

Glenn Research Center, Environmental Programs Manual

Chapter 11 - Hearing Conservation Program

NOTE: The current version of this Chapter is maintained and approved by the Environmental Management Office (EMO). The revision date for this chapter is April 2002. If you are referencing paper copies, please verify that it is the most current version before use. The current version is maintained on the Glenn Research Center intranet at <http://osat-ext.grc.nasa.gov/emo/pub/epm/epm-contents.pdf>. Approved by: EMO Chief, Michael Blotzer {mailto:Michael.J.Blotzer@grc.nasa.gov}.

PURPOSE

This Chapter establishes minimum requirements for GRC Hearing Conservation Program (HCP). The program's purpose is to prevent noise-induced hearing loss among GRC employees, contractors, and visitors. This chapter sets forth procedures and responsibilities for the effective control of occupational noise exposures at GRC, for the early identification of noise induced hearing loss, and for ensuring compliance with applicable regulations and standards.

APPLICABILITY

This chapter is applicable to all civil servant and contractor employees assigned to GRC sites and to any NASA-controlled, government-owned facilities associated with GRC. The full intent of this chapter shall be incorporated in any support service contract under which contractor employees will be assigned to work in areas or conditions on NASA sites where noise levels are or have the potential to be greater than 80 dBA.

Employees of other contractors (e.g., construction) and all other visitors shall abide by the personal hearing protection requirements and default maximum permissible noise exposure limits specified in this chapter by observing and complying with all posted hearing protection requirements.

DEFINITIONS

Action Level - an exposure to an 8-hour TWA of 8-decibels measured with a dosimeter or sound level meter on the A-scale, slow response. The time-weighted average computation should be made using a 5 dB exchange rate.

Audiogram - a chart, graph, or table resulting from an audiometric test. An audiogram shows an individual's hearing threshold level as a function of frequency.

Standard Threshold Shift (STS) - an average hearing threshold shift of 10 dB or more at 2000, 3000, and 4000 Hz in either ear. A Standard Threshold Shift that is demonstrated on a retest audiogram is determined to be a permanent or persistent Standard Threshold Shift.

Time-Weighted-Average (TWA) sound level - the sound level that, if constant over an 8-hour workday exposure, would result in the same noise dose as is measured.

BACKGROUND

Repeated unprotected exposure to high sound levels is the most direct and common cause of noise-induced hearing loss. Hearing loss due to noise exposure is always irreversible and almost entirely preventable. Implementation of a proactive hearing loss prevention program will minimize noise-induced hearing loss and result in improvements in the safety, productivity, comfort, and regulatory compliance of the work environment. Elements of a successful program include the implementation of engineered noise controls, responsible operation and maintenance of noise sources, consideration of noise emission criteria in equipment purchase and facility design decisions, specific and personalized employee education, and early detection (and follow-up) of hearing loss via accurate medical monitoring.

POLICY

It is GRC policy to conduct research and support operations in such a manner as to minimize unprotected exposure to noise levels above 85 dBA and to proactively support the HCP's primary goal of preventing noise induced hearing loss among employees, contractors, and visitors.

RESPONSIBILITIES

The Chief of the Environmental Management Office (EMO) is responsible for:

- The GRC HCP. The responsibility for the management for this program is delegated to the HCP Manager.
- The Director of the Engineering and Technical Services Directorate is responsible for:
- Ensuring that noise control and reduction considerations are integral to the site selection and design of new or modified GRC facilities.
- The Director of the Glenn Research Center is responsible for:
- Ensuring that the HCP, as specified by the NASA Headquarters Health Standard on Hearing Conservation, is in place at GRC.

Employees of the Engineering and Technical Services Directorate are responsible for:

- Ensuring that the design and development, or selection and purchase, of aeronautical and space hardware, tools, support equipment, engineering controls, and associated procedures (where feasible) will minimize unprotected exposure to noise levels above 85 dBA.
- Planning, scheduling and conducting research, maintenance and construction operations in a manner that minimizes unprotected exposure to noise levels above 85 dBA.
- Selecting building and research support equipment with the lowest noise emissions, where feasible.
- Notifying the Hearing Conservation Program Manager of noisy areas/operations.
- Designing and applying engineering controls necessary to reduce noise exposures below 85 dBA or to the maximum extent feasible.
- Giving necessary consideration to acoustics in the design and modifications of buildings.
- Providing copies of applicable engineering drawings and operational plans to the HCP Manager for review of any precautions planned to limit noise emissions and control noise exposures.
- Maintaining noise producing equipment and controls to preclude noise increases. Vibrations, worn gears, bad bearing, unbalanced fans, corroded mufflers, non-lubricated fittings, and vibrating pipes can all contribute to high noise levels.
- Contracting Officers (CO) and Contracting Officers' Technical Representatives (COTR's) are responsible for:
- Ensuring that the full intent of this chapter is incorporated into all support service contracts and that other (e.g., construction) contracts require compliance with posted personal hearing protection requirements. CO's and COTR's are also responsible for ensuring that all contracted activities are planned, scheduled and conducted in a manner that minimizes unprotected exposure to noise levels above 85 dBA.

The GRC Medical Director, Occupational Medicine Services (OMS) is responsible for:

- Maintaining a registry of all personnel enrolled in the GRC HCP, scheduling those persons for audiometric examinations, and notifying employees of the need to avoid exposure to high noise levels preceding audiometric tests.
- Providing medical evaluations, obtaining an occupational history of participants in the Medical Monitoring Program, supervising on-site audiometric testing, and evaluating test results.
- Notifying employees of significant hearing loss or other medical pathology of the ear, and explaining the need and plans for further testing and/or referrals.
- Notifying the employee (in writing), the employee's supervisor, and the HCP Manager within 21 days if further testing establishes that a permanent Standard Threshold Shift (STS) has occurred. (If the shift is 25 dB or greater, the HCP Manager shall be notified within 48 hours.)
- Forwarding audiometric monitoring results (names, dates, and specific information about any STS's identified) to the HCP Manager on a monthly basis.
- Consulting with the HCP Manager regarding any employee with hearing loss so that the workplace can be evaluated/re-evaluated to assure that no excess exposures occur.
- Recommending to the supervisor the reassignment of employees to work in low noise areas when such is necessary to prevent further significant hearing loss or the aggravation of other medical conditions. Any reassignments should be in accordance with applicable personnel management requirements.
- Referring employees to an audiologist or physician specialist, as appropriate.
- Ensuring that the physicians who conduct or supervise the audiometric testing of employees have reviewed the requirements of this chapter.
- Ensuring that personnel who conduct audiometric testing be responsible to a physician/audiologist.
- Ensuring that audiometric test equipment is properly calibrated and that ambient noise levels in audiometric test rooms' meet the requirements specified in the NASA Headquarters Health Standard on Hearing Conservation. The HCP Manager can measure background noise levels.
- Maintaining audiometric test records and other records as required by the NASA Headquarters Health Standard on Hearing Conservation.
- Providing employee access to medical records in accordance with the requirements of the NASA Headquarters Health Standard on Hearing Conservation.

The Hearing Conservation Program Manager is responsible for:

- Conducting baseline surveys of each new operation, job, procedure having the potential of creating noise levels above 80 dBA. These surveys should be pre-operational, where possible.
- Conducting annual walk-through surveys of all worksites to evaluate the potential for excess noise exposures and to develop sampling strategies as appropriate.
- Monitoring and evaluating noise hazard areas or operations through noise surveys and personal noise dosimetry.

- Recommending appropriate means of controlling noise exposures.
- Designating noise hazard areas and notifying appropriate managers/supervisors of such areas.
- Maintaining a current inventory of all noise hazard areas and noise levels recorded in these areas.
- Providing employee access to noise survey/dosimetry records.
- Notifying supervisors of affected employees and the GRC Medical Director of the requirements for employees to participate in the HCP. Participation is required when noise-monitoring data shows that noise exposures exceed the action level of 80 dBA TWA as specified in this chapter.
- Notifying supervisors of affected employees of the requirements for employees to wear appropriate hearing protection.
- Reviewing facility and operational plans to assess the adequacy of precautions planned/taken to control noise exposures.
- Recommending the selection of hearing protection devices (in collaboration with OMS, as necessary) and specifying performance (attenuation) requirements.
- Coordinating with supervisors, personnel officers, OMS, and others as necessary to carry out all aspects of the HCP.
- Providing guidance in the development of training programs for personnel enrolled in the HCP and their immediate managers, and assuring that the training provided is adequate and meets regulatory requirements.
- Coordinating with OMS in determining if the cause of a permanent STS is work-related.
- Notifying the Glenn Safety Office of any employees who have demonstrated a persistent STS of 25 dB or greater so that the appropriate information may be entered on the OSHA 200 Log.
- Assisting OMS in measuring background noise levels in audiometric booths.

The Chief of the Glenn Safety Office is responsible for:

- Entering the appropriate information on the OSHA 200 Log when notified by the HCP Manager that an employee has demonstrated a persistent STS of 25 dB or greater.
- Supervisors are responsible for:
- Reporting suspected hazardous noise in all of their areas of jurisdiction to the HCP Manager.
- Maintaining a roster (name and job titles) of personnel working in designated high-noise areas (or otherwise exposed to hazardous noise) and informing the HCP Manager of changes (new employees, employees transferred, employees terminated, etc.).
- Referring personnel who complain of hearing loss or other hearing or ear problems to OMS for examination.

- Enforcing the wearing of hearing protection devices and ensuring that administrative controls are followed where required.
- Notifying the HCP Manager of any changes in operations requiring noise determinations or evaluations.
- Ensuring that hearing protective devices that have been approved by the HCP Manager are available for use by employees.
- Ensuring that employees who are enrolled in the HCP receive annual (calendar year basis) training.
- Ensuring that employees who are enrolled in the HCP participate in annual (calendar year basis) audiometric testing.
- Attending Hearing Conservation Training as required for supervisors.
- Assuring that caution signs are posted in designated noise hazard areas and that appropriate labels, decals, or placards are placed on tools and equipment as specified by the HCP Manager.
- Notifying each affected employee of the results of noise monitoring when the employee's noise exposure meets or exceeds the action level of 80 dBA TWA.

Individual employees are responsible for:

- Participating in annual Hearing Conservation Training (on a calendar year basis), if enrolled in the HCP.
- Receiving an annual (calendar year basis) audiometric test, if enrolled in the HCP.
- Utilizing control procedures established for maintaining effective noise exposure control, including wearing and maintaining hearing protective devices furnished for their protection.
- Observing posted hearing protection signs, decals and labels and complying with the specific NRR requirements at all times.
- Cooperating with supervisors, OMS personnel and the HCP Manager in activities/actions undertaken to evaluate hazardous noise and to prevent hearing loss caused by excessive exposure to workplace noise.
- Notifying supervisors or the HCP Manager of areas, operations, or equipment that may produce hazardous noise.

REQUIREMENTS

Written Program

This chapter incorporates the requirements of the OSHA Standard on Occupational Noise Exposure and the NASA Headquarters Health Standard on Hearing Conservation. These requirements shall be incorporated into all support service contractor written programs.

Employee Access

Copies of this chapter, 29 CFR 1910.95 and any appropriate records required by this chapter shall be provided, upon request, to employees, former employees, representatives of employees, and representatives of the U.S. Department of Labor, the national Institute for Occupational Safety and Health (NIOSH), and NASA Occupational Health Division personnel. Privacy Act provisions shall be adhered to where applicable.

Default Maximum Noise Exposure Limits (With Hearing Protection)

Where highest rated personal hearing protective devices (plugs plus muffs) are insufficient to attenuate employee noise exposure to a level of 85 dBA or below, administrative controls shall be implemented to ensure that the employee's exposure does not exceed the default exposure limit of 85 dBA Time-Weighted-Average (TWA) shown in Table 1 below, computed using a 5 dB exchange rate. This default exposure limit also applies to cases where the requirement for personal hearing protection with a specific Noise Reduction Rating (NRR) has been waived by the HCP Manager for operational or safety reasons.

Table 1
85 dBA TWA Default Maximum Permissible Noise Exposure Limits*

Noise duration, hr.....	Sound level*, dB(A)
16	80
8	85
4	90
2	95
1	100
0.5	105
0.25	110
0.125 or less	115

These limits apply to noise exposure with (after accounting for) hearing protection and are applicable only when highest-rated hearing protector(s) (plugs plus muffs) are insufficient to attenuate noise exposure to 85 dBA. Exposure (after accounting for hearing protection) to sound levels above 115 is not permitted, regardless of duration of exposure.

Engineering Controls

Where feasible, facilities and equipment shall be procured, designed, operated, and/or modified in such a manner as to minimize exposure to noise levels above 85 dBA. Any reduction in noise level, even if it is not reduced below 85 dBA, is beneficial. If engineering controls fail to reduce sound levels below 85 dBA, hearing protective equipment and/or administrative methods of noise exposure protection must be used.

Personal Hearing Protection

Personal protective equipment is to be used only temporarily or where engineering controls are not feasible or practical.

Earmuffs and/or plugs shall be provided to employees assigned to work in areas where they will be exposed to continuous, intermittent, or impact noise (without regard to duration of exposure) in excess of 80 dBA. Disposable earplugs shall be available for employee use where noise exposures are less than 80 dBA (for protection against nuisance noise), if they so desire. Earmuffs and/or earplugs shall be worn by employees exposed continuous, intermittent, or impact noise in excess of 85 dBA, without regard for duration of exposure or character of the noise source. Earplugs and earmuffs shall be for the exclusive use of each employee and shall not be traded or shared. Use of ear protectors shall be mandatory where requirements are posted, and their use shall be enforced by supervisors as specified in this chapter.

Hearing protectors must attenuate noise exposure (at the ear) to a level of 85 dBA or below, based on the NRR of the protector. Estimation of the adequacy of hearing protector attenuation shall be performed according to OSHA-specified methods.

The adequacy of hearing protector attenuation shall be re-evaluated whenever employee noise exposures increase to the extent that the hearing protector currently in use may no longer provide adequate attenuation. More effective hearing protectors shall be provided when necessary.

Employees shall be able to choose either earmuffs or earplugs from a variety styles. Any protector (or combination of protectors) that provides the required NRR, as specified by the HCP Manager, shall be acceptable.

Special hearing protection equipment, such as sound-attenuating communication headsets, may be used in high-noise areas. These devices should be regularly inspected. Sound-attenuating headsets which have been damaged, altered, or modified in any way which affects the attenuation characteristics may not be used. Where replacement parts, such as earcup seals are available, the headsets may be repaired and reused. Where sound attenuating headsets are not permanently issued to individuals, such equipment must be cleaned before being reissued.

Requirements for specific NRR performance in Section 3 may be waived on a case-by-case basis by the HCP Manager where warranted for technical or safety considerations. The default maximum noise exposure limit of 85 dBA TWA shall apply in those cases.

Administrative Control

Where highest rated hearing protective equipment (plugs plus muffs) or engineering controls are not sufficient to attenuate noise exposure to less than 85 dBA, the duration of time spent in the noise hazard area shall be limited so as not to exceed the default maximum exposure limit (with hearing protection) of 85 dBA TWA. This default limit is 80 dBA TWA for employees who have demonstrated a persistent Standard Threshold Shift.

Noise Monitoring

Measurement of potentially hazardous sound levels shall be conducted when any information, observation or calculation shows that an employee could be exposed to a noise level in excess of 80 dBA. This includes, but is not limited to times where there is a need to document representative noise exposures, where employees complain of excessive noise, or where it is difficult to understand a normal conversation when the speaker and listener face each other at a distance of two feet. Any new equipment, operation, job or procedure with the potential for creating noise levels above 80 dBA should be evaluated with regard to noise emissions prior to start-up. All continuous, intermittent and impulsive sound levels from 80 dB to 130 dB shall be integrated into the noise measurements. Noise exposure computation is shown in Appendix A of 29CFR 1910.95. Noise monitoring should be repeated at least biannually, or whenever any changes to facilities, equipment, work practices, procedures, or noise control measures alter potential noise exposures.

Noise monitoring shall be conducted in accordance with the OSHA Standard on Occupational Noise Exposure and the NASA Headquarters Health Standard on Hearing Conservation. Requirements of these standards are hereby incorporated by reference.

Employee Participation in the HCP

All personnel who are routinely exposed to noise (30 or more days per year) at or above the action level of 80 dBA TWA as shown in Table 2 below shall be identified and placed in the HCP. [Program enrollment is based on employee noise exposure independent of hearing protector usage or selection.] Other personnel, including those in maintenance, custodial, emergency response, safety, security, and environmental management positions who have a reasonable potential for periodic exposure to noise levels above 85 dBA should also be enrolled in the HCP.

Table 2
80 dBA TWA Action Level for Employee Enrollment in the HCP

Noise duration, hr.....	Sound level*, dB(A)
8	80
4	85
2	90
1	95
0.5	100
0.25	105

0.125

110 or above

These sound levels apply to measured or estimated TWA exposures, without accounting for any reduction provided by hearing protection. They are to be used only as a threshold for Program enrollment and are not to be construed as exposure limits.

All employees who are enrolled in the HCP shall receive an annual audiogram (every calendar year).

All employees who are enrolled in the HCP shall participate in annual hearing conservation training activities (every calendar year), as specified by the HCP Manager.

Medical Monitoring Program

Audiometric testing shall be conducted in accordance with the OSHA Standard on Occupational Noise Exposure and the NASA Headquarters Health Standard on Hearing Conservation. All medical monitoring requirements specified in these standards are hereby incorporated by reference.

Posting of Personal Hearing Protection Requirements

Caution signs that clearly indicate the hazard of high noise levels and state the requirements to wear hearing protection shall be posted at the entrance(s) to, or the periphery of, noise hazard areas. Decals or placards with similar statements shall be affixed to power tools and machines that produce noise levels above 85 dBA. Signs and decals shall have working in black letters on a yellow or orange background.

Employee Training

Hearing conservation training shall be provided to each employee on annual (calendar year) basis and shall include, at a minimum, an overview of the GRC HCP, a review of the effects of noise on hearing (including permanent hearing loss); noise control principles; the purpose of hearing protectors; the advantages, disadvantages, and attenuation characteristics of various types of ear protectors; instructions on selections, fitting, use, and care of hearing protectors; and explanation of the audiometric testing procedure; and the purpose of audiometric testing.

An education program shall be provided for supervisory and managerial personnel whose employees are exposed above the action level of 80 dBA, emphasizing their responsibility in the HCP.

Personnel shall be encouraged to use hearing protectors whenever they are exposed to noise levels above 80 dBA during off-duty activities (e.g., from lawn mowers, firearms, etc.).

Recordkeeping Requirements

Audiometric test data, noise exposure records and instrument calibration records shall be established and maintained in accordance with the OSHA Standard on Occupational Noise Exposure and the NASA Headquarters Health Standard on Hearing Conservation. Recordkeeping requirements of these standards are hereby incorporated by reference.

RECORDS

- Standard Threshold Shift Cases
- Training Rosters
- Noise Survey Reports
- Community Noise Complaints
- Program Enrollment Status Report

REFERENCES

OSHA Standard on Occupational Noise Exposure 29CFR 1910.95

NASA Headquarters Health Standard on Hearing Conservation NHS/IH 1845.4

Office of Safety, Environmental, & Mission Assurance ([OSAT](#))

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