees that would be affected on a railroad. Thus, the impacts on small entities should be relatively less than they would be for medium and large railroads. However, most large and some medium railroads currently have voluntary and/or OSHA hearing conservation programs, which would simplify and ease compliance with this final rule. FRA anticipates that the burdens would be from developing hearing conservation programs, conducting noise monitoring, providing hearing protectors, and locomotive noise maintenance related to responding excessive noise reports.

The two requirements that have the greatest impact are the audiometric testing requirement and the training requirement. The purpose of FRA's audiometric testing program section is to provide 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. 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 requires railroads to conduct periodic audiometric testing of covered employees at least once every three years. FRA requires that audiograms be offered annually to all covered employees.

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 anticipates that the short line railroad association will develop a generic program for training that its members can utilize.

For compliance purposes, this final rule provides an exception for Tourist, Steam and Historic railroad operations. In addition, railroads with less than

400,000 annual 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 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 12 months to establish hearing conservation training programs. The rulemaking process for this final rule included outreach to small entities. The proposal for the NPRM and this final rule was produced by the RSAC. Representation on this committee included the ASLRRRA.

This final Regulatory Flexibility Assessment (RFA) concludes that the rule would not have a significant economic impact on a substantial number of small entities. Thus, the FRA certifies that this final rule is not expected to have an "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 RFA, FRA reviewed and considered all pertinent comments from all interested parties concerning the potential economic impact on small entities.

As noted above Executive Order No. 13272 requires Federal agencies to notify the 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 final rule would not have significant impact on a substantial number of small entities, FRA has not provided any notification to the SBA.

C. Paperwork Reduction Act of 1995

The information collection requirements in this final rule will be submitted 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 CFR	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	\$190
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	17,214

⁸¹ 680 railroads – 220 (Tourist, Steam & Historic) railroads – 50 (large, medium, passenger and commuter) = 410 railroads.

⁸² See FRA's Regulatory Impact Analysis, Appendix C.

CFR Section—49 CFR	Respondent universe	Total annual responses	Average time per response	Total annual burden hours	Total annual burden cost
227.107—Hearing Conservation Program (HCP).	460 Railroads	461 HCPs	150 hours/2 hours/31 hours/7.5 hours.	2,875	0 (incl. in RIA).
—Revised Hearing Conservation Programs (HCPs).	460 Railroads	92 HCPs	1.74 hours	160	0 (incl. in RIA).
227.109—Audiometric Testing Prog.—Existing Employees; Baseline Audiograms.	78,000 Employees	60,000 audiograms + 6,000 audiograms.	7 min./25 min	7,000 + 2,500	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	2,330 evaluations + 93 retests	6 min./2.5 hours	466	0 (incl. in RIA).
—Problem Audiograms	8,000 Employees	45 documents	10 minutes	8	304.
—Follow-up Procedures—Notifications.	8,000 Employees	93 notifications	15 minutes	24	912.
—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	76.
—New Audiometric Interpretation.	240 Employees	20 notifications	20 notifications	2	76.
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/1 hour.	956	0 (incl. in RIA).
—Employee Training	460 Railroads	26,000 trained employees	30 minutes	13,000	0 (incl. in RIA).
—Periodic Training	460 Railroads	7,000 tr. empl	30 minutes	3,500	0 (incl. in RIA).
227.121—Record Keeping—Authorization: Records.	460 Railroads	10 requests + 10 responses	10 min. + 15 min	5	130.
—Requests for Copies of Reports.	460 Railroads	150 requests + 150 responses	21 min. + 45 min	166	0 (incl. in RIA).
—Records Transfer When Carrier Becomes Defunct.	460 Railroads	10 records	24 minutes	4	152.
—Railroad Audiometric Test Records.	460 Railroads	26,000 records	2 minutes	867	0 (incl. in RIA).
—Hearing Conservation Program (HCP) Records.	460 Railroads	54,000 records	45 seconds	675	0 (incl. in RIA).
—HCP Training Records of Employees.	460 Railroads	26,000 records	30 seconds	217	8,246.
—Records: Standard Threshold Shifts of Employees.	460 Railroads	280 records	7 minutes	33	0 (incl. in RIA).
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. + 5 min	750	22,500.
—Maintenance Records	460 Railroads	3,750 records	8 minutes	500	0 (incl. in RIA).
—Internal Auditable Monitoring Systems.	570 Railroads	570 systems	36 min. + 8.25 hour	572	0 (incl. in RIA).
Appendix H—Static Test Protocols/Records.	700 Locomotives	2 retests + 2	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. For information or a copy of the paperwork package submitted to OMB, contact Mr. Robert Brogan, FRA's Information Clearance Officer, at 202-493-6292.

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**.

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 this final rule. The OMB control number, when assigned, will be announced by separate notice in the **Federal Register**.

D. Federalism Implications

Executive Order 13132, "Federalism" (64 FR 43255, Aug. 10, 1999), requires FRA to develop an accountable process to ensure "meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications." "Policies that have federalism implications" are defined in the Executive Order to include regulations that have "substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and

responsibilities among the various levels of government." Under Executive Order 13132, the agency may not issue a regulation with Federalism implications that imposes substantial direct compliance costs and that is not required by statute, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by State and local governments, the agency consults with State and local governments, or the agency consults with State and local government officials early in the process of developing the proposed regulation. Where a regulation has Federalism implications and preempts State law, the agency seeks to consult with State and local officials in the process of developing the regulation.

This is a rule with preemptive effect. Subject to a limited exception for

essentially local safety hazards, its requirements will establish a uniform Federal safety standard that must be met, and State requirements covering the same subject are displaced, whether those standards are in the form of State statutes, regulations, local ordinances, or other forms of State law, including State common law. Preemption is addressed in § 227.7 “Preemptive effect,” as it was in the NPRM. As stated in the corresponding preamble language for § 227.7, 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. This is consistent with past practice at FRA, and within the Department of Transportation.

FRA has analyzed this final rule in accordance with the principles and criteria contained in Executive Order 13132. The RSAC, which recommended the final 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.

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 final 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 final rule will not result in the expenditure, in the aggregate, of \$128,100,000 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 final rule is not likely to have a significant adverse effect on the supply, distribution, or use of energy. Consequently, FRA has determined that this final 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

Incorporation by reference, Locomotives, Noise Control, Occupational Safety and Health, Penalties, Railroad safety, Reporting and recordkeeping requirements.

49 CFR Part 229

Incorporation by reference, Locomotives, Penalties, Railroad safety, Reporting and recordkeeping requirements.

The Rule

■ For the reasons discussed in the preamble, the Federal Railroad Administration amends chapter II, subtitle B of Title 49, Code of Federal Regulations, as follows:

■ 1. Part 227 is added to read as follows:

PART 227—OCCUPATIONAL NOISE EXPOSURE

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 and applicability.
- 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 Baseline Revision
- Appendix D to Part 227—Audiometric Test Rooms
- Appendix E to Part 227—Use of Insert Earphones for Audiometric Testing
- Appendix F to Part 227—Calculations and Application of Age Corrections to Audiograms
- Appendix G to Part 227—Schedule of Civil Penalties

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 noise standards for locomotive cab occupants. 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 and contractors to 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 rapid transit operation in an urban area that is connected to the general system and operates under a shared use waiver;

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

(5) Foreign railroad operations that meet the following conditions: Employees of the foreign railroad have a primary reporting point outside of the U.S. but are operating trains or conducting switching operations in the U.S.; and 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. A "foreign railroad" refers to a railroad that is incorporated in a place outside the U.S. 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 140 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.

Audiogram means a record of audiometric testing, showing the thresholds of hearing sensitivity measured at discrete frequencies, as well as other recordkeeping information.

Audiologist means a professional, who provides comprehensive diagnostic and treatment/rehabilitative services for auditory, vestibular, and related impairments and who

(1) Has a Master's degree or doctoral degree in audiology and

(2) Is licensed as an audiologist by a State; or in the case of an individual who furnishes services in a State which does not license audiologists, has successfully completed 350 clock hours of supervised clinical practicum (or is in the process of accumulating such supervised clinical experience), performed not less than 9 months of supervised full-time audiology services after obtaining a master's or doctoral degree in audiology or a related field, and successfully completed a national examination in audiology approved by the Secretary of the U.S. Department of Health and Human Services.

Audiometry means the act or process of measuring hearing sensitivity at discrete frequencies. Audiometry can also be referred to as audiometric testing.

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, covering the ear canal or inserted 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 record of follow-up audiometric testing conducted at regular intervals after the baseline audiometric test.

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.

Professional Supervisor of the Audiometric Monitoring Program in a hearing conservation program means an audiologist, otolaryngologist, or a physician with experience and expertise in hearing and hearing loss.

Qualified Technician is a person who is certified by the Council for Accreditation in Occupational Hearing Conservation or equivalent organization; or who has satisfactorily demonstrated competence in administering audiometric examinations, obtaining valid audiograms, and properly using, maintaining, and checking calibration and proper functioning of the audiometers used; and is responsible to the Professional Supervisor of the Audiometric Testing Program.

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 regulation, SLOW time response, in accordance with ANSI S1.43-1997 (Reaffirmed 2002), "Specifications for Integrating-Averaging Sound Level Meters," is required. The Director of the Federal Register approves this incorporation by reference of this standard in this section in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. You may obtain a copy of the incorporated standard from the American National Standards Institute at 1819 L Street, NW., Washington, DC 20036 or <http://www.ansi.org>. You may inspect a copy of the incorporated standard at the Federal Railroad Administration, Docket Room, 1120 Vermont Ave., NW., Suite 700, Washington, DC 20005, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.

Standard threshold shift (STS) 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 these regulations 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 \$550 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 \$27,000 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 part 211 of this chapter.

(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 and applicability.

(a) This subpart shall apply to the noise-related 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, subject to a railroad's election in paragraph (a)(3) of this section, does not apply to:

(i) Employees who move locomotives only within the confines of locomotive repair or servicing areas, as provided in §§ 218.5 and 218.29(a) of this chapter, 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 located at 29 CFR 1910.95.

§ 227.103 Noise monitoring program.

(a) *Schedule.* A 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), in accordance with the following schedule:

(1) Class 1, passenger, and commuter railroads no later than February 26, 2008.

(2) Railroads with 400,000 or more annual employee hours that are not Class 1, passenger, or commuter railroads no later than August 26, 2008.

(3) Railroads with fewer than 400,000 annual employee hours no later than August 26, 2009.

(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 140 decibels shall be integrated into the noise measurements.

(2) Noise measurements shall be made under typical operating conditions using:

(i) A sound level meter conforming, at a minimum, to the requirements of ANSI S1.4–1983 (Reaffirmed 2001) (incorporated by reference, see § 227.103(h)), Type 2, and set to an A-weighted SLOW response;

(ii) An integrated sound level meter conforming, at a minimum, to the requirements of ANSI S1.43–1997 (Reaffirmed 2002) (incorporated by reference, see § 227.103(h)), Type 2, and set to an A-weighted slow response; or

(iii) A noise dosimeter conforming, at a minimum, to the requirements of ANSI S1.25–1991 (Reaffirmed 2002) (incorporated by reference, see

§ 227.103(h)) 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 § 227.103.

(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.

(h) *Incorporation by reference.* The materials listed in this section are incorporated by reference in the corresponding sections noted. These incorporations by reference were approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. You may obtain a copy of the incorporated materials from the American National Standards Institute at 1819 L Street, NW., Washington, DC 20036 or <http://www.ansi.org>. You may inspect a copy of the incorporated standards at the Federal Railroad Administration, Docket Room, 1120 Vermont Ave., NW., Suite 700, Washington, DC 20005, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202–741–6030, or go to http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.

(1) ANSI S1.4–1983 (Reaffirmed 2001), Specification for Sound Level

Meters, incorporation by reference (IBR) approved for § 227.103(c)(2)(i).

(2) ANSI S1.43–1997 (Reaffirmed 2002), Specifications for Integrating-Averaging Sound Level Meters, IBR approved for § 227.103(c)(2)(ii).

(3) ANSI S1.25–1991 (Reaffirmed 2002), Specification for Personal Noise Dosimeters, IBR approved for § 227.103(c)(2)(iii).

§ 227.105 Protection of employees.

(a) A railroad shall provide appropriate protection for its employees who are exposed to noise, as measured according to § 227.103, that exceeds the limits specified in appendix A of this part.

(b) In assessing whether exposures exceed 115 dB(A), as set forth in paragraph (a) of this section and appendix A to this part, the apparent source of the noise exposures shall be observed and documented 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 120 dB(A) are permissible, provided that the total daily duration does not exceed 5 seconds.

§ 227.107 Hearing conservation program.

(a) Consistent with the requirements of the noise monitoring program required by § 227.103, the railroad shall administer a continuing, effective hearing conservation program, as set forth in §§ 227.109 through 227.121, for all employees exposed to noise at or above the action level.

(b) For purposes of the hearing conservation program, employee noise exposure shall be computed in accordance with the tables in appendix A of this part, and without regard to any attenuation provided by the use of hearing protectors.

§ 227.109 Audiometric testing program.

(a) Each railroad shall establish and maintain an audiometric testing program as set forth in this section and include 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) An audiologist, otolaryngologist, or other physician who has experience and expertise in hearing and hearing loss; or

(2) A qualified technician.

(d) [Reserved]

(e) *Baseline audiogram.* This paragraph (e) applies to employees who

are required by § 227.107 to be included in a hearing conservation program.

(1) *New employees.*

(i) Except as provided in paragraph (e)(1)(ii), for employees hired after February 26, 2007, the railroad shall establish a valid baseline audiogram within 6 months of the new employee's first tour of duty.

(ii) Where mobile test vans are used to meet the requirement in paragraph (e)(1)(i), the railroad shall establish a valid baseline audiogram within one year of the new employee's first tour of duty.

(2) *Existing employees.*

(i) For all employees without a baseline audiogram as of February 26, 2007, Class 1, passenger, and commuter railroads, and railroads with 400,000 or more annual employee hours shall establish a valid baseline audiogram by February 26, 2009; and railroads with less than 400,000 annual employee hours shall establish a valid baseline audiogram by February 26, 2010.

(ii) If an employee has had a baseline audiogram as of February 26, 2007, 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 February 26, 2007, 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 (5), the railroad may elect to use that baseline audiogram provided that the Professional Supervisor of the Audiometric Monitoring Program makes a reasonable determination that the baseline audiogram is valid and is clinically consistent with 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 action level. Hearing protectors may be used as a substitute for the requirement that baseline audiograms be preceded by 14 hours without exposure to occupational 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) The railroad shall offer an audiometric test to each employee included in the hearing conservation program at least once each calendar year. The interval between the date offered to any employee for a test in a

calendar year and the date offered in the subsequent calendar year shall be no more than 450 days and no less than 280 days.

(2) The railroad shall require each employee included in the hearing conservation program to take an audiometric test at least once every 1095 days.

(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 qualified 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 review:

(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 dB, 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 railroad shall use the following methods for revising baseline audiograms:

(1) Periodic audiograms from audiometric tests conducted through February 26, 2009, may be substituted for the baseline measurement by the Professional Supervisor of the Audiometric Monitoring Program who is evaluating the audiogram if:

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

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

(2) Baseline audiograms from audiometric tests conducted after February 26, 2009, shall be revised in accordance with the method specified in appendix C of this part: Audiometric Baseline Revision.

(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, 6000, and 8000 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 S3.6-2004 "Specification for Audiometers." The Director of the Federal Register approves the

incorporation by reference of this standard in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. You may obtain a copy of the incorporated standard from the American National Standards Institute at 1819 L Street, NW., Washington, DC 20036 or <http://www.ansi.org>. You may inspect a copy of the incorporated standard at the Federal Railroad Administration, Docket Room, 1120 Vermont Ave., NW., Suite 700, Washington, DC 20005, or at the National Archives and Records Administration (NARA). For more information on the availability of this material at NARA, call 202-741-6030, or go to http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.

(1) Pulsed-tone audiometers should be used with the following on and off times: F–J and J–K shall each have values of 225 ± 35 milliseconds (ms).

(2) Use of insert earphones shall be consistent with the requirements listed in appendix E of this part: Use of Insert Earphones for Audiometric Testing.

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

(d) *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 according to the procedures described in ANSI S3.6–2004. Frequencies below 500 Hz and above 8000 Hz may be omitted from this check. The audiometer must meet the sound pressure accuracy requirements of section 7.2 of ANSI S3.6–2004 of 3 dB at any test frequency between 500 and 5000 Hz and 5 dB at any test frequency 6000 Hz and higher for the specific type of transducer used. For air-conduction supra-aural earphones, the specifications in Table 6 of ANSI S3.6–2004 shall apply. For air-conduction insert earphones, the specifications in Table 7 of ANSI S3.6–2004 shall apply. Audiometers that do not meet these requirements must undergo an exhaustive calibration.

(3) Exhaustive Calibration. An exhaustive calibration shall be performed in accordance with ANSI S3.6–2004, according to the following schedule:

(i) At least once every two years on audiometers not used in mobile test vans. Test frequencies below 500 Hz and above 6000 Hz may be omitted from this calibration.

(ii) At least annually on audiometers used in mobile test vans.

§ 227.113 Noise operational controls.

(a) Railroads may use noise operational controls at any sound level to reduce exposures to levels below those required by Table A–1 of appendix A of this part.

(b) Railroads are encouraged to use noise operational controls when employees are exposed to sound exceeding an 8-hour TWA of 90 dB(A).

§ 227.115 Hearing protectors.

(a) *General requirements for hearing protectors.*

(1) The railroad shall provide hearing protectors to employees at no cost to the employee.

(2) The railroad shall replace hearing protectors as necessary.

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

(4) 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.

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

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

(b) *Availability of hearing protectors.* A railroad shall make hearing protectors available to all employees exposed to sound levels that meet or exceed the action level.

(c) *Required use at action level.* A railroad shall require the use of hearing protectors when an employee is exposed to sound levels that meet or exceed the action level, and the employee has:

(1) Not yet had a baseline audiogram established pursuant to § 227.109; or

(2) Experienced a standard threshold shift and is required to use hearing protectors under § 227.109(h).

(d) *Required use for TWA of 90 dB(A).* The railroad shall require the use of hearing protectors when an employee is exposed to sound levels equivalent to an 8-hour TWA of 90 dB(A) or greater. The hearing protectors should be used to reduce sound levels to within those levels required by appendix A of this part.

§ 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 Protector Attenuation."

(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 to each employee included in the hearing conservation program at least once each calendar year. The interval between the date offered to any employee for the training in a calendar year and the date offered in the subsequent calendar year shall be no more than 450 days and no less than 280 days.

(2) The railroad shall require each employee included in the hearing conservation program to complete the training at least once every 1095 days.

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

(1) For employees hired after February 26, 2007, within six months of the employee's first tour of duty in a position identified within the scope of this part.

(2) For employees hired on or before February 26, 2007, by Class 1, passenger, and commuter railroads, and railroads with 400,000 or more annual employee hours, by no later than February 26, 2009;

(3) For employees hired on or before February 26, 2007, by railroads with fewer than 400,000 annual employee hours, by no later than February 26, 2010.

(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 § 229.121(b); and
- (11) How to file an excessive noise report, pursuant to § 229.121(b).

§ 227.121 Recordkeeping.

- (a) *General requirements.*
- (1) *Availability of records.* Each railroad required to maintain and retain records under this part shall:
- (i) Make all records available for inspection and copying/photocopying to representatives of the FRA, upon request;
 - (ii) Make an employee's records available for inspection and copying/photocopying to that employee, former employee, or such person's representative upon written authorization by such employee;
 - (iii) Make exposure measurement records for a given run or yard available for inspection and copying/photocopying to all employees who were present in the locomotive cab during the given run and/or who work in the same yard; and
 - (iv) Make exposure measurement records for specific locations available to regional or national labor representatives, upon request. These reports shall 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 by the railroad. A railroad may maintain and transfer records through electronic transmission, storage, and retrieval provided that:

- (i) The electronic system be designed so that the integrity of each record is maintained through appropriate levels of security such as recognition of an electronic signature, or other means, which uniquely identify the initiating person as the author of that record. No two persons shall have the same electronic identity;
- (ii) The electronic system shall ensure that each record cannot be modified in any way, or replaced, once the record is transmitted and stored;
- (iii) Any amendment to a record shall be electronically stored apart from the record which it amends. Each amendment to a record shall be uniquely identified as to the person making the amendment;
- (iv) The electronic system shall provide for the maintenance of records as originally submitted without corruption or loss of data; and
- (v) Paper copies of electronic records and amendments to those records, that may be necessary to document compliance with this part shall be made available for inspection and copying/photocopying by representatives of the FRA.

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

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

- (1) Maintain an accurate record of all employee exposure measurements required by § 227.103; and
 - (2) Retain these records for the duration of the covered employee's employment plus thirty years.
- (c) *Audiometric test records.* 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;
 - (vi) The model and serial number of the audiometer used for testing; and

(2) Retain the records required by § 227.107 for the duration of the covered employee's employment plus thirty years.

(d) *Positions and persons designated records.* 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; and
 - (2) Retain these records for the duration of the designation.
- (e) *Training program materials records.* The railroad shall:
- (1) Maintain copies of all training program materials used to comply with § 227.119(c) and a record of employees trained; and
 - (2) Retain these copies and 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; and
- (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

A. Noise dose is computed using Table A-1 as follows:

1. When the sound level, L, is constant over the entire work day, 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 duration permitted corresponding to the measured sound level, L, as given in Table A-1.

2. When the work day 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_n indicates the total time of exposure at a specific noise level, and T_n indicates the duration permitted for that level as given by Table A-1.

B. The eight-hour TWA in dB 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 work day with the noise level constant over the entire day, the TWA is equal to the measured sound level.

C. Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.

D. Any time that an employee spends deadheading shall be included in the calculation of the noise dose.

E. A table relating dose and TWA is given in Section II of this Appendix.

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

where L is the measured A-weighted sound level.

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

A. Compliance with subpart B of part 227 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 TWA."

B. In order to convert the reading of a dosimeter into TWA, see Table A-2, below. 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.

C. 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: $TWA = 16.61 \log_{10} (D/100) + 90$ where TWA = 8-hour time-weighted average sound level and D = accumulated dose in percent exposure.

TABLE A-1¹

A-weighted sound level, L (decibel)	Duration permitted 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
140	0.078

¹ Numbers above 115 dB(A) are italicized to indicate that they are noise levels that are not permitted. The italicized numbers are included only because they are sometimes necessary for the computation of noise dose.

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

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
99	89.9
100	90.0
101	90.1
102	90.1
103	90.2
104	90.3
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

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
490	101.5
500	101.6
510	101.8
520	101.9
530	102.0
540	102.2
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

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

This appendix is mandatory.

Employers must select one of the following three methods by which to estimate the adequacy of hearing protector attenuation.

I. Derate by Type

Derate the hearing protector attenuation by type using the following requirements:

A. Subtract 7 dB from the published Noise Reduction Rating (NRR).

B. Reduce the resulting amount by:

1. 20% for earmuffs,
2. 40% for form-able earplugs, or
3. 60% for all other earplugs.

C. Subtract the remaining amount from the A-weighted TWA. You will have the estimated A-weighted TWA for that hearing protector.

II. Method B From ANSI S12.6-1997 (Reaffirmed 2002)

Use Method B, which is found in ANSI S12.6-1997 (Reaffirmed 2002) “Methods for Measuring the Real-Ear Attenuation of Hearing Protectors.” The Director of the Federal Register approves the incorporation by reference of this standard in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. You may obtain a copy of the incorporated standard from the American National Standards Institute at 1819 L Street, NW., Washington, DC 20036, or <http://www.ansi.org>. You may inspect a copy of the incorporated standard at the Federal Railroad Administration, Docket Room, 1120 Vermont Ave., Suite 700, Washington, DC 20005, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.

III. Objective Measurement

Use actual measurements of the level of noise exposure (as an A-weighted SLOW response dose) inside the hearing protector when the employee wears the hearing protector in the actual work environment.

Appendix C to Part 227—Audiometric Baseline Revision

This appendix is mandatory beginning on February 26, 2009.

I. General

A. A professional reviewer (audiologist, otolaryngologist, or physician) shall use these procedures when revising baseline audiograms.

B. Although these procedures can be programmed by a computer to identify records for potential revision, the final decision for revision rests with a human being. Because the goal of the guidelines is to foster consistency among different professional reviewers, human override of the guidelines must be justified by specific concrete reasons.

C. These procedures do not apply to: The identification of standard threshold shifts (STS) other than an FRA STS¹ or to the calculation of the 25-dB average shifts that are reportable on the Form FRA F 6180.55a.

D. Initially, the baseline is the latest audiogram obtained before entry into the hearing conservation program. If no appropriate pre-entry audiogram exists, the baseline is the first audiogram obtained after entry into the hearing conservation program. Each subsequent audiogram is reviewed to

¹ OSHA and FRA use the same definition for Standard Threshold Shift (STS). FRA’s definition is located in § 227.5. OSHA’s definition is located in 29 CFR 1910.95(g)(10)(i).

detect improvement in the average (average of thresholds at 2, 3, and 4 kHz) and to detect an FRA STS. The two ears are examined separately and independently for improvement and for worsening. If one ear meets the criteria for revision of baseline, then the baseline is revised for that ear only. Therefore, if the two ears show different hearing trends, the baseline for the left ear may be from one test date, while the baseline for the right ear may be from a different test date.

E. Age corrections do not apply in considering revisions for improvement (Rule 1). The FRA-allowed age corrections from appendix F of Part 227² may be used, if desired, before considering revision for persistent STS. Rule 2 operates in the same way, whether age corrections are used or not.

II. Rule 1: Revision for Persistent Improvement

If the average of the thresholds for 2, 3, and 4 kHz for either ear shows an improvement of 5 dB or more from the baseline value, and the improvement is present on one test and persistent on the next test, then the record should be identified for review by the audiologist, otolaryngologist, or physician for potential revision of the baseline for persistent improvement. The baseline for that ear should be revised to the test which shows the lower (more sensitive) value for the average of thresholds at 2, 3, and 4 kHz unless the audiologist, otolaryngologist, or physician determines and documents specific reasons for not revising. If the values of the three-frequency average are identical for the two tests, then the earlier test becomes the revised baseline.

III. Rule 2: Revision for Persistent Standard Threshold Shift

A. If the average of thresholds for 2, 3, and 4 kHz for either ear shows a worsening of 10 dB or more from the baseline value, and the STS persists on the next periodic test (or the next test given at least 6 months later), then the record should be identified for review by the audiologist, otolaryngologist, or physician for potential revision of the baseline for persistent worsening. Unless the audiologist, otolaryngologist, or physician determines and documents specific reasons for not revising, the baseline for that ear should be revised to the test which shows the lower (more sensitive) value for the average of thresholds at 2, 3, and 4 kHz. If both tests show the same numerical value for the average of 2, 3, and 4 kHz, then the audiologist, otolaryngologist, or physician should revise the baseline to the earlier of the two tests, unless the later test shows better (more sensitive) thresholds for other test frequencies.

B. Following an STS, a retest within 90 days of the periodic test may be substituted for the periodic test if the retest shows better (more sensitive) results for the average threshold at 2, 3, and 4 kHz.

C. If the retest is used in place of the periodic test, then the periodic test is retained in the record, but it is marked in

² FRA and OSHA use the same age-correction provisions. FRA’s is found in appendix F of part 227 and OSHA’s in appendix F of 29 CFR 1910.95.

such a way that it is no longer considered in baseline revision evaluations. If a retest within 90 days of periodic test confirms an FRA STS shown on the periodic test, the baseline will not be revised at that point because the required six-month interval between tests showing STS persistence has not been met. The purpose of the six-month requirement is to prevent premature baseline revision when STS is the result of temporary medical conditions affecting hearing.

D. Although a special retest after six months could be given, if desired, to assess whether the STS is persistent, in most cases, the next annual audiogram would be used to evaluate persistence of the STS.

Appendix D to Part 227—Audiometric Test Rooms

This appendix is mandatory.

A. Rooms used for audiometric testing shall not have background sound pressure levels exceeding those in Table D-1 when measured by equipment conforming at least to the Type 2 requirements of ANSI S1.4-1983 (Reaffirmed 2001) and to the Class 2 requirements of ANSI S1.11-2004, “Specification for Octave-Band and Fractional-Octave-Band Analog and Digital Filters.”

B. The Director of the Federal Register approves the incorporation by reference of ANSI S1.4-1983 (Reaffirmed 2001) and

S.1.11-2004 in this section in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. You may obtain a copy of the incorporated standard from the American National Standards Institute at 1819 L Street, NW., Washington, DC 20036 or <http://www.ansi.org>. You may inspect a copy of the incorporated standard at the Federal Railroad Administration, Docket Room, 1120 Vermont Ave., NW., Suite 700, Washington, DC 20005, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.

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 levels—supra-aural earphones	40	40	47	57	62
Sound pressure levels—insert earphones	50	47	49	50	56

Appendix E to Part 227—Use of Insert Earphones for Audiometric Testing

This appendix is mandatory.

Section 227.111(d) allows railroads to use insert earphones for audiometric testing. Railroads are not required to use insert earphones, however, where they elect to use insert earphones, they must comply with the requirements of this appendix.

I. Acceptable Fit

A. The audiologist, otolaryngologist, or other physician responsible for conducting the audiometric testing, shall identify ear canals that prevent achievement of an acceptable fit with insert earphones, or shall assure that any technician under his/her authority who conducts audiometric testing with insert earphones has the ability to identify such ear canals.

B. Technicians who conduct audiometric tests must be trained to insert the earphones correctly into the ear canals of test subjects and to recognize conditions where ear canal size prevents achievement of an acceptable insertion depth (fit).

C. Insert earphones shall not be used for audiometric testing of employees with ear canal sizes that prevent achievement of an acceptable insertion depth (fit).

II. Proper Use

The manufacturer’s guidelines for proper use of insert earphones must be followed.

III. Audiometer Calibration

A. Audiometers used with insert earphones must be calibrated in accordance with ANSI S3.6-2004, “Specification for Audiometers.” The Director of the Federal Register approves the incorporation by reference of this standard in this section in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. You may obtain a copy of the incorporated standard from the American National Standards Institute at 1819 L Street, NW., Washington, DC 20036 or <http://www.ansi.org>. You may inspect a copy of the incorporated standard at the Federal Railroad Administration,

Docket Room, 1120 Vermont Ave., NW., Suite 700, Washington, DC 20005, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.

B. Audiometers used with insert earphones must be calibrated using one of the couplers listed in Table 7 of ANSI S3.6-2004.

C. The acoustical calibration shall be conducted annually.

D. The functional calibration must be conducted before each day’s use of the audiometer.

IV. Background Noise Levels

Testing shall be conducted in a room where the background ambient noise octave-band sound pressures levels meet appendix D to this part.

V. Conversion From Supra Aural Earphones

At the time of conversion from supra-aural to insert earphones, testing must be performed with both types of earphones.

A. The test subject must have a quiet period of at least 14 hours before testing. Hearing protectors may be used as a substitute for the quiet period.

B. The supra-aural earphone audiogram shall be compared to the baseline audiogram, or the revised baseline audiogram if appropriate, to check for a Standard Threshold Shift (STS). In accordance with § 227.109(f)(2), if the audiogram shows an STS, retesting with supra-aural earphones must be performed within 90 days. If the resulting audiogram confirms the STS, then it is adopted as the current test instead of the prior one.

C. If retesting with supra-aural earphones is performed, then retesting with insert earphones must be performed at that time to establish the baseline for future audiometric tests using the insert earphones.

VI. Revised Baseline Audiograms

A. If an STS is confirmed by the re-test with supra-aural earphones, the audiogram may become the revised baseline audiogram per the requirements of § 227.109(i) for all future hearing tests with supra-aural earphones. The insert-earphone audiogram will become the new reference baseline audiogram for all future hearing tests performed with insert earphones.

B. If an STS is not indicated by the test with supra-aural earphones, the baseline audiogram remains the reference baseline audiogram for all future supra-aural earphone tests, until such time as an STS is observed. In this case, the insert-earphone audiogram taken at the same time will become the new reference baseline audiogram for all future hearing tests performed with insert earphones.

C. Transitioning Employees with Partial Shifts. Employers must account for the workers who are in the process of developing an STS (e.g., demonstrate a 7 dB average shift), but who at the time of the conversion to insert earphones do not have a 10 dB average shift. Employers who want to use insert earphones must enter the 7 dB shift information in the employee’s audiometric test records although it is not an “STS”. When the next annual audiogram using insert earphones shows an average threshold shift at 2000, 3000 and 4000 Hz of 3 dB, completing the full shift (7 dB + 3 dB), employers must then label that average shift as an STS. This triggers the follow-up procedures at § 227.109(h).

VII. Records

All audiograms (including both those produced through the use of insert earphones and supra-aural headsets), calculations, pure-tone individual and average threshold shifts, full STS migrations, and audiometric acoustical calibration records, are to be preserved as records and maintained according to § 227.121(c).

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 below. 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 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

a. 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.

b. (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:

c. 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

d. 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

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

Years	Audiometric test frequencies (Hz)				
	1000	2000	3000	4000	6000
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
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

TABLE F-2.—AGE CORRECTION VALUES IN DECIBELS FOR FEMALES—Continued

Years	Audiometric test frequencies (Hz)				
	1000	2000	3000	4000	6000
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—Schedule of Civil Penalties

Section	Violation	Willful violation
Subpart A—General		
227.3 Application:		
(b)(4) Failure to meet the required conditions for foreign railroad operations	\$2,500	\$5,000
Subpart B—General Requirements		
227.103 Noise monitoring program:		
(a) Failure to develop and/or implement a noise monitoring program	7,500	10,000
(b) Failure to use sampling as required	2,500	5,000
(c) Failure to integrate sound levels and/or make noise measurements as required	2,500	5,000
(d) Failure to repeat noise monitoring where required	2,500	5,000
(e) Failure to consider work environments where hearing protectors may be omitted	2,500	5,000
(f) Failure to provide opportunity to observe monitoring	2,000	4,000
(g) Reporting of Monitoring Results:		
(1) Failure to notify monitored employee	2,500	5,000
(2) Failure to post results as required	2,500	5,000
227.105 Protection of employees:		
(a) Failure to provide appropriate protection to exposed employee	7,500	10,000
(b) Failure to observe and document source(s) of noise exposures	2,500	5,000
(c)–(d) Failure to protect employee from impermissible continuous noise	5,000	7,500
227.107 Hearing conservation program:		
(a) Failure to administer a HCP	7,500	10,000
(b) Failure to compute noise exposure as required	3,500	7,000
227.109 Audiometric testing program:		
(a) Failure to establish and/or maintain an audiometric testing program	7,500	10,000
(b) Failure to provide audiometric test at no cost to employee	2,500	5,000
(c) Failure to have qualified person perform audiometric test	2,500	5,000
(d) [Reserved]		
(e) Failure to establish baseline audiogram as required	3,500	7,000
(f) Failure to offer and/or require periodic audiograms as required	2,500	5,000
(g) Failure to evaluate audiogram as required	2,500	5,000
(h) Failure to comply with follow-up procedures as required	2,500	5,000
(i) Failure to use required method for revising baseline audiograms	2,500	5,000
227.111 Audiometric test requirements:		
(a) Failure to conduct test as required	2,500	5,000
(b) Failure to use required equipment	2,500	5,000
(c) Failure to administer test in room that meets requirements	2,500	5,000
(d) Complete failure to calibrate	5,000	7,500
(1) Failure to perform daily calibration as required	2,000	4,000
(2) Failure to perform annual calibration as required	2,000	4,000
(3) Failure to perform exhaustive calibration as required	2,000	4,000
227.115 Hearing protectors (HP):		
(a) Failure to comply with general requirements	3,000	6,000
(b) Failure to make HP available as required	2,500	5,000
(c) Failure to require use of HP at action level	5,000	7,500
(d) Failure to require use of HP at TWA of 90 dB(A)	5,000	7,500
227.117 Hearing protector attenuation:		
(a) Failure to evaluate attenuation as required	2,500	5,000
(b)–(c) Failure to attenuate to required level	2,500	5,000
(d) Failure to re-evaluate attenuation	2,500	5,000
227.119 Training program:		
(a) Failure to institute a training program as required	5,000	7,500
(b) Failure to provide training within required time frame	2,500	5,000
(c) Failure of program and/or training materials to include required information	2,500	5,000
227.121 Recordkeeping:		
(a) General Requirements:		
(1) Failure to make record available as required	2,500	5,000

Section	Violation	Willful violation
(3) Failure to transfer or retain records as required	2,000	4,000
(b)-(f) Records:		
(1) Failure to maintain record or failure to maintain record with required information	2,000	4,000
(2) Failure to retain records for required time period	2,000	4,000

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 adding, in alphabetical order, the following definitions.

§ 229.5 Definitions.

* * * * *

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

* * * * *

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

* * * * *

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 October 29, 2007, 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:

(i) 82 dB(A) if the average sound level for a locomotive design or model is less than 82 dB(A); or

(ii) 85 dB(A) if the average sound level for a locomotive design or model is 82 dB(A) to 85 dB(A), inclusive,

(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) *Maintenance of Locomotives.*

(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 part 229, the railroad shall maintain a record of the report, and repair or replace the item identified as substantially contributing to the noise:

(i) on or before the next periodic inspection required by § 229.23; or

(ii) if the railroad determines that the repair or replacement of the item requires significant shop or material resources that are not readily available, at the time of the next major equipment

repair commonly used for the particular type of maintenance needed.

(2) Conditions 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) A railroad has an obligation to respond to an excessive noise report that a locomotive cab occupant files. The railroad meets its obligation to respond to an excessive noise report, as set forth in paragraph (b)(1) of this section, 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 items cause the noise.

(4) *Recordkeeping.*

(i) A railroad shall maintain a written or electronic record of any excessive noise report, inspection, test, maintenance, replacement, or repair completed pursuant to § 229.121(b) and the date on which that inspection, test, maintenance, replacement, or repair occurred. If a railroad elects to maintain an electronic record, the railroad must satisfy the conditions listed in § 227.121(a)(2)(i) through (v).

(ii) The railroad shall retain these records for 92 days if they are made pursuant to § 229.21, or for one year if they are made pursuant to § 229.23.

(iii) The railroad shall establish an internal, auditable, monitorable system that contains these records.

■ 6. Appendix B to part 229 is amended by revising the entry related to § 229.121 to read as follows:

Appendix B to Part 229—Schedule of Civil Penalties

* * * * *

Section	Violation	Willful violation
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* * * * *
 229.121 Locomotive Cab Noise:
 (a) Performance Standards

Section	Violation	Willful violation
(1) Failure to meet sound level	5,000	7,500
(2) Improper maintenance alterations	2,500	5,000
(3) Failure to comply with static test protocols	2,500	5,000
(b) Maintenance of Locomotives		
(1) Failure to maintain excessive noise report record or respond to report as required	2,500	5,000
(3) Failure to make good faith effort as required	2,500	5,000
(4) Failure to maintain record as required	2,000	4,000
* * * * *		

- * * * * *
- 7. Appendices F and G are added to part 229 and reserved.
- 8. 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 (Reaffirmed 2002), "Specifications 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 (Reaffirmed 2001), "Specification for Acoustical Calibrators." The Director of the Federal Register approves the incorporation by reference of ANSI S1.43-1997 (Reaffirmed 2002) and ANSI S1.40-1984 (Reaffirmed 2001) in this section in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. You may obtain a copy of the

incorporated standards from the American National Standards Institute at 1819 L Street, NW., Washington, DC 20036 or <http://www.ansi.org>. You may inspect a copy of the incorporated standards at the Federal Railroad Administration, Docket Room, 1120 Vermont Ave., NW., Suite 700, Washington, DC 20005, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html

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) $L_{Aeq, T}$ is defined as the A-weighted, equivalent sound level for a duration of T seconds, 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.

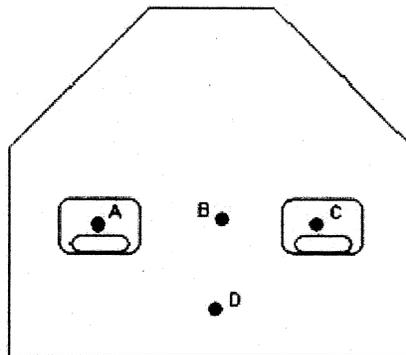


Figure 1. Microphone Locations inside Typical Locomotive Cab

(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, $L_{Aeq, T}$ shall be measured, either directly or using a 1 second sampling interval, for a minimum duration of 30 seconds at each measurement position ($L_{Aeq, 30s}$).

(9) The highest $L_{Aeq, 30s}$ 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 regulation 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 § III(9) of this appendix, the suspected reason(s) for the failure.

Issued in Washington, DC, on September 29, 2006.

Joseph H. Boardman,

Federal Railroad Administrator.

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