# NHCA POSITION STATEMENT

# Hearing Protector Fit Testing (HPFT)

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*Jackie DiFrancesco, Theresa Schulz, Laurel Alstot, Amy Blank, Sandar Bregg, Stephanie Karch, Devon Kulinski, William J. Murphy, Matthew Tolley, Jennifer Tufts, and Laurie Wells*

*National Hearing Conservation Association (NHCA)*
*Task Force on Hearing Protector Fit Testing (HPFT)*

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# Executive Summary

Hearing protection devices (HPDs) are commonly used in occupational settings to protect workers from hazardous noise exposure. HPDs should be selected such that they provide adequate attenuation for the environment in which they are worn. Several methods of evaluation exist for this purpose.

The attenuation rating will be dictated by applicable regulations. Group statistics like the Noise Reduction Rating (NRR), Single Number Rating (SNR), High Medium Low (HML), and Sound Level Conversion ($SLC_{80}$) describe the noise reduction of an HPD when tested in optimal conditions with a select panel of test subjects. Hearing protector fit testing (HPFT) measures the amount of attenuation provided by a specific HPD as fitted by the wearer. It can help to identify workers who are not properly fitting their HPDs, as well as those who require a different hearing protector (e.g., due to comfort issues or inadequate attenuation even when properly fitted). The immediate feedback provided by the fit test is valuable for reinforcing training and ensuring each worker can be adequately protected from the noise levels in their environment.

NHCA and the National Institute for Occupational Safety and Health (NIOSH) recommend the use of HPFT in occupational settings (NIOSH, 2025). HPFT should be used as a tool within a comprehensive hearing conservation program (HCP), coupled with training and intervention strategies tailored to the individual and the specific workplace environment. HPFT may also be used to help comply with existing regulatory requirements. As a leading indicator of overexposure, fit testing can be used to improve workers' ability to wear HPDs correctly and achieve an appropriate level of attenuation. Applied in this way, HPFT is an important tool in promoting the health and safety of workers exposed to noise both on and off the job (Murphy et al., 2023a; OSHA, 2019).

NHCA recommends:

- Continued research to further define best practice policy, explore use cases, and evaluate the long-term impacts of HPFT
- Information sharing within the hearing conservation community related to the implementation of HPFT, success stories, surmounting barriers, and the impacts of HPFT within a hearing conservation program
- Use of fit testing instead of generalizations, such as applying a derating factor to the NRR

# Background

Historically, hearing protection device attenuation has been measured using standardized protocols with human test subjects in a laboratory environment. Group average attenuation measurements are used to calculate an attenuation rating representing the noise reduction that users might achieve when the HPD is fitted properly. The United States Environmental Protection Agency (EPA) requires all HPDs offered for public commerce be tested and labeled with a Noise Reduction Rating (NRR) according to EPA regulation 40 CFR 211(B) (EPA, 1979). Outside of the U.S., alternative hearing protector rating schemes are used, for example, the Single Number Rating (SNR), High Medium Low (HML), and Sound Level Conversion ($SLC_{80}$). Such statistical attenuation ratings, derived from testing a small sample of users under controlled conditions, do not necessarily provide an accurate representation of the amount of attenuation a particular individual will receive from a given HPD. Because the NRR uses an experimenter-fit protocol and reports group statistics, it does not provide accurate estimates of real-world attenuation achieved by individual workers, even when derated (Edwards et al., 1983; Berger et al., 1996; NIOSH, 1998; Franks et al., 2000; Murphy et al., 2022). More accurate attenuation estimates can be obtained by individually fit-testing workers with their HPDs (Schulz, 2011; Voix et al., 2022; Murphy et al., 2022).

Directly measuring the attenuation provided by the HPD *as fitted by the wearer*, a practice called *hearing protector fit testing* (HPFT), can more accurately estimate individual attenuation. Approaches for assessing individual attenuation of HPDs in the workplace have been investigated for more than fifty years and include over a dozen different estimation methods (Berger, 1986; Karch et al., 2024; Michael et al., 1976). HPFT was recognized by NIOSH as a best practice in the *1998 Criteria for a Recommended Standard: Occupational Noise Exposure* document, stating “ideally, workers should be individually fit tested for hearing protectors.” (NIOSH, 1998)

In 2008, an alliance among NHCA, the Occupational Safety and Health Administration (OSHA), and the National Institute for Occupational Safety and Health (NIOSH) was formed and a best-practice document recognizing the benefits of HPFT was published (NHCA/OSHA/NIOSH Alliance, 2008). Since then, a greater number of HPFT systems have become commercially available, occupational HPFT has become more broadly accepted, and numerous HPFT-related standards, regulations, studies, and guidance documents have been published (Wells et al., 2023; Morata et al., 2024).

In 2023, NHCA, NIOSH, the Acoustical Society of America (ASA) and University of Texas at Dallas supported the International Hearing Protector Fit-Testing Symposium, where hearing conservation professionals met to discuss the state of the science of

HPFT and paths forward (Murphy et al., 2023a). The symposium prompted a series of papers (Murphy et al., 2023a; Murphy et al., 2023b; Murphy et al., 2023c; Murphy et al., 2023d; Schulz et al., 2023; Wells et al., 2023), the development of a fit testing training curriculum for the Council for Accreditation in Occupational Hearing Conservation (CAOHC), and the creation of the NHCA HPFT Task Force.
In 2025, NIOSH updated its policy as follows:

> As fit-test systems are now readily available, this NIOSH Science Policy Update "recommends employers use individual, quantitative fit testing to evaluate the attenuation received by workers from their hearing protection devices... Employers should integrate individual fit testing into their hearing loss prevention Programs" (NIOSH, 2025).

This NHCA position statement is an outcome of the symposium, aligns with NIOSH policy, and affirms the potential for HPFT to shape the practice of hearing loss prevention and improve the effective use of HPDs.

## Benefits of HPFT

HPFT is a powerful tool that can be used in efforts to prevent noise-induced hearing loss, and other consequences of hazardous noise exposure, by verifying HPD fit and performance. The implementation of HPFT in the workplace offers many benefits to both the organization and its workforce (Schulz, 2011). In addition to measuring the attenuation of a specific HPD on an individual, HPFT:

- Actively engages individuals in training
- Demonstrates that the user can properly fit the HPD
    - Users can experience what a proper fit feels like
    - Provides evidence that proper fit can be achieved
- Aids in the selection of effective hearing protectors for a given exposure level
- Supplements NRR or other single number ratings
- Eliminates need for derating
- Identifies individuals who need additional training and/or a different HPD
- May improve effectiveness of the trainer (Stephenson & Stephenson, 2011)
- May improve the effectiveness of the training tools (Federman et al., 2021; Joseph et al., 2007; Murphy et al., 2011)
- Assists in complying with regulations that require:
    - reducing exposure below hazardous levels
    - refitting/retraining following a standard threshold shift (STS)
    - ensuring proper initial fit
    - supervising correct use of HPD

## Measurement Methods and Systems

Commercially available HPFT systems employ a variety of test methods, software, and hardware. Most systems employ some variation of either a real-ear attenuation at threshold (REAT) or field-microphone in real-ear (F-MIRE) method for estimating attenuation. These two methods have emerged as the most viable methods for estimating individual attenuation.

REAT-based systems require the user to respond to acoustic stimuli presented at various center frequencies with and without the HPD in place. Federman and Duhon (2016) found that “at a minimum, center frequencies of 500, 1000, and 2000 Hz should be included in order to obtain an estimate of attenuation”.

F-MIRE systems present a signal, typically broadband noise, to the user while they wear their HPDs. The signal level is measured simultaneously outside the HPD and in the wearer’s ear canal(s) or underneath the earmuff cup. No response is required from the wearer.

Because there are multiple technologies and reporting practices available, a technical standard was developed by ASA and the American National Standards Institute (ANSI) to help address accuracy and transparency of results. The ASA/ANSI S12.71-2018 (R2022) Performance Criteria for Systems that Estimate the Attenuation of Passive Hearing Protectors for Individual Users standard is a voluntary standard intended for manufacturers of fit-test systems. It includes performance criteria that can accommodate a variety of measurement and reporting methods. The premise of the standard is to ensure the fit-test system outcomes correspond to the attenuation results achieved using a standardized laboratory REAT method. The standard provides guidance on using attenuation data to calculate PAR. The NIOSH Science Policy Update recognizes that systems that compute PAR in conformance with the standard meet the NIOSH recommendations (NIOSH, 2025).

## Outcome Measures

Outcome measures of HPFT may include a personal attenuation rating (PAR), frequency-specific attenuation, pass/fail determinations, and/or other metrics depending on the system. A PAR is a single number estimate of attenuation in decibels. It is intended to be subtracted from the A-weighted noise level in a user’s environment in order to estimate the user’s protected noise exposure level. The target range for the protected noise exposure level is commonly set within a range of 70 to 85 dBA, although this could vary by the user and the environment (CEN, 2021; Murphy, 2024). Protected exposure levels that fall outside the target range can result in either

overprotection or underprotection. *Overprotection* refers to when an HPD provides more attenuation than needed, leading to a low (i.e., < 70 dBA) protected exposure level. *Underprotection* refers to when the amount of attenuation is insufficient for the environment, resulting in a protected exposure level that is too high (i.e., > 85 dBA). Both situations should be avoided: overprotection can increase communication difficulties and safety risks, while underprotection can expose the wearer to potentially hazardous noise. The PAR can assist in identifying potential instances of overprotection and/or underprotection.

Regardless of the metric used, an individual's fit-test results must be interpreted and acted upon within the context of the workplace environment. For example, a PAR that is underprotective in one environment may be overprotective in another. As another example, an HPD with a lower PAR that is comfortable to wear may be preferable to one with a higher PAR that is uncomfortable (and thus less likely to be worn correctly and/or consistently).

While a PAR can reflect a user's general proficiency in fitting a given HPD, there is no guarantee that the user will obtain the same or a similar PAR with subsequent fittings, nor would they be expected necessarily to receive a similar PAR with a different size, brand, or style of HPD. For that reason, the PAR cannot be applied retroactively to past histories of noise exposure.

# Incorporating HPFT into a Hearing Conservation Program

## Choosing an HPFT System

When choosing an HPFT system, the specific needs of the employer, the workers, and the workplace environment should be considered, including:

- Types of HPDs that will be available to workers
    - HPD compatibility with HPFT system
- Background noise levels in the area where fit testing will be done
- Time availability for testing
- Who will conduct the testing
- How the results will be used
- How hearing loss will affect the test
- How many employees will be tested and when

For more information on choosing an HPFT system, a list of considerations can be found in *Fit testing for hearing protection: A practical introduction for your workplace (NORA HLP Cross-sector Council, 2025).* A comparison of fit-test methods is included in the *European Standard EN 17479:2021 Hearing protectors: Guidance on selection of*

*individual fit-testing methods (CEN, 2021)*. Information can also be obtained by consulting the system manufacturer's literature.

## Who and When to Fit Test

NHCA recommends fit testing upon a worker's enrollment in an HCP, when a new HPD is first issued, if a significant threshold shift is identified, and when there is a change in the individual's noise exposure level. Ideally, every noise-exposed person should be fit tested routinely to ensure that short- and long-term effects of HPD training are realized (Voix et al., 2022). Employers may consider offering fit testing as a benefit for employees who use HPDs outside of work, whether or not they are enrolled in the HCP.

The specific periodicity with which HPFT should be repeated for the same HPD and worker will depend on many variables. Evidence suggests that one fit test may not be sufficient to maintain the positive effects of training on PAR achieved within the initial fit-test session (Gong et al., 2019; Heyer et al., 2011). Therefore, programs should plan to provide routine fit testing to maintain PAR values and build consistent HPD use over time. Individuals who required retraining and retesting, those identified as needing a different HPD, and those who are infrequent users of HPDs may benefit from more frequent fit testing.

Ideally all workers who are expected to use HPDs in the workplace should be fit tested. However, employers may choose to prioritize certain categories of workers to include in the HPFT program. This triggers the need to assess risk for over or underprotection. Some examples of workers at risk of underprotection may include those at the highest noise exposures, those who are new to working in hazardous noise and/or using HPDs, and those who are exposed at the lower margin of the exposure limit which may not be perceived as hazardous by the workers. Categories of workers who may be at risk of overprotection are workers who depend on situational awareness, such as hearing important signals, alarms, equipment sounds, and speech to be safe and productive, and those workers exposed to lower levels of hazardous noise. Some additional considerations include the quality of the HPD training, the health and safety culture in the workplace, the worker's hearing ability, and the exposure to hazards other than noise. Identifying workers to include or exclude from a HPFT program should be made in consultation with the employer's hearing conservation team members.

## Tips for Successful Implementation

- HPFT alone will not protect a worker from the effects of hazardous noise
- Incorporate fit testing as *one* element of a comprehensive hearing conservation program

    - Consider that the results of a single fit test do not provide information about how a worker fits their HPDs on a daily basis, whether the fit changes during a work shift, or if HPDs are even worn at all
- Ensure ample time is available for both testing and training
- Create a follow-up plan for workers who:
    - Require additional instruction and training on the proper use of HPDs
    - Require additional time for counseling
- Ensure PARs are sustainable with periodic HPFT
- Maintain fit-test equipment. Some HPFT systems require routine calibration, software updates, and/or accessories or supplemental supplies

## Considerations for Special Situations

Currently, there are still unanswered questions regarding how to apply HPFT in special situations, including those involving:

- Dual hearing protection
- Acoustic helmets
- Passive level-dependent / nonlinear hearing protectors
- Active hearing protectors with electronics activated
- Exposure to impulsive noise

As technology evolves, it is expected that the capabilities of HPFT systems will expand and new methods of measuring and reporting attenuation will be developed. NHCA supports continuing research and welcomes evidence-based developments in these areas.

## Conclusion

NHCA endorses HPFT as an essential component of an HCP and supports its use in occupational environments. HPFT can help improve the selection of proper HPDs, provide meaningful training, and support continuous, appropriate HPD fit. HPFT is a powerful tool to help improve worker safety and health. NHCA supports integrating HPFT as part of an effective and comprehensive HCP and is committed to disseminating research findings and emerging information to improve HCP outcomes.

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