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Occupational Health Programs Manual – Chapter 3

Hearing Conservation Program w/Change 2 (9/30/2015)

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Change Record

Rev.	Effective Date	Expiration Date	GRC25, Change Request #	Description
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***Include all information for each revision. Do not remove old revision data. Add new rows to table when space runs out by pressing the tab key in the last row, far right column.*

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Chapter 3—Hearing Conservation Program

NOTE: The current version of this chapter is maintained and approved by the Safety and Health Division (SHeD). The last revision date of this chapter was May 2012. The current version is located on the Glenn Research Center intranet within the BMS Library. Approved by the Chief of Safety and Health, Division.

1.0 PURPOSE

The purpose of this chapter is to provide guidance for employees and supervisors on how to address employee exposure to hazardous noise in the workplace. The chapter provides details for the current procedures and practices set forth by the NASA Glenn Research Center (GRC) Hearing Conservation Program (HCP), as required by the NASA Procedural Requirement for Hearing Conservation. The program’s ultimate purpose is to prevent noise-induced hearing loss among GRC employees, contractors, students, and visitors.

2.0 APPLICABILITY

This chapter is applicable to all civil servant and support service contractor (SSC) employees assigned to GRC sites, construction contractors, students, and visitors. SSCs, construction contractors, and visitor employers are responsible for the health and safety of their employees. SSCs with employees who may be working on tasks where the noise exposure levels may equal or exceed the NASA action level of 82 decibels, A-weighted scale (dBA), are required to have their own site-specific, written HCP that meets Federal, state, and NASA requirements. Contractor HCPs shall be developed in accordance with NASA Federal Acquisition Regulation (FAR) Supplement 1852.223–70, Safety and Health, and shall incorporate the full intent in this chapter. Employers shall ensure employees comply with all program requirements including noise hazard assessments, training, personal protective equipment, medical surveillance, NASA Buy-Quiet/Quiet-by-Design, and other requirements as needed, to ensure compliance with NASA policy.

Construction contracts require the submission of a health and safety plan per NASA FAR supplement 1852.223–73 and also require compliance with NASA FAR supplement 1852.223–70. NASA FAR supplement 1823.7001 provides the guidance as to when the 1852.223–70 is required. Construction contractors and all other visitors shall abide by the personal hearing protection requirements and noise exposure limits, as specified in this chapter, by observing and complying with all posted hearing protection requirements.

3.0 BACKGROUND

Noise-induced loss of hearing is an irreversible, sensorineural condition that progresses with exposure. Although hearing ability declines with age (presbycusis) in all populations, exposure to noise produces hearing loss greater than that resulting from the natural aging process. Noise-induced loss is caused by damage to the nerve cells of the inner ear (cochlea) and, unlike some conductive hearing disorders, cannot be treated medically. While loss of hearing may result from a single exposure to a very brief impulse noise or explosion, such traumatic losses are rare. In most cases, noise-induced hearing loss is insidious. Often, physical impairment has occurred before the condition is clearly recognized. Such impairment is usually severe enough to permanently affect a person’s ability to hear and understand speech under everyday conditions. There is also evidence to suggest that noise exposure beyond the fifth month of pregnancy may cause hearing loss in the fetus.

GRC, as part of its effort to provide a safe and healthful work environment, is committed to the implementation of a proactive hearing loss prevention program. This written program encompasses all elements of a successful program, including but not limited to the identification of hazardous noise sources, the implementation of engineered noise controls, the NASA Buy-Quiet/Quiet-by-Design program for the purchase or design of new equipment, administrative controls for limiting employee exposures, employee exposure monitoring, employee education, and the early detection of hearing loss through medical surveillance.

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4.0 POLICY

The Glenn Research Center's safety and occupational health programs are intended to maintain and protect the health and safety of our workers, as well as to promote employee wellness. This Chapter is based upon applicable laws and regulations, industry standards or other guidelines, as well as agency policy. The GRC shall follow the requirements of NASA Procedural Requirement (NPR) 1800.1C, Chapter 4.8 Hearing Conservation. NPR 1800.1C also states that NASA Centers shall comply with OSHA standards promulgated under Section 6 of the OSHA Act of 1970. In addition to complying with the OSHA Occupational Noise Exposure Standard (29 CFR 1910.95), Hearing Conservation Amendment Final Rule and appendices, the Construction Industry Standards and Occupational Noise Exposure (29 CFR 1926.52), and Occupational Injury and Illness Recordkeeping and Reporting Requirements (29 CFR Part 1904.10), the following entities provide current guidance such as consensus and industry standards:

- American Conference of Governmental Industrial Hygienists (ACGIH)
- American National Standard Institute (ANSI)
- National Institute for Occupational Safety and Health (NIOSH)
- Acoustical Society of America (ASA)

Where conflicts exist among other regulations and NASA health and safety requirements, the most protective requirements shall apply. Currently the NASA hearing conservation policy, in most cases, provides the most protective requirements.

5.0 RESPONSIBILITIES

5.1 SHed Hearing Conservation Program Lead

The SHed Program Lead shall:

- Complete and maintain the Certification of Occupational Hearing Conservationist (OHC) as administered by the Council for Accreditation of Occupational Hearing Conservation (CAOHC)
- Develop and implement a written HCP, in accordance with NPR 1800.1C, Chapter 4.8, to prevent noise-induced hearing loss among GRC employees, contractors, students, and visitors
- Conduct or facilitate noise hazard assessments to identify hazardous noise areas, operations, and equipment
- Identify, using a hierarchical approach, where engineering controls should be considered. Where the implementation of engineering controls is not feasible, operational and administrative controls and hearing protection shall be specified as needed
- Prioritize, facilitate, and provide results and recommendations to employees and supervisors for employee exposure monitoring and sound level surveys of hazardous noise areas, operations, and equipment
- Provide employees enrolled in the HCP and their supervisors with initial and annual refresher HCP training
- Provide employees with a standard threshold shift (STS) or significant hearing loss concern HCP training or retraining, and a review of work area and work practices to identify strategies to reduce noise exposures to below the action level
- Coordinate with Medical Services, the employee, and the employee's supervisor to complete an investigation for each hearing loss concern, STS, and NASA Ability and Risk concern and ensure follow-up activities are completed
- Provide Medical Services with the industrial hygiene component of STS and significant hearing loss investigations
- Provide the Human Capital Development Division (HCDD) with the course content for the HCP training classes offered and the delivery dates for each fiscal year; forward attendance forms to the HCDD for System for Administration, Training and Educational Resources for NASA (SATERN) recordkeeping of

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employee training history; provide a list of employees assigned the SATERN curriculum for Hearing Conservation.

- Provide labeling for hazardous noise areas and equipment
- Maintain a registry of all personnel enrolled in the HCP
- Audit employee compliance and evaluate and maintain the program's effectiveness
- Facilitate the implementation of corrective actions, with employee supervisors, for employees who violate requirements of the HCP or 29 CFR 1910.95 and appendices
- Facilitate implementation of the NASA Buy-Quiet/Quiet-by-Design program for GRC sites
- Support Reproductive Hazards Program Lead in assessing employee noise exposures and the fetus

5.2 SHeD Environmental Protection or Occupational Health Specialists

The SHeD Specialists shall

- Assist the SHeD Program Lead with the conduction of sound level surveys and dosimetry
- Assist with the selection, maintenance, and tracking of hearing protection dispensers to ensure adequate hearing protection availability

5.3 Medical Director, Occupational Medicine Services

The Medical Director shall

- Ensure that all audiometric examinations are properly performed, by an audiologist, physician, or CAOHC-certified OHC, appropriate records maintained, and all medical examination results are communicated to the employee as specified in NPR 1800.1C
- Ensure, for employees enrolled in the HCP, baseline, annual, and exit audiometric examinations are conducted and results reviewed and that medical follow-up is made available as needed
- Notify, in writing, the employee, the employer, and the SHeD Program Lead of the need to perform an Ability and Risk Evaluation when the employee has been identified as potentially unable to perform their job safely, due to hearing loss or medical concerns identified by medical examination
- Ensure confirmation audiograms are performed for employees with an identified STS
- Notify, in writing, the employee, the employer, and the SHeD Program Lead, within 21 days, of the determination of an employee STS; STSs shall also be recorded in the Incident Reporting Information System (IRIS)
- Ensure an audiologist or physician with hearing conservation experience reviews problem audiograms, including those showing a STS, and determines whether there is need for further medical evaluation by an otolaryngologist, other qualified physician, or an audiologist
- Coordinate with the SHeD Program Lead, the employee, and the employee's supervisor to complete an investigation for each hearing loss concern, STS, and NASA Ability and Risk concern and any follow-up activities
- Provide medical support for employers to ensure a work-relatedness determination is made for purposes of OSHA recordability by a physician or other licensed health care professional, in consultation with the employer
- Ensure STSs that are confirmed as work-related and thus OSHA recordable are provided to the IRIS-site administrator
- Ensure employees, with a work-related hearing loss, are reexamined for hearing protection fit and effectiveness and refitted as necessary

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- Ensure a 6-month follow-up audiogram is performed for employees assigned a new baseline audiogram, as a result of an STS
- Ensure when employees at GRC retain their “work role position” but change employers, due to contract award to a new employer, all medical records applicable to hearing conservation follow them to their new employer, including their current baseline threshold
- Determine whether reassignment to work in a low noise area is indicated to prevent further hearing impairment and shall advise the employer accordingly

5.4 **IRIS-site Administrator**

The IRIS-site Administrator shall record OSHA-recordable STSs for civil servants, as directed by Medical Services, on the OSHA 300 Log, and maintain the record in accordance with OSHA 29 CFR 1904, Recording and Reporting Occupational Injuries and Illnesses.

5.5 **Supervisors**

Supervisors of employees exposed to hazardous noise shall

- Ensure employees who have exposure to hazardous noise have completed an instructor-led hearing conservation training class.
- Ensure that employees enrolled in the HCP are in compliance with requirements for annual training and medical surveillance
- Ensure that employees are cognizant of hearing protection requirements in their work area and are notified of noise exposure monitoring results
- Ensure that a variety of appropriate hearing protection devices are available and worn properly by employees exposed to hazardous noise
- Ensure that engineering, operational, and administrative controls are implemented
- Ensure that surveys of noisy areas and equipment have been conducted and that the SHed Program Lead is notified when changes in operations and/or equipment that may impact noise exposure levels has occurred
- Ensure designated hazardous noise areas are posted and that hazardous noise-emitting tools and equipment are properly labeled with applicable hearing protection requirements
- Coordinate with the SHed Program Lead to confirm, on an annual basis, employees who are required to be enrolled in the hearing conservation program.
- Refer personnel who complain of hearing loss or other hearing or ear problems to Medical Services for examination
- Ensure that special hearing-protective equipment, such as sound-suppression or noise-cancellation communication headsets, are regularly cleaned, inspected, and maintained
- Ensure the implementation of corrective actions for employees who violate the requirements of the GRC HCP or OSHA 29 CFR 1910.95
- Attend annual hearing conservation training as required for supervisors
- Coordinate with Medical Services, the SHed Program Lead, and the employee to complete an investigation for each hearing loss concern, STS, and NASA Ability and Risk concern and any follow-up activities

5.6 **Employees**

Employees shall

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- Ensure all purchases of equipment, for which noise emissions are expected to exceed 80 dBA, shall be made in accordance with the Buy-Quiet requirements
- Notify supervisors or the SHed Program Lead of any areas, operations, or equipment in their work area that may produce hazardous noise
- Facilitate noise surveys with the SHed Program Lead or SHed specialists; assist with the scheduling and completion of employee noise dosimetry
- Avoid high levels of noise exposure, or don hearing protection to reduce noise exposure, during the 14-hr period preceding the initial, termination, and STS follow-up audiometric exams
- Complete a baseline and annual STS confirmation if needed, and program termination audiometric exams
- Complete initial and annual refresher hearing conservation training
- Consistently use and maintain hearing protection devices that meet the task-specific recommended noise reduction rating (NRR)
- Adhere to the established engineering, operational, and administrative noise controls
- Ensure special hearing-protective equipment, such as sound-suppression or noise-cancellation communication headsets, is regularly cleaned, inspected, and maintained

5.7 Facility Engineers and Research Design Engineers

Facility Engineers and Research Design Engineers shall

- Implement GRC Buy-Quiet/Quiet-by-Design protocols, as specified in this program by
 - Considering acoustics in the design and modifications of buildings and research facilities
 - Ensuring the selection of all building and research support equipment, that is expected to produce noise that approaches hearing conservation levels of 80 dBA and higher under a variety of site and operational considerations, incorporates the Buy-Quiet/Quiet-by-Design criteria
 - Ensuring the design, development, selection, and purchase of aeronautical and space hardware, tools, support equipment, engineering controls, and associated procedures minimizes employee exposure to noise levels at or above 85 dBA
- Plan, schedule, and conduct maintenance and construction operations to minimize unprotected exposure to noise levels at or above 85 dBA
- Design and apply engineering controls to retrofit existing hazardous noise-emitting equipment, as necessary, to reduce noise exposures below 85 dBA or to the maximum extent feasible
- Maintain noise-producing equipment and controls to prevent increases in noise levels (Vibrations, worn gears, bad bearings, unbalanced fans, corroded mufflers, non-lubricated fittings, and vibrating pipes can all contribute to high noise levels.)

5.8 Research and Test Facility Operations Engineers

Research and Test Facility Operations Engineers shall

- Ensure that surveys of noisy areas and equipment have been conducted and that the SHed Program Lead has been notified of changes in operations and/or equipment that may impact noise exposure levels
- Plan, schedule, and conduct research and test operations to minimize unprotected exposure to noise levels at or above 85 dBA
- Ensure that operational plans incorporate hearing conservation requirements
- Ensure that engineering, operational, and administrative controls are implemented

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- Ensure that designated hazardous noise areas and hazardous noise-emitting tools and equipment are properly labeled with hearing protection requirements
- Ensure that appropriate hearing protection devices are available for use for visitors or transient personnel, as required
- Maintain noise-producing equipment and controls to prevent increases in noise levels

5.9 Human Capital Development Division Chief

The HCDD Chief shall

- Ensure employee hearing conservation training records are maintained in SATERN
- Ensure the SATERN Hearing Conservation Training curriculum is current and activated to issue annual training reminders for CS employees active in the Hearing Conservation Program, as determined by the SHed Program Lead

5.10 Chief of Procurement

The Chief of Procurement shall ensure that Buy-Quiet/Quiet-by-Design provisions are included in all GRC contracts and in the purchase of new equipment, as appropriate.

5.11 Chief of Safety and Health Division

The Chief of SHed shall:

- Ensure a qualified individual is identified as the Hearing Conservation Program Lead, to carry out the responsibilities set forth in the GRC Hearing Conservation Program. The qualified individual shall be identified by the organization tasked with the implementation of the Hearing Conservation Program.
- Provide support to the SHED Program Lead in the performance of their duties to ensure and maintain the effectiveness of the hearing conservation program
- Maintain HCP records and documentation provided by the SHed Program Lead

6.0 REQUIREMENTS

6.1 Noise Exposure Limits (NPR 1800.1C, Chapter 4.8.3.3, OSHA 29 CFR 1910.95(b)(1), and 29 CFR 1926.52(d))

NASA's maximum occupational exposure level for noise, the criterion sound level, is equivalent to 85 dBA, as a time-weighted average (TWA) exposure, measured on the A-weighted scale, set to slow response, using a 3 dB exchange rate; the action level is 82 dBA, TWA or equivalently, a dose of 50 percent. The maximum occupational exposure level for employees who have demonstrated a work-related STS is a more stringent limit of 82 dBA, TWA; the maximum occupational exposure level for employees who experience a second (subsequent) work-related STS is 79 dBA.

All personnel who enter areas or perform tasks where exposure to noise is greater than or equal to 82 dBA, regardless of the duration of exposure, shall be provided with personal hearing protection. All personnel who enter designated hazardous noise areas or who perform tasks where exposure to noise is greater than or equal to 85 dBA or 140 dB peak, regardless of the duration of exposure or number of impulses, shall be provided with and required to wear personal hearing protection.

Table 6.1 lists NASA's allowable noise exposure limits, as a function of exposure level and exposure time. Employee exposures exceeding the equivalent exposures in Table 6.1 shall be controlled, reduced, or eliminated through a hierarchical combination of engineering controls, administrative controls, and hearing protection devices.

6.1 – Documentation of compliance with noise exposure limits is found in the HCP Noise Survey Reports and the Noise Exposure Assessments (dosimetry), kept in the HCP program files and on the SHed server, by building or facility

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TABLE 6.1.—NASA NOISE EXPOSURE LIMITS

Exposure level, dB(A)	Noise duration, hr	Noise duration, min
82	16	0
85	8	0
88	4	0
91	2	0
94	1	0
97	0	30
100	0	15

6.2 Assessment of Noise

6.2.1 Noise Surveys (*NPR 1800.1C, Chapter 4.8.3.10, OSHA 29 CFR 1910.95(d), 29 CFR 1926.52, and 29 CFR 1910.145*)

The SHeD Program Lead with the assistance of SHeD Specialists shall survey noisy areas and equipment to identify and assess hazardous noise areas and hazardous noise-emitting equipment. Noise survey results and recommendations shall be posted on the SHeD Web site, Hearing Conservation page, and shall be forwarded to all affected personnel, as indicated by the supervisor, facility manager, or research and test personnel. Noise surveys shall be conducted when any information, observation, or calculation indicates that an employee may be exposed to noise at or above the action level. Hazardous noise is defined as environmental noise equal to or exceeding of 85 dBA. Noise surveys shall be done to document representative noise exposures, to respond to employee complaints of excessive noise, or where it is difficult to understand normal conversation when the speaker and listener face each other at a distance of 3 ft.

Noise surveys shall be conducted whenever there are changes to facilities, equipment work practices, procedures, or noise-control measures that may alter potential noise exposures. 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 startup. All continuous, intermittent, and impulse sound levels from 80 dB to 140 dBA shall be integrated into the noise measurements. A priority sampling of hazardous noise areas shall be surveyed and documented yearly.

All hazardous noise areas, as well as tools and equipment, shall be posted with signs to clearly indicate the presence of hazardous noise and the hearing protection requirements.

6.2.2 Employee Exposure Assessments (*NPR 1800.1C, Chapter 4.8.3.10, OSHA 29 CFR 1910.95(d) and (e), 29 CFR 1926.52, 29 CFR 1904.10, and 29 CFR 1904.5*)

Employee exposure monitoring shall be conducted when a noise survey shows that any employee or group of employees may be exposed to noise equal to or exceeding the action level of 82 dBA, TWA. To determine employee exposure to noise an estimated occupational exposure level may be derived from the noise survey data of the hazardous noise source(s) and areas, coupled with the employees' exposure time(s) to the noise. Where circumstances such as high worker mobility, significant variations in sound level, or a significant component of impulse noise make area monitoring generally inappropriate, representative personal noise dosimetry shall be conducted. The employee exposure assessments shall be used to determine hearing conservation enrollment, the need for engineering, operational, and administrative controls, and hearing protection equipment requirements.

Monitoring results shall be provided to affected employees, their immediate supervisors, and Medical Services. Monitoring shall include the evaluation of the presence of compounding hearing-related circumstances present in the environment such as solvents, heavy metals, carbon monoxide, heat, and vibration. Noise exposure monitoring should be repeated whenever any changes to facilities, equipment, work practices, procedures, or noise control measures alter potential noise exposures.

6.2 – Documentation of noise exposure assessments is found in the HCP Noise Survey Reports and the Noise Exposure Assessments (dosimetry), kept in the HCP program files and on the SHeD server, by building or facility

6.3 Engineering, Operational, and Administrative Control of Noise

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6.3.1 Engineering Control General (NPR 1800.1C, Chapter 4.8.3.5 and OSHA 29 CFR 1910.95(b)(1))

Engineering controls shall be the first and primary means of controlling hazardous noise. Engineering controls should attempt to reduce noise emissions, measured at operator position or equivalent, below 85 dBA. Where feasible, facilities and equipment shall be procured, designed, operated, and/or modified to reduce or maintain environmental noise exposure below 85 dBA. Any reduction in noise level, even if it is not below 85 dBA, is beneficial. If engineering controls fail to reduce sound levels below 85 dBA, hearing protective equipment and/or administrative controls must be used.

6.3.2 NASA Buy-Quiet/Quiet-by-Design Program (NPR 1800.1C, Chapter 4.8.3.4)

The NASA Buy-Quiet/Quiet-by-Design program is a progressive and integral part of the of the NASA commitment to implement a proactive hearing loss prevention program. The program encompasses the design and development or selection and purchase of a broad variety of fixed and portable equipment purchased for use by centers, including equipment purchased by contractors. Equipment expected to produce noise that approaches hearing conservation levels of 80 dBA and higher, under a variety of site and operational considerations shall be subject to a Buy-Quiet/Quiet-by-Design analysis during the design phase or prior to purchase.

6.3.3 Operational Control of Noise (NPR 1800.1C, Chapter 4.1.3.8(o))

In addition to causing hearing impairment, noise can interfere with communication, disturb sleep, cause cardiovascular and psycho-physiological effects, reduce performance, and provoke annoyance responses and changes in social behavior. Research and test facility operations where emitted noise may result in an employee noise exposure concern or a community noise concern may be subject to GRC operational plan restrictions to address such concerns.

6.3.4 Administrative Controls (NPR 1800.1C, Chapter 4.8.3.8 and OSHA 29 CFR 1910.95(b)(1))

Where the highest rated hearing protective equipment (plugs plus muffs) or engineering controls are not sufficient to attenuate employee exposure to noise, as required, 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 limit is 82 dBA for employees who have demonstrated a persistent work-related STS and 79 dBA for employees sustaining two subsequent work-related STSs.

6.3 -Documentation of employee compliance with the implementation of engineering controls, Buy-Quiet/Quiet-by-Design program, and operational and administrative control of noise is found in the HCP Noise Survey Reports, and GRC Safety Permit requirements. The records are kept in the HCP program files, on the SHed server, and in the SHed Safety Permit files.

6.4 Hearing Conservation Program Enrollment (NPR 1800.1C, Chapter 4.8.3.2)

6.4.1 HCP Enrollment General (NPR 1800.1C, Chapter 4.8.3.2 and OSHA 29 CFR 1910.95(c)(1))

Employees exposed to noise equal to or exceeding the NASA action level, of 82 dBA TWA, for 30 or more days per year, or can be expected to be exposed to 85 dBA TWA for any 1 day, an equivalent dose, shall be enrolled in the HCP. Exposures shall be computed without regard to any attenuation provided by the use of personal protective equipment. Due to the transient nature of personnel, supervisory input, with regard to employee job duties, is solicited annually to support program enrollment decision-making.

6.4.2 Audiometric Exams (NPR 1800.1C, Chapter 4.8.3.14 and OSHA 29 CFR 1910.95(g))

Medical surveillance is a critical component of the HCP for it allows for the early detection of hearing loss. All employees who are enrolled in the HCP shall receive a baseline audiometric exam before beginning work in hazardous noise areas or, within 30 days of initial exposure to hazardous noise. Annual audiometric exams shall be completed thereafter, as long as the employee remains enrolled in the HCP; a program termination audiometric exam is conducted for employees exiting the program. Employees shall avoid high levels of noise exposure, or don hearing protection to reduce noise exposure, during the 14-hr period preceding initial, termination, and STS follow-up audiometric evaluations.

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6.4.3 Training (NPR 1800.1C, Chapter 4.8.3.19 and OSHA 29 CFR 1910.95(k))

Employees enrolled in the HCP and their supervisors shall complete the initial and annual refresher HCP training. The initial class shall be instructor-led; annual refresher training can be SATERN web-based or a training video as determined by SHed. Training classes are offered on a monthly basis through SATERN. Training is also conducted on a branch-, project-, or contractor-specific basis, as requested.

6.4 – Documentation of employee compliance with HCP enrollment, audiometric exams, HCP training is found in the HCP Noise Survey reports, HCP Medical Records, HCDD HCP training records. The records are kept in the HCP program files and on the SHed server, with the exception of medical records which are kept by Medical Services, and the employee training records which are kept in SATERN and accessible by the reporting function of the an administrative SATERN session.

6.5 Personal Hearing Protection (NPR 1800.1C, Chapter 4.8.34.8.3.9 and OSHA 29 CFR 1910.95(b)(1) and (i))

Hearing protection devices shall be used only where engineering controls are not feasible or practical. Personnel who are exposed to noise levels equal to or greater than 82 dBA, regardless of duration, shall be provided with personal hearing protection. All personnel who enter designated noise hazardous areas or who perform tasks where exposure to noise is equal to or greater than 85 dBA or 140 dB peak, regardless of duration of exposure, shall be provided with and required to wear hearing protection.

Hearing protection selection and use shall be discussed during each HCP training session. Individual hearing protection fit shall be audited during the HCP annual audiometric exam. Hearing protection devices selected shall attenuate employee noise exposure to an 8-hr, TWA of 85 dBA or less. For employees with one work-related STS or two subsequent work-related STSs, the hearing protection devices must attenuate noise exposure at the ear to a level of 82 or 79 dBA, respectively.

Estimation of the adequacy of hearing protector attenuation shall be based on the NASA derating criteria for the published noise reduction rating (NRR); the required $NRR = [(measured\ ambient\ sound\ level - 85) \times 2] + 7$. Alternatively, where employees have high worker mobility or significant variations in sound level exposures, representative personal noise dosimetry shall be conducted to provide a TWA exposure. For employees with representative noise dosimetry, the required $NRR = [(TWA - 85) \times 2] + 7$.

Use of hearing protection shall be mandatory where requirements are posted, and shall be enforced by supervisors. A selection of hearing protection devices shall be available from GRC stock, and a hearing protection stock listing shall be posted on the SHed Hearing Conservation Web site.

Special hearing-protective equipment such as sound suppression or noise cancellation communication headsets shall be regularly inspected for damage or unauthorized modifications; headsets not permanently issued to individuals shall be cleaned and sanitized before reissuance.

6.5 – Documentation of the use of personal hearing protection is found in the HCP Noise Survey reports and HCP Program reviews. The records are kept in the HCP program files and on the SHed server.

6.6 Medical Surveillance (NPR 1800.1C, Chapter 4.8.3.14–18, OSHA 29 CFR 1910.95(g)(1), 29 CFR 1904.10, and 29 CFR 1904.5)

Medical surveillance includes, but is not limited to, a baseline, an annual, and a termination audiometric exam for employees enrolled in the HCP. Civil servant employees not enrolled in the HCP are offered an audiometric exam on a triennial basis.

The purpose of HCP medical surveillance is the early detection of significant hearing loss. OSHA defines a significant hearing loss as a STS. A STS is a hearing loss of 10 dB or greater (as compared to the employees baseline audiogram), derived from an average of the audiometric results for 2000, 3000, and 4000 Hertz, and the loss is 25 dB above audiometric zero. For employees who have sustained a STS, SHed conducts a hearing loss assessment, in conjunction with the employee, the employee's supervisor, and Medical Services to determine if the

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hearing loss is work-related and to evaluate current noise exposure and hearing protection use to prevent further hearing loss. A review of hazardous noise sources and controls, employee exposures to noise, ototoxic substances and medications, as well as a review of work practices and procedures shall be conducted whenever an employee experiences a STS. Employees shall be referred by the Medical Director to an audiologist or other physician knowledgeable in hearing conservation for further evaluation as needed.

If during any medical evaluation or audiometric examination, an employee is identified as potentially unable to perform their job safely, or has a hearing profile equal to or worse than that listed in Table 6.2, then the employee, the employer, and the SHed Program Lead shall receive written notification that an Ability and Risk Evaluation is required. Medical Services and the SHed Program Lead shall coordinate with the employee and the employee’s supervisor to ensure an Ability and Risk Evaluation is conducted and follow-up activities are completed.

TABLE 6.2.—NASA ABILITY AND RISK EVALUATION CRITERIA

Frequency (Hz)	500	1000	2000	3000	4000	6000
Hearing Level (dB)	25	25	25	35	45	45

The GRC Occupational Medical Director shall determine if reassignment to work in a low-noise area is indicated to prevent further hearing impairment and shall advise the employer accordingly.

When employees at GRC retain their “work role position” but change employers due to contract award to a new employer, all medical records applicable to hearing conservation follow them to their new employer, including their current baseline threshold.

6.6 – Documentation of compliance with the annual HCP medical surveillance requirements, STS concerns and Ability and Risk reviews is located in the employee Medical Record files kept by Medical Services

7.0 RECORDS (NPR 1800.1C, CHAPTER 4.8.3.21, OSHA 29 CFR 1910.95(M), 29 CFR 1904.10, AND 29 CFR 1904.5)

SHed shall ensure compliance with recordkeeping and access information requirements, as per NPR 1441.1, NASA Records Retention Schedules and Privacy Act requirements. Records to be maintained shall include

- Registry of HCP enrollment (annual).—Maintained on SHed server and HCP files.
- Noise Exposure Assessments (dosimetry).— Maintained on SHed server and HCP files.
- Noise Survey Reports — Maintained on SHed server, HCP files, posted on SHed website
- Medical Records.—Maintained by Medical Services.
- SHed STS and Hearing Loss documentation —Maintained by SHed HCP SBU files.
- HCP training records.—Maintained by the HCDD.
- HCP program review and audit documentation.—Maintained on SHed server.

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8.0 REFERENCES

Document Number	Document Name
ACGIH	American Conference of Governmental Industrial Hygienists, Threshold Limit Values (TLV®) -Occupational Exposure Guidelines for Chemical Substances and Physical Agents, and Biological Exposure Indices (BEIs®) for chemical substances.
29 CFR 1910.95	OSHA General Industry Standards, Occupational Noise Exposure and Hearing Conservation
29 CFR 1904.5	OSHA, Recording and Reporting Occupational Injuries and Illness: Determination of work-relatedness
29 CFR 1904.10	OSHA Occupational Injury and Illness Reporting and Recordkeeping Requirements
29 CFR 1926.52	OSHA, Construction Industry Standards and Occupational Noise Exposure
29 CFR 1910.145	OSHA accident prevention signs and tag requirements
NPR 1800.1, Chapter 4.8	NASA Occupational Health Program Procedures, Chapter 4.8, Hearing Conservation
NPR 1441.1	NASA Records Retention Schedules and Privacy Act Requirements, Administrative Management Programs, Records Management
NASA FAR Supplement	Safety and Health 1852.233-70

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APPENDIX A.—DEFINITIONS AND ACRONYMS

OSHA and NASA Hearing Conservation Program definitions are also located in OSHA 29 CFR 1910.95, Appendix 1 and NASA NPR 1800.1, respectively.

Ability and Risk Evaluations.—Evaluations performed for the purpose of determining a worker’s ability to perform specific job tasks (ability) and the likelihood of harm, either to the worker or others (risk), in relation to anticipated workplace exposures and job demands. Also includes the processes used to evaluate the ability of individuals to safely perform essential duties, if placed in a noisy work environment, and not pose a health or safety risk to themselves or others.

Action level.—A noise dose of 50 percent is designated as the action level, or the point at which the hearing conservation policy requires implementation of a continuing, effective hearing conservation program. The NASA action level is 82 dBA, measured as an 8-hr time-weighted average (TWA). A noise dosimeter (preferred) or sound level meter is used for measurement, and the instrument is programmed for the A-weighted scale set to slow response, with a 3-dB exchange rate. Employees with exposures equal to or greater than the NASA action level of 82 dBA TWA, for 30 days or more per year, are required to be enrolled in a hearing conservation program.

Administrative control.—Any procedure that limits noise exposure by restricting access to noise areas or by control of exposure times, distance, and/or work practices.

Audiogram.—A chart, graph, or table resulting from an audiometric test showing an individual’s hearing threshold levels for specific frequencies.

Baseline audiogram.—The reference audiogram against which future audiograms are compared, typically resulting from an audiometric evaluation conducted at the time the employee is enrolled in the hearing conservation program. The baseline audiogram for one or both ears is replaced if the employee’s hearing thresholds demonstrate either a persistent standard threshold shift or a persistent improvement as defined in NASA Procedural Requirement 1800.1, Chapter 4.8.3.15.

Baseline, revised.—The most recent audiogram that has established a persistent STS upon retest, or a significant improvement, that is used as the basis of comparison for future audiograms. Since ears are considered separately when making baseline revisions, it is possible for someone to have baseline audiograms from different years.

Buy-Quiet and Quiet-by-Design Program.—A program that endeavors to achieve long-term reduction of employee noise exposures through purchase and design of equipment with the intention of achieving realistic and achievable noise criteria, which are considered before procurement or design, using criteria based on operational conditions as well as the noise outputs of equipment. The Buy-Quiet and Quiet-by-Design approach requires designers and engineers to consider noise emission when purchasing and designing equipment that is expected to generate noise emission levels of concern for hearing conservation (80 dBA and higher).

Code of Federal Regulations (CFR)

Council for Accreditation of Occupational Hearing Conservation (CAOHC)

Criterion sound level.—An exposure level of 85 dBA time-weighted average (NASA’s maximum occupational exposure level).

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Decibel A-weighted (dBA).—A sound level reading in decibels made on the A-weighted network of a sound level meter at slow response.

Decibels, peak (dBp).—The highest instantaneous sound level measured. Commonly used to measure impulsive or impact noise. This quantity cannot be measured on the slow response A-weighted scale.

Derating.—The process of reassigning the manufacturers' values of hearing protectors to more realistic, real-world performance values. NASA derates the published manufacturer noise reduction rating (NRR) for hearing protection devices according to the following formula:

NASA required NRR = [(noise exposure level dBA – 85) × 2] + 7.

Engineering control.—Any mechanical device or physical barrier that reduces the sound level at the source of noise generation or along the path of propagation of the noise to the potentially exposed individual. This does not include personal protective equipment such as earmuffs or plugs or administrative controls.

Exchange rate (doubling rate).—The NASA Hearing Conservation Program exchange rate is 3 dBA. The exchange rate is the trade-off relationship between an increase (or decrease) in sound level and the corresponding change in the allowed exposure duration. When the sound level increases by the decibel value of the exchange rate, the allowed exposure duration is halved. For the 3dB exchange rate, that NASA and most of the world uses, every time the sound power doubles, the measured level increases by 3dB. OSHA currently uses a 5dB exchange rate.

Federal Acquisition Regulation (FAR)

Glenn Research Center (GRC)

Hazardous noise area.—Any work-- area where the environmental noise level is at or above 85 dBA, or where the environmental impulse noise level is at or above 140 decibels on a C-weighted scale, regardless of duration of exposure or number of impulses.

Hearing Conservation Program (HCP).—A proactive hearing loss prevention program.

Hertz (Hz).—Unit of measurement of frequency, numerically equal to cycles per second.

Human Capital Development Branch (HCDB)

Industrial hygienist (IH).—A professional tasked with the anticipation, recognition, evaluation, and control of health hazards in the workplace.

Impulsive or impact noise.—Variations in noise levels that involve peaks of intensity that occur at intervals of greater than 1 second. If the noise peaks occur at intervals of 1 second or less, the noise is considered continuous.

Incident Reporting Information System (IRIS)

Medgate – A software program implemented by NASA headquarters for NASA Centers to track and manage employee medical records and industrial hygiene workplace exposure data.

NASA Procedural Requirement (NPR)

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Noise dose.—A measure of cumulative noise exposure over a stated time period, which takes into account both the intensity of sound and the duration of exposure. Dose is a dimensionless quantity that represents the amount of actual noise exposure relative to the amount of allowable noise exposure (NASA criterion level) and for which 100 percent and above represents noise exposures that are hazardous.

Noise dosimeter.—An instrument that integrates a function of sound pressure over a period of time in such a manner that it directly indicates a noise dose.

Noise reduction rating (NRR).—A noise reduction value, in decibels, averaged across the frequencies from 125 Hz to 8 kHz, computed from laboratory tests of the attenuation of hearing protectors measured under ideal conditions. The NRR, per a 1979 Environmental Protection Agency regulation, is required to appear on all devices worn on the head or ear that are sold for purposes of personal noise reduction.

Noise survey.—A periodic or event-driven investigation of a hazardous noise, standard threshold shift, or other driving condition for the purposes of determining the noise levels, frequencies, and other sound characteristics as they relate to employee exposure.

Occupational Hearing Conservationist (OHC).—Also known as an industrial audiometric technician. A person who is certified by the Council on Accreditation for Occupational Hearing Conservation (CAOHC) and conducts the practice of hearing conservation, including pure-tone air-conduction hearing testing and other associated duties under the supervision of an audiologist or physician.

Operations Team (Ops Team)

Occupational Safety and Health Administration (OSHA)

Plum Brook Station Team (PBS Team)

System for Administration, Training and Educational Resources for NASA (SATERN)

Safety and Mission Assurance Directorate (SMAD)

Safety and Health Division (SHeD)

Sound level meter.—An instrument for the measurement of sound levels.

Support service contractor (SSC)

Standard threshold shift (STS).—A decline in hearing threshold of 10 dB or more from the baseline audiogram at 2000, 3000, and 4000 Hz (average) in either ear.

Time-weighted average (TWA).—The sound level, which if constant over an 8-hr exposure, would result in the same noise dose as is measured.

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