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Chapter 7.1 Hearing Conservation

This could be you . . .

A worker didn't think it was important to use hearing protection while working with equipment that produced high levels of noise and usually "forgot" to wear any hearing protective devices. He eventually noticed conversations seemed quite muffled and unclear, and that he had an annoying ringing in his ears. He then learned his hearing problem was permanent and could not be improved with surgery or medication.

7.1.1 Applicability of this chapter

You are required to follow this chapter if you work in a designated hazardous noise area or an area having a hazardous noise source, such as the flight line at Ellington Field or machines in a sheet metal shop.

7.1.2 What this chapter covers

This chapter covers the minimum requirements for JSC's Hearing Conservation Program (HCP). It discusses JSC's efforts to prevent noise-induced hearing loss among employees who are exposed to hazardous noise while working at this Center. JSC managers, supervisors, and employees share responsibilities for meeting these requirements.

7.1.3 Policy

7.1.3.1 These documents govern JSC's hearing conservation program:

- NPR 1800.1, Chapter 4 describes the general requirements and provisions of NASA's HCP.
- 29 CFR 1910.95, "Occupational Noise Exposure," and its appendices describe the Occupational Safety and Health Association's (OSHA) hearing conservation standards.
- 29 CFR 1904.10, "Occupational Injury and Illness Recordkeeping and Reporting Requirements," describes OSHA's requirements for recording and reporting noise-related hearing loss.

7.1.4 HCP elements

7.1.4.1 The success of the JSC HCP requires support from managers, medical personnel, supervisors, and employees in the following:

- "Buy Quiet and Quiet by Design" program and noise control requirements and strategies.
- Noise exposure monitoring.
- Medical surveillance and audiometric testing.
- Selection, use, and inspection of hearing protective devices (HPDs).
- Training in hearing loss prevention.
- Policy, documentation, and recordkeeping.
- Effective implementation of engineering, operational, and administrative controls.

Verify correct version before use at [Center Directives Management System](#).

JSC Form JF2420B (Revised April 3, 2012) (MS Word August 28, 2006)

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h. Appropriate corrective actions for employees who violate HCP requirements.

7.1.5 What is “too noisy”

7.1.5.1 NASA’s hearing conservation policy states the allowable occupational noise limit is the equivalent exposure of 85 decibels on the A-weighted scale (dBA) over an 8-hour time-weighted-average (TWA_{8hr}). Noise may be potentially hazardous to hearing if the exposure is greater than the equivalent of 82 dBA TWA_{8hr}, which is the NASA “action level.” The following apply:

- a. Employees shall be enrolled in the JSC HCP whenever they are assigned duties in a hazardous noise environment and exposed to:
 - (1) Noise levels exceeding the action level of 82 dBA TWA_{8hr} for 30 or more days per year
 - (2) Noise levels exceeding the allowable limit of 85 dBA TWA_{8hr} for 1 or more days per year
- b. This table shows exposures equivalent to the NASA action level and allowable limit. As noise levels increase, it takes less time to get the same exposure.

Exposure Level (* dBA TWA _{8hr})	NASA Action Level (Duration in hours)	NASA Allowable Exposure Limit (Duration in hours)
82	8	16
85	4	8
88	2	4
91	1	2
94	0.5	1.0
97	0.25	0.5
100	0.13	0.25
103	0.06 or less	0.13

*Measured in dBA, with sound level meter set at “slow response.”

- c. For impact and impulse noise, “too noisy” is anything exceeding 140 dB peak sound pressure level.
- d. Employees who anticipate being exposed to noise levels exceeding 85 dBA (or 140 dB impulse or impact noise) shall wear personal HPDs, regardless of duration of exposure.

7.1.6 How to determine whether your work area is too noisy:

The easiest way to know if your work area is too noisy is to check for hazardous-noise warning signs posted just outside the hazard areas or for warning labels on power tools or machines. If you have to shout at someone 3 feet away from you to make yourself understood, the levels in that area may be exceeding 82 dBA. If you think your work area or machinery may be noise-hazardous, but no warning signs or labels are present, call Occupational Health at x36726 for noise monitoring support. Occupational Health will complete the monitoring and report back to you in writing with their findings and recommendations. If your work area is too noisy, you will be notified that you may be included in the hearing conservation medical monitoring program (see paragraph 7.1.9).

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7.1.7 Engineering, operational, and administrative controls

7.1.7.1 Engineering controls shall be the first and primary means of controlling hazardous noise. Employees or their supervisors shall follow these requirements to control noise:

- a. The “Buy Quiet and Quiet by Design” program aims to reduce employee noise exposures through early consideration of the noise outputs of systems, facilities, and equipment before their purchase and design. JSC designers and engineers should consider noise emissions when purchasing and designing equipment expected to generate noise emission levels of concern (80 dBA and higher). Noise engineering control measures should be considered in the early stages of the design or planning process of engineering projects, drawings, and operational plans, and before contract award or authority to proceed by following the requirements of the NASA “Buy Quiet and Quiet by Design” program. This program shall:
 - (1) Be integral to the site selection and design of new or modified facilities and equipment.
 - (2) Meet realistic and achievable baseline noise criteria and optimize noise emission criteria based on individual and specific operational and site conditions. Encompass design and development, or selection and purchase, of a broad variety of fixed and portable equipment purchased for use by JSC organizations, including equipment purchased by contractors, to minimize noise-exposure hazards to personnel.
 - (3) Include all equipment expected to produce noise levels of 80 dBA and higher under a variety of site and operational considerations.
 - (4) Identify noise emission and control requirements for equipment procurement specifications and design.
 - (5) Contain provisions for “Buy Quiet and Quiet by Design” program support, promotion, training, and management sponsorship.
 - (6) Be individualized to meet an organization’s specific needs, configuration, and other relevant factors.
 - (7) Not apply to specialized research project items or flight hardware, which may be expected to produce high noise levels.
 - (8) Ensure Contracting Officers and Contracting Officer’s Representatives include these provisions in all contracts and in the purchase of new equipment, as appropriate.
 - (9) Incorporate the NASA “Buy-Quiet Roadmap” in all covered procurements. Centers are allowed to use an alternative formal process for noise engineering control measures to provide equivalent documentation of key decisions, authorizations and verifications.
- b. If a work area is noise-hazardous (using criteria described above), engineering noise controls shall:
 - (1) Aim to reduce noise emissions (measured at operator position or equivalent) to below 85 dBA.
 - (2) Be reviewed at least annually to assess the adequacy of precautions planned or undertaken to control noise exposures.
- c. Organizations planning to change facilities, operations, or procedures shall notify Occupational Health at x36726 of:

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- (1) Changes in operations or equipment which may change noise levels
- (2) New, uncontrolled, or previously unidentified areas, operations, or equipment that may produce hazardous noise or may not meet the requirements of this chapter
- d. If engineering controls fail to reduce sound levels and hearing protective equipment is not sufficient to attenuate noise to less than 85 dBA, employees shall use administrative or operational controls as recommended by Occupational Health.

7.1.8 Selecting, using, and inspecting HPDs

7.1.8.1 Employees shall wear HPDs, such as earmuffs or ear plugs if they are exposed to noise levels in paragraph 7.1.5 above. HPDs will also be available for use by employees working in areas with nuisance noise levels lower than 82 dBA TWA_{8hr}. The follow requirements apply to HPDs:

- a. Employees shall never trade or share earplugs. They are for one person's exclusive use only.
- b. HPDs shall attenuate employee noise exposure to a TWA_{8hr} of 85 dBA or less. For employees who have shown a Standard Threshold Shift (or STS, as described in paragraph 7.1.10), HPDs shall attenuate exposure to a TWA_{8hr} of 82 dBA or less.
- c. To determine the necessary noise reduction rating (NRR) of the manufacturer for any kind of HPD in a noisy environment, employees shall use one of the following techniques:
 - (1) Use this basic formula to calculate the noise reduction required of an employee's HPD:

$$NRR = [(L_A - 85) \times 2] + 7$$
 where L_A is the measured ambient sound level to which the employee is exposed.
 - (2) Measure how much attenuation an employee actually achieves with HPDs by using a commercial fit-check system or another method of measuring personal hearing protection that is approved by Occupational Health.
- d. Supervisors shall reevaluate the adequacy of HPD attenuation whenever employee noise exposures increase.
- e. Employees shall regularly inspect special HPDs if they are used in hazardous noise areas.
- f. Employees shall never use earmuffs or amplitude-limiting and noise-cancellation headsets that have been damaged, altered, or modified in any way that affects the attenuation characteristics. Clean the devices before reissuing them to other users.
- g. Occupational Health can recommend the best types of hearing protection to wear in a noise-hazardous area.
- h. Occupational Health may reevaluate noise-hazardous areas whenever the noise level increases to see whether current HPDs are still adequate.
- i. Employees shall wear double protection (both earmuffs and earplugs) when analysis shows that the protection provided by earplugs (or earmuffs) does not reduce noise exposures below 85 dBA (TWA_{8hr}).

7.1.9 Medical surveillance and audiometric examinations (hearing tests)

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7.1.9.1 Employees shall be included in the HCP medical surveillance program and receive periodic audiometric examinations if they are occupationally-exposed to noise levels exceeding the NASA action level or NASA allowable limit (see paragraph 7.1.5 above). Medical surveillance and audiometric testing shall meet requirements described in NPR 1800.1, Chapter 4. There are three types of audiometric exams:

- a. **Baseline exam.** Within 30 days of initial exposure to hazardous noise, noise-exposed employees should receive a baseline medical examination. Results of subsequent hearing tests will be compared to the results of this baseline hearing test.
 - (1) The exam shall include a hearing test (preceded by at least 14 hours without high noise exposures), a medical examination to determine any pre-existing ear problems, and a noise exposure history to document past noise exposures.
 - (2) Occupational health personnel will review the baseline hearing test results and may recommend a referral to an audiologist or a physician for further evaluation.
 - (3) The employee and his or her supervisor shall receive a written notification of any hearing condition that may impair the employee's ability to safely hear commands or signals on the job.
 - (4) If a contract is awarded to a new contractor and an employee of the former employer occupies the same work role position and the current baseline audiogram is considered to be valid, that audiometric baseline will continue to be used for comparison with results of annual audiometric tests.
- b. **Annual exam.** Noise-exposed employees shall, at least every 12 months, receive an audiometric exam to include:
 - (1) An update to their exposure and medical history.
 - (2) A hearing test. (Unlike the baseline test, no special provisions are needed for avoiding noise prior to annual hearing tests).
 - (3) A comparison of the annual exam's audiogram to the baseline audiogram to determine if the audiogram is valid and if an STS has occurred. If a decline in hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000, 3000, and 4000 Hz is seen in either ear, additional testing is required. Allowances may be made for a change in hearing level due to the contributions of aging, using procedures described in Appendix F of 29 CFR 1910.95.
 - (4) A retest is recommended within 30 days after identifying an STS to confirm if the STS is permanent or temporary. If it is not done within 30 days, the STS will be considered to be confirmed permanent by default. You should not be exposed to hazardous noise for at least 14 hours prior to the retest.
- c. **Final (termination) exam.** Employees who have participated in the HCP medical surveillance program shall receive a final audiometric exam before ending employment, transfer to duties not involving noise exposures, transfer to another installation, or retirement. If an annual audiogram has been completed within 6 months of the termination, transfer, or retirement date, those results may be used.

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NOTE: The employer is responsible for paying for medical referrals needed to accurately determine an employee's hearing status for the purpose of further identifying the effects of occupational noise exposure, or needed to determine if there are any detrimental effects from wearing hearing protectors.

7.1.10 Hearing conservation training

7.1.10.1 For employees exposed to noise at or exceeding the NASA action levels (see paragraph 7.1.5), they and their supervisors shall receive annual training from Occupational Health in the hazards of noise exposure to include:

- a. Elements of JSC's HCP.
- b. The roles and responsibilities of noise-exposed employees:
 - (1) Elements required by NPR 1800.1, Chapter 4.
 - (2) Effects of hazardous noise and other factors that may contribute to hearing loss.
 - (3) Hazardous noise sources in the employee's JSC work areas.
 - (4) Noise control practices, including use of hearing protection at work and in non-occupational activities (for example, power tools and firearms).
 - (5) The purpose, selection, fitting, proper use, advantages and disadvantages, and maintenance of various types of HPDs.
 - (6) An explanation of Occupational Health's audiometric testing purpose and procedures.

7.1.11 HCP records

- a. Supervisors shall maintain a registry of personnel enrolled in their activity's HCP. Supervisors shall forward an updated listing of these personnel to Occupational Health once per quarter.
- b. Occupational Health shall maintain records required by NPR 1800.1, Chapter 4.
- c. Contractors shall record any work-related hearing loss in the OSHA Log 300 form, as required by 29 CFR 1904.10.

7.1.12 Other potential noise exposures

7.1.12.1 In addition to noise exposures at work, your activities off the job may also cause hearing loss. You should also protect your hearing by using HPDs when exposed to loud non-occupational noises caused by:

- a. Motorized vehicles and equipment such as motorcycles, boats, lawn mowers, and power tools (woodworking equipment, chain saws, power generators, etc.).
- b. Recreational use of firearms.
- c. Audio equipment, such as personal listening devices like music players, and musical instrument amplifiers, if the volume is set too high.
- d. Attendance at loud concerts, monster truck shows, car races, and night clubs.