NOISE WORKSHOP
History and Use of EPA's Hearing Protector Labeling Regulation

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I. INTRODUCTION

I thought I would begin by telling you that I am a former employee of EPA's Office of Noise Abatement, then OSHA's Office of Health Standards, then NIOSH's Physical Agents Effects Branch (now the Engineering and Physical Hazards Branch), so you can see that I'm well traveled in the federal bureaucracy. I have a sense of history about these matters, and I also know about the long and arduous nature of the rulemaking process. But I have also worked in the private sector for many years, and I believe that I can approach this subject with some degree of objectivity.

EPA's labeling rule for hearing protectors was published in 1975, and since that time, most manufacturer's in the U.S. have used the (Noise Reduction Rating) NRR to label their hearing protection products. The NRR received added emphasis when OSHA promulgated the amendment to its noise regulation in 1981. Hearing protector manufacturers, as well as employers, and hearing conservation professionals in the U.S. have become quite accustomed to the NRR, for better or worse, over the two and one-half decades since that time. Despite our somewhat insular mentality, interested individuals in the U.S. are aware that the NRR is not the only method for rating hearing protectors. There are other methods used elsewhere in the world. I will just mention these methods now, although they will get more attention later in the workshop.

Who Uses What:

- **Europe** **SNR (Single Number Rating)**
  HML (High, Middle, Low)
- **Canada and Australia use a Class System**
- **U.S.A.** **NRR**

II. HOW THE NRR'S USE CAUSES PROBLEMS

At this point I thought I would jump right in with a discussion of how the NRR's use causes problems.

How the NRR's Use Causes Problems

- **Bigger is Better Mentality**
- **NRR is Gospel**
- **Failure to Match the NRR to TWA**
- **NRR Overestimates attenuation**
- **Discourages Tailoring to Individual Needs**

In the preparing for this talk I called several of my colleagues in the hearing conservation field to find out about their experience with employers and their representatives, including those who actually order hearing protectors. It became clear that most of the people in the field who use and order these devices have little understanding of the NRR. To those who order them, the "bigger is better" mentality prevails, causing people to make selection decisions on the basis of differences as small as 1 dB, whereas issues of comfort, compatibility with safety equipment, and ease of use are so much more important. Most people treat the NRR as gospel, believing that it tells the truth about what will happen to anyone who wears it, and if it isn't high, it isn't good. As one colleague said, it's a "very tight mindset." In addition, people don't really match the NRR with the worker's attenuation needs, they don't follow OSHA's mandatory requirements in Appendix B of the revised (1983) version of the hearing conservation amendment, and some of them are under the impression that the hearing protector is supposed to block out all sound, so they are surprised when the wearer can hear anything.

One of the most common problems is that workers move around so much during the day that it is difficult to assess the amount of attenuation that is needed. In fact, my colleagues report that most employers don't even know what the worker's time-weighted average exposure level (TWA) is. Moreover, the TWA doesn't always give a good estimate of the worker's attenuation needs, especially in intermittent and varying noise environments, because workers can be seriously overprotected at times if employers and supervisors make hearing protection mandatory throughout the exposure period.

There are several reasons why a more realistic descriptor of attenuation is needed. First, if people are going to treat the labeled value as gospel, it ought to bear some resemblance to reality, and I don't think many of you would dispute the fact that the present NRR bears little resemblance to what most workers achieve in real-world use. It gives both management and workers a false sense of security. Here, wear this and you'll be OK. If the loudest noise you're exposed to is 110 dBA and the NRR is 29, you're fine. And if the level during the majority of the day is around 95 dBA, you're in quietland. Even if the employer were to take the instructions seriously and subtract the NRR from the C-weighted noise level in the worker's environment, it still would yield a gross overestimate of the worker's protected level in most cases.

In addition, the NRR discourages those who fit and select hearing protectors from tailoring the protector to the individual's attenuation needs because the spread of attenuation

values, especially among muffs, is relatively small. Of course the "bigger is better" attitude discourages it even more.

III. MODIFICATIONS TO THE NRR

At this point I'd like to discuss some attempts to modify the current NRR resulting from some of the problems I've just mentioned.

Modifications to the NRR

- **OSHA's Compliance Policy**
  Derating by 50 % when assessing the relative effectiveness of hearing protectors and engineering controls

  OSHA Technical Manual mentions NRR(SF)for informational purposes

- **NIOSH Criteria Document Recommendation**

Earmuffs	**NRR minus 25%**
Form Earplugs	**NRR minus 50%**
All Other Earplugs	**NRR minus 70%**

- **Some Employers**

In 1973, OSHA issued a compliance policy that is still in effect today. OSHA inspectors are not to cite a company for failing to use feasible engineering or administrative controls between TWAs of 90 and 100 dBA unless the company does not have "an effective hearing conservation program." Although OSHA has never given an explanation of exactly what constitutes an effective hearing conservation program, the Agency has instructed inspectors to derate the hearing protector's expected attenuation by 50 % when assessing the relative effectiveness of hearing protectors and engineering controls. Interestingly, the OSHA Technical Manual does mention the deliberations a National Hearing Conservation Association (NHCA) Task Force (to be discussed shortly), the publication of the revised ANSI standard, ANSI S12.6-1997 and its new Method B option, and the existence of the NRR(subject fit) (NRR(SF)) as a new development. But the Agency mentions these developments for informational purposes only. If an employer were to use the NRR(SF) instead of the current NRR, he or she might be subject to a *de minimis* violation of the noise standard, a highly unlikely scenario, but nevertheless, a possibility.

On the basis of the many studies of real-world attenuation values, NIOSH has suggested different amounts of derating for three types of hearing protectors: subtracting 25% from the labeled NRR of earmuffs, 50% from the labeled NRR of foam earplugs, and 70% from the NRR of all other earplugs.

For both the OSHA and NIOSH. methods, the user is expected to subtract the NRR from the C-weighted TWA in the worker's environment, or lacking that, to use the 7-dB adjustment (meaning subtraction) to the NRR required by Appendix B of the OSHA regulation before subtracting the NRR from the worker's A-weighted TWA.

As I mentioned earlier, most employers select their hearing protectors either by subtracting the NRR from some estimate of the worker's TWA, or just pick protectors with large NRRs and hope for the best. However, some large companies have a policy similar to OSHA's, where they use the NRR minus 7 dB, divided by 2. One large employer which has used this method is the 3M Company.

IV. HISTORY OF EPA'S LABELING REGULATION

Now I would like to delve into some hearing protector history.

A. The Noise Control Act:

Noise Control Act of 1972

Congress declares that it is the policy of the United States "to promote an environment for all Americans free from noise that jeopardizes their health or welfare. To that end, it is the purpose of the Act to establish a means for effective coordination of Federal research and activities in noise control, to authorize the establishment of Federal noise emission standards for products distributed in commerce, and to provide information to the public respecting the noise emission and noise reduction characteristics of such products."

EPA's Office of Noise Abatement and Control was given the responsibility of implementing the requirements of the Noise Control Act, which it did with some degree of vigor, between 1973 and 1982. Despite the fact that the program was shut down by the Administration in 1982, Congress has never repealed the Noise Control Act. Theoretically, the Act's mandates have not changed, although the program remains largely unfunded.

Noise Control Act - Section 8

Gives EPA the Responsibility to Regulate the Labeling of:
Products Emitting Noise
Products Reducing Noise

(a) The EPA Administrator must designate any product or class of products which:

1. Emits noise capable of adversely affecting the public health or welfare, or
2. Is sold wholly or in part on the basis of its effectiveness in reducing noise.

(b) For each product or class of products EPA shall require that notice be given to the prospective user of the level of noise the product emits, or of its effectiveness in reducing noise. The regulation must specify:

1. Whether such notice shall be affixed to the product or to the outside of its container (or both), at the time of its sale to the ultimate purchaser, or whether such notice shall be given to the prospective user in some other manner,
2. The form of the notice,
3. The methods and units of measurement to be used.

B. Rationale for Labeling Hearing Protectors:

Rationale for Labeling Hearing Protectors

- **Section 6 of the Noise Control Act mandates regulations for major sources of noise**
- **Too many noisy new products would take too long to regulate**
- **Technical and economic feasibility problems**
- **Need to protect against noise of in-use products**

According to EPA's *Background Document for the Labeling of Hearing Protectors*, the best way to control noise is at its source. Section 6 of the Noise Control Act directed EPA to issue regulations for maximum levels of noise emitted by new products. But the Agency recognized that it would be many years before the EPA could regulate all the major sources of noise. Also, the document acknowledged that it was not technically and economically feasible to control all sources to the level needed to prevent adverse effects of noise. In addition, most of the EPA's noise regulations applied only to new products, so the public needed protection against the noise of in-use products. Therefore, providing information regarding the performance of hearing protection devices would assist individuals with an immediate, potentially effective, and relatively easy and inexpensive method of protection against hazardous noise levels.

C. Background Leading up to the Regulation:

Background Leading up to the Regulation

- **ANSI Z24.22-1957**
- **ANSI S3.19-1974**

- **NIOSH Methods #1, #2, and #3**
  Subtracting 2 SDs "should rarely overestimate the degree of protection"

There had been considerable consensus activity in the field before EPA embarked on its regulatory process. ANSI Z24.22, "American Standard Method for the Measurement of the Real-Ear Attenuation of Ear Protectors at Threshold" had been published in 1957, which was revised to become ANSI S3.19-1974, "American National Standard Method for the Measurement of Real-Ear Protection of Hearing Protectors and Physical Attenuation of Earmuffs." The revised standard included a physical method for measuring the attenuation of earmuff devices and also the substitution of narrow bands of noise instead of pure tones in the psychoacoustical measurement of hearing protector attenuation. According to EPA, the new standard was not popular because the results generally showed less attenuation than the tests according to the older standard. Also, there was a common perception that the ANSI standard was too complex and there was a need for simplicity. It was difficult for many people to relate octave-band data to the commonly used A-weighted sound level descriptor. This perception led to the development of proposed single-number rating techniques.

There are always tradeoffs, however, between simplicity and precision. One is the dependence of hearing protector performance on the spectrum of the noise environment. The other is the natural variation among individual responses expressed as the standard deviation.

In 1975, NIOSH put forward three proposed single-number ratings. Methods #1, 2, and 3, are listed in decreasing order of precision and increasing order of simplicity. The less precise methods include adjustments to guard against overestimating the noise reduction factor. In general, the methods with greater the precision, show greater noise reduction factors, but they are more complicated to use. Method #1, the "long method," requires octave band noise levels as well as A-weighted sound levels. Method #2, originally developed by James Botsford, uses a standard "pink noise" and requires taking the difference between A-weighted and C-weighted noise levels. It incorporates an adjustment of 3 dB to account for spectral uncertainty. Method #3 is the simplest, where all that is needed is the A-weighted noise level, but it incorporates an additional adjustment of 8.5 dB to account for spectral uncertainty.

All three methods use a 2-standard-deviation (SD) adjustment to the mean attenuation value to account for individual variability. According to the NIOSH report, subtracting 2 SDs "should rarely overestimate the degree of protection."

D. <u>EPA Issues its Labeling Regulation:</u>

EPA issued a proposed labeling rule in June of 1977 and held public hearings later that year. According to the preamble of the final rule, which was promulgated in 1979, a large majority of the public comments received by EPA were in favor of the proposed labeling program.

Most of these comments came from citizens, whereas most of the industry commentors disagreed with various aspects of the program. While EPA modified or clarified some aspects of the proposal, the final rule was promulgated in 1979 with no major changes.

Subpart A of the 1979 rule deals mainly with general provisions for labeling of all noise emitting and noise reducing products, including the label content, format, type, and location, as well as administrative requirements, such as inspection and monitoring, and conditions for exemptions. Subpart B applies specifically to hearing protection devices. No doubt everyone here is thoroughly familiar with its provisions, so I won't reiterate them now, except to list the major requirements:

EPA-1979 Hearing Protector Labeling Requirements - Subpart B

- **211.204 Information content of primary label**
  Includes requirements for primary label size, print and color, label location and type, and supporting information.
- **211.205 Special claims and exceptions**
- **211.206 Methods for measurement of sound attenuation**
  Specifies real ear method in ANSI S3.19-1974 (as modified in this section)
- **211.207 Computation of the noise reduction rating (NRR)**
- **211.208 Export provisions**
- **211.209 Maintenance of records and submittal of information**
- **211.210 Labeling verification requirements**
- **211.211 Compliance with labeling requirements**
- **211.212 Compliance audit testing**
- **Etc.**

As mentioned previously, EPA's Office of Noise Abatement and Control was closed in 1982. Most of the product noise regulations that EPA had promulgated were revoked, including the product verification testing and reporting and recordkeeping requirements of the Hearing Protector Labeling regulation, but the remainder of the regulation is still in effect.

V. POST-EPA EVENTS

A. OSHA's Hearing Conservation Amendment

OSHA's Hearing Conservation Amendment

- **Appendix G (1981) now Appendix B (1983)**

  Use NRR

Or NIOSH #1, #2, or #3

- **Using the NRR to estimate the A-weighted level under the ear protector:**
  C-weighted TWA - NRR
  A-weighted TWA - (NRR-7)

The NRR got another boost when OSHA issued its hearing conservation amendment to its noise regulation in 1981. Appendix G of the amendment (which is Appendix B in the revised version) is entitled "Methods for Estimating the Adequacy of Hearing Protector Attenuation." It gives employers a choice between using the NRR or any one of the three NIOSH methods mentioned previously. OSHA recommends the NRR, which the agency describes as a simplification of NIOSH Method #2, as the most convenient method, and it is doubtful that virtually any employers have chosen to use the alternative methods. To estimate the employee's A-weighted exposure level beneath the ear protector, the NRR is to be subtracted from the employee's C-weighted TWA. In the absence of C-weighted measurements, the NRR is to be subtracted from the A-weighted TWA after subtracting a 7-dB penalty from the NRR.

As I stated earlier, OSHA has an enforcement policy that allows hearing protectors in lieu of engineering controls under certain conditions, in which case the employer must derate the protector by 50 %. The derating is done after subtracting the 7-dB correction (when dBA is used instead of dBC), in effect, derating the correction factor as well. However, if the correction factor were subtracted after the derating, the resulting "NRR" would be even smaller, which could lead to overkill. Dealing with the 7-dB correction factor either way is less than satisfactory.

B. Field Studies of Hearing Protector Attenuation

From the mid 1970s through the 1990s, investigators performed numerous studies of the attenuation workers received as they wore hearing protectors on the job. The data derived from these investigations threw cold water on NIOSH's optimistic statement that a rating using a 2-SD adjustment "should rarely overestimate the degree of protection." Field attenuation proved to be about ⅓ to ½ of that realized in the laboratory, even in companies with fairly decent hearing conservation programs.

[Figure 1 here]

Figure 1 shows a comparison of labeled NRRs published in North America to real-world attenuation results derived from 22 separate studies. This graph is from Elliott Berger's chapter on hearing protection in the 5th edition of the AIHA noise manual.

You can see that the disparity between laboratory NRRs and the field "NRRs" is huge, despite the fact that the field data bars reflect the mean minus one standard deviation rather than two standard deviations, as in the conventional method. It looks as though we could use a method that more closely reflects the real-world picture, such as a rating method derived from the new ANSI standard's Method B. While the current NRR is arrived at by treating subjects as "test

fixtures," the Method B procedure calls for subjects who are naive with respect to the use and testing of hearing protectors and are told to fit the device as best they can by using the same instructions that would be available to them in the field.

Another reason why we need a more realistic measure of attenuation is that the NRR is not even very good for rank-ordering the attenuation capabilities of hearing protectors. The next slide shows how the revised ANSI standard's Method B rank-orders a series of protectors in a manner quite similar to the field studies, even though they still overestimate the field data somewhat. Keep in mind that the labeled NRRs are computed with a 2-SD correction, while the field and Method B data are computed with a 1-SD correction. This graph is from a paper by Berger and Kieper presented at the 2000 meeting of the Acoustical Society of America.

[Figure 2 here]

C. ISEA Meeting in April 1993

Individuals representing industry, government, and professional organizations expressed concern about the status and implementation of the EPA labeling regulation. Consequently, the Industrial Safety Equipment Association (ISEA) called a meeting of interested parties in April of 1993. This meeting stimulated action on the part of several organizations to form a Task Force on Hearing Protector Effectiveness.

VI. FORMATION OF THE NATIONAL HEARING CONSERVATION ASSOCIATION (NHCA) TASK FORCE

The Task Force met under the auspices of the National Hearing Conservation Association and was chaired by Larry Royster. Initially, there were 15 organizations represented on the Task Force plus four ANSI working groups. Table I gives the names of these groups and the individuals representing them.

[Table 1 here]

AAOHN - American Assoc. of Occup. Health Nurses
AAO-HNS - American Acad. of Otolaryngology-Head and Neck Surgery
ACOEM - American College of Occupational and Environmental Medicine
AIHA - American Industrial Hygiene Assoc.
ASA - Acoustical Society of America
ASHA - American Speech-Language-Hearing Assoc.
CAOHC - Council for Accreditation in Occupational Hearing Conservation

ISEA - Industrial Safety Equipment Assoc.
NHCA - National Hearing Conservation Assoc.
NSC - National Safety Council
EPA - U.S. Environmental Protection Agency
MAA - Military Audiology Assoc.
MSHA - Mine Safety and Health Admin.
NIOSH - National Inst. for Occupational Safety and Health
OSHA - Occupational Safety and Health Admin.
WG10- Hearing Protector Attenuation
WG11- Field Effectiveness of Hearing Protectors
WG12- Evaluation of Hearing Conservation Programs
WG35- Evaluation of Communication Ability in Noise for Individ. with Hearing Protectors

It is important to note that some of the members were participating informally and not as official representatives of their organizations. Consensus was achieved among the members with only 2 negative votes, and NHCA petitioned EPA recommending changes in the hearing protector labeling rule. NHCA was later joined in petitioning EPA by most of the other professional organizations from the Task Force, including the AAOHN, AAO-HNS, ACOEM, AIHA, ASA, ASHA, and CAOHC, plus 2 organizations not involved in the Task Force, the American Academy of Audiology (AAA), and the American Society of Safety Engineers (ASSE).

The principal mission of the Task Force was to develop:

Guidelines for labeling hearing protection devices
Recommendations for educational materials that should be provided, and
General guidelines for hearing protector selection and use

The Task Force issued the following caveat in its report: The most important recommendation is not necessarily the way hearing protection devices are tested or the value of one rating method over another, but the criteria for selecting the hearing protector, which should always include issues of comfort, compatibility with other safety equipment, and personal preference. According to Royster, "The Committee felt very strongly that no single HPD characteristic, such as the present NRR or the recommended NRR(SF) should be used in selecting the HPD to be worn by any one individual." The Task Force noted that approximately 90% of the noise-exposed population needs only 10 dB of attenuation to obtain adequate protection.

VI. RECOMMENDATIONS OF THE NHCA TASK FORCE ON HEARING PROTECTOR EFFECTIVENESS

A. Administrative Issues

Administrative Issues

- **Use Method B from ANSI 12.6-1997**
- **Test facilities meet NVLAP requirements**
- **Retesting at least every 10 years but not more often than every 5 years**

Members of the NHCA Task Force agreed that the current NRR is too high and that the number on the label should better represent hearing protector performance in the field. They favored the adoption of Method B from the draft ANSI standard that was being prepared by ANSI working group S12/WG11. The rating scheme would be the NRR (subject fit) or NRR(SF). The standard was designated then as ANSI S12.6-199x, (a bit of courage reflected in the 1990s designation, knowing how long it takes to develop or revise and ANSI standard), and the standard is now known as S12.6-1997. The Task Force also recommended that test facilities meet the requirements of the Department of Commerce's National Voluntary Laboratory Accreditation Program (NVLAP), and that retesting of hearing protector should take place at least every 10 years but not more often than every 5 years.

B. Primary Label Format

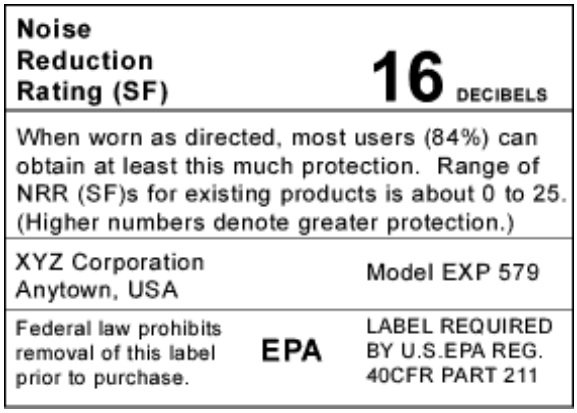

Fig. 3. Proposed Primary Label

There are several important differences between the primary label recommended by the Task Force and the current one. First, it uses the NRR(SF) instead of the NRR, and consequently incorporates a 1-SD rather than the 2-SD adjustment. Also new is the indication that real-world attenuation will vary among individuals and that approximately 84 % of the population using the the labeled NRR(SF) will achieve at least this much protection. This proposed level states the range of existing NRR(SF)s is approximately 0-25 instead of the current 0-30.

C. Secondary Label Format

The Task Force also recommended several additions and changes to the secondary label, and I will discuss these changes one section at a time:

Instructions for use (specific to each product)

[Note: This section may contain unlimited text and pictures at the discretion of the manufacturer.]

The Task Force recommended more extensive and user-friendly instructions than in the current practice.

Selecting hearing protectors

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:

1 Hearing protector's noise reduction
2 Wearer's daily equivalent noise exposure
3 Variations in noise level
4 User preference
5 Communication needs
6 Hearing ability
7 Compatibility with other safety equipment
8 Wearer's physical limitations
9 Climate and other working conditions
10 Replacement, care and use requirements

Comments about the above:

("A comfortable, noise-blocking seal" is the most critical consideration)

1. Hearing protector's noise reduction: Here, the NRR(SF) is only one of the important considerations.

2. Wearer's daily equivalent noise exposure: Again, the Task Force believed that since most workers' exposures would be 95 dBA or less, an NRR(SF) of 10 should be enough.

3. Variations in noise level are of concern. For example, in levels that fluctuate between 70 dBA and 110 dBA, some supervisors require high-attenuating protectors or even double protection to be worn throughout the exposure. The hazards and inefficiencies of this practice are obvious. There needs to be much education and improvement of public awareness on this issue. Even a well-used earmuff with an NRR(SF) of 18 would not be appropriate for much of this exposure period.

4. User preference: The hearing protector fitter should be mindful of the worker's needs in that earcanals come in different shapes and sizes and some workers may not have the finger strength to roll down a foam plug.

5. Communication needs: Again, to overprotect may be counter-productive for the sake of communication and warning signal audibility.

6. Hearing ability: Persons with hearing losses, especially noise-induced hearing losses, are at an added disadvantage when they wear hearing protection devices. Hearing protectors tend to be most efficient in attenuating the higher frequencies. Add this fact to a high-frequency hearing loss and the person is additionally "deafened." It may be especially dangerous to "require" hearing protectors with high attenuation values in situations where communication is essential. Much education is needed on this topic.

7. Compatibility with other safety equipment: The user needs to achieve a good seal without interference with other types of safety equipment, such as safety glasses or respirators.

8. Wearer's physical limitations: This could included missing arthritic fingers, among other problems.

9. Climate and other working conditions: For example, plugs tend to be preferred in areas of high humidity, plugs or small-volume muffs in confined spaces. White earplugs could be problematical for use around dairy products, and corded earplugs could become caught in machinery.

10. Replacement, care, and use requirements: These would include recommendations for regular checking and replacement programs.

Laboratory attenuation values re:ANSIS12.6-199x (subject fit) along with corresponding HML values and the NRR(SF)

Test Frequency (Hz)	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**H**	**M**	**L**	**NRR(SF)**

Mean Atten. (dB)	**17.9**	**19.0**	**21.0**	**24.7**	**29.9**	**35.6**	**34.6**	**25**	**18**	**14**	**16**
S D (dB)	**7.3**	**6.3**	**7.3**	**6.4**	**5.3**	**5.0**	**5.4**				

The Task Force adds the following notes:

1. The data in the table above are representative of a foam earplug. For 2- and 3-position devices, such as earmuffs or semi-inserts hearing protectors, the data would also have to be provided for the alternative positions, so the table could contain up to four additional rows.

2. The H, M, and L, values refer to the High, Middle, and Low indices from ISO 4869-2, which require both C-weighted and A-weighted sound levels. H and M are used in noise environments with primary energy in the mid and high frequencies, where L_C -- $L_A \leq$ 2dB. M and L are used in noise environments with primary energy in the mid and low frequencies, where $L_C - L_A \geq$ 2dB. These levels are arrived at using a range of 8 different octave-band spectra. The rationale behind including them is that hearing protectors usually attenuate less in the low frequencies than they do in the high frequencies, and this type of rating gives the user an opportunity to take spectrum into account, particularly for low-frequency noise environments.

How to use the Noise Reduction Rating (Subject Fit), [NRR(SF)]

The NRR(SF) may be subtracted from an A-weighted sound level or TWA

1. **For example, the noise level is 92 dBA.**
2. **The NRR(SF) is 16 dB.**
3. **Most users (84%) should be protected to a level of 76 dBA.**

Tip: A better estimate of the protected level can be obtained by adding 5 dB to the NRR(SF) and subtracting it from a measurement made using C- instead of A-weighting.

The NRR(SF) is designed to use with A-weighted sound levels, so that the confusing subtraction of 7 dB is no longer necessary. If the noise environment is predominantly low-frequency, the user may either choose to add the 5-dB and then subtract the adjusted NRR(SF) from the C-weighted noise level, or he or she has the option of using the HML method.

Applicability

FAILURE TO FIT THIS HEARING PROTECTOR ACCORDING TO INSTRUCTIONS WILL REDUCE ITS EFFECTIVENESS. When used as directed, this hearing protector is expected to provide between 16 and 30 dB of noise reduction for about 66% of the users.

Of those remaining, 17% will be likely to obtain less than 16 dB of protection, and the other 17% will be likely to obtain more than 30 dB.

Differences between hearing protector ratings of less than 3 dB are <u>not</u> important.

This section reiterates the amount of protection to be expected ONLY if the protector is used as directed, so that users will understand that the importance of correct insertion and use. One is to be concerned, of course, about the 17% of those who will obtain less than 16 dB, but one might also be concerned about those receiving more than 30 dB, since over-protection could be a problem.

The relative unimportance of differences between ratings of less than 3 dB is to discourage purchases and users from the hair-splitting mind-set of "bigger is always better."

Estimating noise reduction for individual users

The labeled values of noise reduction are based on laboratory tests. It is <u>not possible</u> 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. Non-occupational users should have hearing evaluations by an audiologist, qualified physician, or other qualified professional, on a regular basis.

The rationale for this caveat should be self-evident. Too many employers are still under the impression that all they need to do is purchase protectors and say, "Here, wear this."

Impulse Noise

Although hearing protectors are useful for protection from impulsive noise, the noise reduction measurements are based on tests in *continuous* noise and may not be an accurate indicator of the device's performance for *impulsive* sounds, such as gunfire.

It is interesting to note, however, that the Task Force members expected at least the same level of protection, and most likely even higher, when protectors are used in an impulsive noise environment.

Additional Information

For additional information, call NIOSH at 800-35-NIOSH to obtain document 9X-XXX, or contact the EPA at phone/address.

(Or check the Agencies' websites: www.cdc.gov/NIOSH or www.epa.gov)

Here the Task Force intended that a cartoon pamphlet would be prepared by its members, explaining all features of the Secondary Label, and to be made available by NIOSH or EPA.

Summary

- **Current NRR is not useful to purchasers and users of hearing protectors**
- **Modifications to NRR vary and are less than ideal**
- **EPA developed its hearing protector regulation with the idea that the NRR would be beneficial information for hearing protector users**
- **NIOSH believed that the 2-SD adjustment would prevent overestimates**
- **OSHA cast the NRR in concrete**
- **Field studies provided a wake-up call**
- **NHCA Task Force responded, made recommendations**
- **Something needs to change.....**

In summary, it is clear that the current NRR is not useful to purchasers and users of hearing protectors because it bears virtually no resemblance to the attenuation that is achieved in the field and it doesn't even do a good job of rank-ordering the real-world attenuation of protectors.

The modifications used by OSHA and NIOSH are not satisfactory because they are not well supported by test data and they differ between the two Agencies. In fact, the OSHA derating could lead to overprotection in some instances.

EPA meant well when it developed and promulgated its regulation for hearing protectors, but the information supplied by the NRR has turned out not to be beneficial.

The NIOSH belief that the 2-SD adjustment would prevent overestimates has turned out to be untrue.

OSHA's hearing conservation amendment, which I had a considerable hand in drafting, has further solidified the legitimacy of the NRR and, in fact, almost forced people to use it.

Field studies of hearing protector attenuation have provided a wake-up call to the entire profession, to which the inter-organization Task Force convened by NHCA has responded. And now, it is quite clear that something needs to be done, perhaps along the lines of the Task Force's recommendations. I trust the papers presented at this workshop will provide some viable solutions.