

DATE: May 13, 2016
TO: Center Directives Manager
Langley Research Center



FROM: Grant M. Watson
Director, SMAO

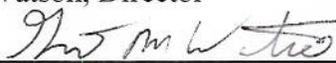
SUBJECT: Memo Authorizing Continued Use of Expired Langley Directive
LPR 2710.1 Langley Research Center Noise Control and Hearing Conservation
Program
Expiration date: January 31, 2016

REF A: NASA Requirement Waiver for NPR 1400.1 (3.5.2.6), NRW 1400-37

In accordance with reference A, I authorize the continued use of the expired subject directive.

LPR 2710.1 Langley Research Center Noise Control and Hearing Conservation Program
The subject directive has been reviewed prior to the expiration date and a summary of the required changes is: The document is currently being updated to comply with NASA requirements which require major revisions.
The directive was also assessed for the risk of continued use after expiration versus the risk of not having the directive available after expiration. The results of that risk assessment are: This LPR is part of the Langley Management system and it sets forth the procedural requirements and responsibilities of periodic noise hazard evaluations, personal hearing protective devices, education, and audiometric testing. There would be a high risk to the efficient and effective implementation of the LaRC Safety Program if this requirements document is not available in the LMS.
Justification for the delay is: Due to the excessive amount of time spent on revising other LMS documents, these revisions took longer to complete than initially expected. There would be a high risk to the efficient and effective implementation of the LaRC Safety Program if this requirements document is not available in the LMS.
The directive was submitted for Center wide review on October 9, 2015.

Please refer any questions or concerns regarding the continued use of this directive to Grant M. Watson, Director


Grant M. Watson, Director, SMAO

5/17/16
(Date)

cc:
218/K. C. Suddreth

304/LJNorthern:ljn 05/09/16 (44569)



Langley Research Center

LPR 2710.1G

Effective Date: February 22, 2011

Expiration Date: January 31, 2016

**LANGLEY RESEARCH CENTER
NOISE CONTROL AND HEARING
CONSERVATION PROGRAM**

National Aeronautics and Space Administration

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Responsible Office: Safety and Mission Assurance Office

PREFACE

P.1 PURPOSE

This Langley Research Center Procedural Requirements (LPR) sets forth the procedural requirements and responsibilities for the Langley Research Center (LaRC) Noise Control and Hearing Conservation Program under the direction of the Safety and Facility Assurance Branch (SFAB), Safety and Mission Assurance Office (SMAO).

P.2 APPLICABILITY

- a. These procedural requirements are applicable to all LaRC facilities.
- b. These procedural requirements are to be incorporated in any contract under which contractor employees will be assigned to on-site LaRC high noise or potential high noise areas.
- c. Contractors shall provide and implement their own written noise control and Hearing Conservation Programs (HCP).
 - (1) As a minimum, these programs shall be in accordance with the LaRC programs as described herein.
 - (2) If a contracting company performs work in high noise areas, the hearing conservation program shall include regular noise dosimetry to determine worker exposure.
 - (3) If exposures exceed the action level of 80 dB(A), workers shall be given annual audiograms, training, and be included in an effective hearing conservation program.
 - (4) As with other mandated safety programs, the HCP and associated records of LaRC contractors shall be subject to audit by the Hearing Conservation Program Officer (HCPO) or his/her designated representative.
- d. The provisions of these procedural requirements, which define periodic noise hazard evaluations, personal hearing protective devices, education, audiometric testing, and personnel pre-selection criteria shall not apply to hearing-impaired personnel.

NOTE: *Excessive stretching of the tympanic membrane (eardrum) is the source of pain from high intensity noise in normal hearing individuals. Noise, which is painful to normal hearing, will also be painful to the hearing-impaired who have eardrums. Therefore, the hearing-impaired should be protected from steady-state noise over 120 dB(A) and high-level impulse noise over 150 dB(C) sound pressure level (SPL) (Appendix B, "Definitions and Terminology") and educated accordingly. In addition, any residual hearing should be closely monitored if the hearing-impaired are exposed to high-level noise.*

P.3 AUTHORITY

It is LaRC policy to comply with NASA regulations and Federal Laws as prescribed in the following documents:

- a. Noise Control Act of 1972, as amended.
- b. "Occupational Noise Exposure," 29 Code of Federal Regulations (CFR) 1910.95.
- c. "Basic Program Elements for Federal Employee Occupational Safety and Health Program," 29 CFR Part 1960.
- d. Executive Order 12196 of February 26, 1980, "Occupational Safety and Health for Federal Employees."
- e. American National Standards Institute (ANSI) Standards S3.6-2010, Specification for Audiometers
- f. American National Standards Institute (ANSI) Standards S1.4-1983(R2006)/S1.4A-1985(R2006), Specifications for Sound Level Meters.
- g. NASA Procedural Requirements (NPR) 1800.1C, Chapter 4.8, "Hearing Conservation."

P.4 APPLICABLE DOCUMENTS

- a. NASA Procedural Requirements (NPR) 8715.3, "NASA Safety Manual."
- b. NPR 8715.1, "NASA Safety and Health Handbook Occupational Safety and Health Programs."
- c. Langley Policy Directive (LAPD) 1700.2, "Safety Assignments."
- d. LMS-CP-4760, "Reporting Injuries, Illnesses, Compensation Claims and Unsafe Working Conditions."
- e. American Conference for Governmental Industrial Hygienists, Threshold Limit Values.

P.5 MEASUREMENT/VERIFICATION

None

P.6 CANCELLATION

LPR 2710.1, dated March 6, 2006, is rescinded and shall be destroyed.

Original signed on file

Stephen G. Jurczyk
Deputy Director

DISTRIBUTION:

Approved for public release via the Langley Management System; distribution is unlimited.

Chapter 1**1. INTRODUCTION****1.1 BACKGROUND**

1.1.1 Every effort shall be made to ensure that the work environment affords the necessary protection and conservation of LaRC employees' hearing.

NOTE: *Noise-induced hearing loss is a serious threat to people exposed to hazardous noise levels. Loss of hearing can occur from exposure to impulse or impact noise as well as from exposure to steady-state (continuous/intermittent) noise. The hearing loss may be temporary or may become permanent through repeated unprotected exposure to intense noise. Initial deterioration of hearing may not be apparent to the individual. By the time there is employee awareness of the loss, the impairment may be substantial and irreversible.*

1.1.2 Hearing loss due to noise exposure is preventable.

1.1.3 Preventive efforts shall be taken to conserve the hearing of personnel employed at LaRC by implementing a HCP as addressed in Chapter 3 and Appendix C.

1.1.4 If controls fail to reduce sound levels to within the specified limits, or during the period controls are being initiated, the remaining components of the HCP, as addressed in Chapter 3 and Appendix C, shall be implemented.

1.1.5 Personal hearing protective equipment, under administrative controls (limitation of exposure duration), shall be used as warranted.

1.1.6 The aim of this procedural requirement is to:

- a. Minimize noise generated by LaRC operations.
- b. Prevent occupational noise-related hearing loss among employees.
- c. Provide a work environment free from hazardous noise.
- d. Give priority to engineering procedures to the greatest extent practicable to eliminate, control, or isolate sources of hazardous noise.

1.2 ISSUANCE AND CONTROL

1.2.1 The SFAB shall be responsible for the issuance, distribution, and control of these procedural requirements.

1.2.2 Revisions shall be reviewed with affected organizations and documented on a Transmittal Notice.

1.3 DEFINITIONS AND TERMINOLOGY

Appendices A, "Definitions and Terminology," and B, "Acronyms," are included to assist with using these procedural requirements.

1.4 WAIVERS

1.4.1 Request for waivers to any of the requirements in this LPR shall be submitted to SFAB in writing and processed in accordance with LMS-CP-7151, "Obtaining Waivers for Langley Management System (LMS) Requirements."

Chapter 2**2. RESPONSIBILITIES****2.1 GENERAL**

This chapter describes the responsibilities of the Hearing Conservation Program Officer (HCPO), Occupational Health Services (OHS), and line management.

2.2 HEARING CONSERVATION PROGRAM OFFICER (HCPO)

The SFAB Industrial Hygienist or his/her designee shall be the HCPO and is responsible for:

- a. Implementing and administering the HCP.
- b. Ensuring that personnel who work in hazardous noise areas, including supervisors/managers, are instructed, individually or in groups, by qualified personnel concerning health hazards associated with noise exposure, noise control measures, and the HCP requirements.
- c. Maintaining a current inventory of all hazardous noise areas and noise levels recorded in these areas.
- d. Making recommendations on the placement or reassignment of personnel with significant hearing loss based on the suggestion of the Chief Medical Officer (CMO), Office of Human Capital Management (OHCM), the need for additional employee training and specific limitations on exposures, and environmental monitoring, audiometric test results, and medical findings.
- e. Measuring and analyzing noise levels to evaluate levels of employee exposures recommend appropriate means of controlling exposures found to be excessive and to achieve regulatory compliance.
 - (1) Potential noise exposure areas shall be identified by industrial hygiene audits, investigation of complaints, participation in construction design reviews, and review of purchase requisitions, contracts, and engineering (noise abatement) drawings.
- f. Conducting a pre-operational survey of each new operation, job, or procedure, which has an associated noise hazard potential before normal operations begin; and, identifying tools and equipment which generate excessive noise levels.
- g. Conducting, as requested, resurveys to evaluate each hazardous noise or job area in order to maintain master lists of areas which require hearing protection.

- h. Reviewing facility (i.e., rehabilitation and operational) plans to assure that adequate attention is being given to noise exposure controls.
- i. Maintaining survey data relative to noise levels and employee exposures.
- j. Selecting hearing protective devices (in conjunction with CMO) to be used and assessing the adequacy of all noise control measures.
- k. Ensuring the procurement of personal hearing protection devices.
- l. Conducting an annual review to ensure that employee hearing protection training is adequate.

2.3 OCCUPATIONAL HEALTH SERVICES (OHS)

The OHS, OHCM, shall be responsible for:

- a. Obtaining noise exposure histories, supervising audiometric testing in support of the HCP, and evaluating test results.
- b. Maintaining a registry of personnel working in hazardous noise areas, scheduling and conducting appropriate medical examinations, and/or referring personnel to an audiologist or an appropriate medical consultant.
- c. Notifying employees on detection of a significant hearing loss, and explaining the need and plans for further testing referrals.
 - (1) The employee's supervisor shall be notified if further testing substantiates a significant hearing loss.
 - (2) The supervisor and employee shall be notified if a change in job assignment is recommended as a result of hearing loss.
 - (a) This change shall be implemented in accordance with applicable personnel actions.
- d. Ensuring that physicians have hearing conservation training and that personnel performing audiometry are certified by the Council on Accreditation for Occupational Hearing Conservation.
 - (1) Persons who operate microprocessor audiometers do not need to be certified.
- e. Ensuring that audiometric equipment is calibrated and that ambient noise levels in the test environment permit measurements to 0 dB hearing level (ANSI S3.6-2010).
- f. Maintaining audiometric test results and other medical records pertinent to the HCP.

g. Ensuring that hearing protectors available fit properly. Hearing protectors include molded earplugs, disposable foam inserts, and earmuffs.

2.4 SUPERVISORS

Supervisors shall be responsible for:

- a. Reporting to the HCPO suspected noise hazards in their functional areas.
- b. Supplying the HCPO and the OHS with the names of personnel that may be exposed to noise at or above the action level, employees who complain of excessive noise, or who work in an area where it is difficult to understand a normal conversation when the speaker and listener face each other at a distance of 3 feet. This is required so that the necessary exposure monitoring, training, hearing protective devices, baseline audiometric examinations, and other needed care or examinations can be provided.
- c. Referring to the LaRC Occupational Health Clinic (OHC) for examination and fitting of personal protective devices all personnel who complain of hearing loss or other hearing or ear problems.
- d. Ensuring employees keep their appointments at the LaRC OHC for examination and fitting of hearing protective devices.
- e. Enforcing the wearing of required hearing protective devices to conserve hearing and ensuring that administrative controls are followed.
- f. Advising the HCPO of any changes in operations requiring noise determinations or evaluations.
- g. Assuring procurement (including credit card purchases) and stocking of appropriate personal protection equipment by obtaining the approval of the HCPO.
- h. Assuring procurement (including credit card purchases) of noise generating equipment that complies with Buy Quiet and Quiet by Design requirements by obtaining the approval of the HCPO. See Appendix D.

Chapter 3**3. PROCEDURES**

The procedures for implementing the HCP are presented in this chapter. The procedures include noise hazard evaluation, application of engineering control measures, use of personal hearing protection devices, audiometric testing, worker training, and recordkeeping. Refer to Chapter 2 of this document for responsibilities.

3.1 NOISE HAZARD EVALUATION

Noise hazard evaluation includes identifying hazardous noise areas, registering employees working in these areas, and posting signs and decals in those areas.

3.1.1 Hazardous Noise Areas

3.1.1.1 Areas shall be identified by noise measurement as specified in Appendix C.

3.1.1.2 Areas shall be resurveyed within 30 days of any modification affecting the noise levels.

3.1.1.3 A walkthrough inspection shall be conducted during the safety and industrial hygiene audit if no documentation of noise levels exists in facility noise files.

3.1.1.4 Where significant differences from the previous surveys are noted, the area shall be resurveyed.

3.1.1.5 The results of these surveys shall be recorded by the HCPO.

3.1.1.6 These records shall be retained for at least 40 years.

3.1.1.7 Full work shift dosimetry shall be performed periodically in facilities with operations where personnel are exposed to noise levels in excess of 75 dB(A) for extended periods and there is reason to suspect that exposure may approach the LaRC Action Level of 80 dB(A).

3.1.1.8 Dosimetry for civil servants shall be conducted by the SFAB Industrial Hygienist or his/her designee.

3.1.1.9 Dosimetry procedures and results shall be reviewed by a Certified Industrial Hygienist (CIH).

3.1.1.10 Contractors shall be responsible for conducting their own noise dosimetry in accordance with LaRC, NASA, ANSI and OSHA standards.

3.1.1.11 The HCPO and/or CIH or his/her designee may provide guidance to contractor organizations when requested, but noise dosimetry and worker exposure assessment shall be the responsibility of the contracting company/organization.

3.1.2 Employees Enrolled in the Hearing Conservation Program

3.1.2.1 A register of employees who are enrolled in the hearing conservation program shall be maintained by line management officials within each LaRC facility.

3.1.2.2 The dates, levels of noise, and period of employment in designated hazardous noise areas shall be recorded in these employees' medical records.

3.1.3 Posting of Hazardous Noise Areas or Equipment

3.1.3.1 All work areas or equipment which produce sound pressure levels of 85 dB(A) or greater, or 140 dB(C) sound pressure level for impulse/impact noise, shall be prominently posted with signs and decals as prescribed in Appendix C.

3.1.3.2 These signs and decals are available from the HCPO.

3.2 ENGINEERING CONTROL MEASURES

Engineering control measures include the following:

a. Effective engineering noise controls shall be the primary methods used to protect personnel from the hazards of noise.

(1) All practical design approaches to reduce levels by acoustical engineering shall be explored and used to reduce steady state noise levels to below 80dB(A) and impulse noise levels to below 140 dB(C), or to the maximum extent possible.

(2) In each instance where, at the design stage, the known or suspected noise level is expected to exceed current maximum allowable limits, the cognizant project or facilities engineer shall document and forward these findings to the HCPO.

(3) Corrective action to abate all levels to acceptable levels shall be included.

b. New equipment being considered for purchase is to have the lowest noise emission levels that are technologically and economically feasible and compatible with performance and environmental requirements in accordance with the Buy Quiet and Quiet by Design (BQ/QBD) requirements. See Appendix D.

(1) When purchasing products for use at LaRC, employees shall ensure the vendors specify the maximum noise levels that can be expected.

c. Acoustic considerations shall be included in the criteria of plans and specifications for all new facilities, substantial modification projects for facilities, and for aircraft and spacecraft systems and subsystems.

(1) The objective shall be to ensure, if feasible, an A-weighted sound pressure level of less than 80 dB(A) at all locations in which personnel may be present during normal operations.

3.3 PERSONAL HEARING PROTECTION DEVICES

Selection of personal protection hearing devices depends on the noise level, type of noise (steady state or impulse), and personnel comfort. Appendix C presents descriptions of personal protection hearing devices.

3.3.1 Steady-State Noise Exposure

3.3.1.1 Approved personal hearing protection devices shall be issued to and used by all employees who either work in designated hazardous noise areas or with hazardous noise equipment where there are steady-state noise exposure levels of 85 dB(A) or greater.

3.3.1.2 Hearing protection devices shall be provided to employees for voluntary use whenever there is equipment or operations with the potential to create hazardous noise levels.

3.3.1.3 Earplugs or earmuffs may attenuate steady-state noise from approximately 15 dB in the lower frequencies to approximately 35 dB in the higher frequencies.

3.3.1.4 Earplugs shall be worn in combination with earmuffs when personnel work in areas where the steady-state noise levels are 110 dB(A) and above. This combination provides approximately 5 to 10 dB more attenuation at most frequencies.

3.3.1.5 Occupancy in areas with steady-state noise levels of 120 dB(A) and above requires that hearing protection devices be worn in combination and that a limitation be placed on daily exposure time (administrative controls).

3.3.1.5.1 The tradeoff rate between noise level and allowable daily exposure is 3 dB(A) for every halving of time.

3.3.1.5.2 Personnel occupancy in areas with steady-state noise levels above 140 dB(A) shall be avoided regardless of the duration of exposure.

3.3.2 Impulse Noise Exposure

3.3.2.1 Measures for protecting hearing against impulse noise shall be the same as for steady-state noise.

3.3.2.2 Protective devices shall be worn when impulse noise levels exceed 140 dB(C).

3.3.2.3 Earplugs shall be worn in combination with earmuffs in areas with impulse noise in excess of 165 dB(C).

3.3.3 Availability of Protective Devices

3.3.3.1 Adequate protective devices (disposable earplugs and earmuffs) shall be maintained and made available.

3.3.3.2 Contractors shall make a variety of hearing protection equipment available to their employees.

3.3.3.3 All hearing protective devices shall have a minimum Noise Reduction Rating (NRR) of 27.

3.4 AUDIOMETRIC TESTING AND MEDICAL EVALUATION

3.4.1 Audiometry, as specified in Appendix C, is a primary element of the HCP.

3.4.2 All employees shall be required to take pre-certification and termination audiometric testing who are exposed to:

- a. The action level of 80 dB(A) as an 8-hour TWA, for 30 or more days per year; or
- b. An equivalent TWA of 85 dB(A) 8-hour TWA exposure using a 3 dB exchange rate (as shown in Table 1 below) for any 1 day per year; or

Table 1	
Duration (Hours)	dB(A)
16	82
8	85
4	88
2	91
1	94
0.5	97
0.25	100
0.125 or less	103

- c. Impact or impulsive noise in excess of the limits

Table 2	
Sound Level dB(C)	Permitted Number of Impacts or Impulses per Day
140	100
130	1000
120	10,000

NOTE: *Audiometric testing is used to identify the presence of early changes in hearing sensitivity. In combination with a history of all noise exposure, including off-duty noise exposure, audiometry makes it possible to determine if the issued hearing protection is being used and if engineering controls are adequate. It may be possible to identify individuals who are highly susceptible to noise-induced hearing loss.*

3.4.3 Civil servant audiograms shall be provided by OHS at the LaRC Occupational Health Clinic.

3.4.4 Contractors shall provide audiograms to employees by utilizing a qualified vendor that provides audiometric testing services.

3.4.5 All audiometric testing and review shall be performed by personnel certified by the Council for Accreditation in Occupational Hearing Conservation.

3.5 TRAINING

Training shall be required for personnel working in, supervising, or managing hazardous noise areas.

3.5.1 Personnel Enrolled in the Hearing Conservation Program

3.5.1.1 All personnel who are enrolled in the HCP, shall be trained periodically regarding the permanent nature of noise induced hearing loss, type and use of personal protective measures, and the requirements of the HCP.

3.5.1.2 The symptoms that may be experienced before permanent hearing loss occurs shall be explained and the importance of obtaining early medical/audiometric evaluation of these symptoms shall be stressed.

3.5.1.3 Personnel shall be encouraged to use hearing protectors whenever they are exposed to hazardous noise during off-duty activities (for example, from lawn mowers, firearms, and so forth).

3.5.1.3.1 As designated by the HCPO, or other trained designees, this training shall be performed by OHS at the time of worker audiometric testing. Contractor employees shall be trained by their respective employer.

3.5.2 Supervisory and Managerial Personnel

The HCPO or other trained individuals shall conduct training for supervisors and managers of personnel in hazardous noise areas emphasizing their responsibilities in the program.

3.6 RECORDS

3.6.1 The SFAB shall identify buildings with hazardous noise levels and shall furnish this information to the OHS.

3.6.2 During the safety and industrial hygiene audits of these buildings, a list of the names of the personnel in the HCP shall be updated and furnished to the OHS.

3.6.3 Records pertaining to the conduct of the HCP shall be maintained in accordance with Appendix C.

Appendix A**A. DEFINITIONS AND TERMINOLOGY**

- A.1 Administrative Controls.** Any procedure that limits daily exposure to noise by control of the work schedule.
- A.2 Audiogram.** A record of the threshold of audibility as a function of frequency obtained for each ear during an audiometric examination.
- A.3 Audiologist.** A professional specializing in the study and rehabilitation of hearing, who is certified by the American Speech, Hearing and Language Association, or licensed by a state board of examiners.
- A.4 Audiometer.** An electronic instrument that conforms to the requirements and specifications of ANSI Standard S3.6-1969 used for measuring hearing threshold levels.
- A.5 Baseline Audiogram.** The audiogram against which future audiograms are compared.
- A.6 Decibel.** A unit of measurement of sound level. The decibel level of a sound is related to the logarithm of the ratio of sound pressure to a reference pressure. The dB has meaning only when the reference is known. The internationally accepted reference pressure used in acoustics and at LaRC is 20 micropascals (μPa).
- a. dBA (decibels - A-weighted).** A unit of measurement of sound level corrected to the A-weighted scale, as defined in ANSI S1.4-1983(R2006)/S1.4A-1985(R2006), using a reference of 20 micropascals.
- b. dBC.** A unit of measurement of sound level corrected to the C-weighted scale. The C scale discriminates very little against low frequencies, approximating a uniform response over the frequency range from 25-8,000 Hertz (Hz).
- A.7 Engineering Control.** Any design procedure that reduces the sound level either at the source of the noise or within the hearing zone of the individuals.
- A.8 Hazardous Noise.** This noise consists of the following two types:
- a.** Steady-State Noise is continuous/intermittent noise equivalent to 85 dB or greater A-weighted sound pressure level (dBA) and is considered hazardous.
- b.** Impulse or Impact Noise is sound with a rise time of not more than 35 milliseconds to peak intensity and a duration of not more than 500 milliseconds to the

time when the level is 30 dB below the peak. If the impulses recur at intervals of less than one-half second, they will be considered as steady-state noise. Noise equivalent to 140 dB or greater peak sound pressure level (dBP) is considered to be hazardous.

A.9 Hearing Threshold Level (HTL). The amount, in decibels, by which the threshold of audibility for an ear differs from the standard audiometric level.

A.10 Hertz (Hz). The international symbol for cycles per second. It is the unit of measurement for the frequency of tones.

A.11 Listening Checks. Preliminary checks of the audiometer, performed by the audiometric technician, to detect noise, distortion, intermittent tones, and other audiometer malfunctions, which would preclude valid testing.

A.12 Monitoring Audiogram. Periodic audiometric tests, obtained subsequent to the reference audiogram, which are used to detect shifts in the individual's threshold of hearing.

A.13 Reference Audiogram. A reference audiogram is the first audiogram obtained (and available) after employment begins at LaRC. This audiogram should be obtained when the individual is free from auditory fatigue and other transient otologic pathology. (The term "reference audiogram" also applies to preplacement, preassignment, entrance, or baseline audiograms.)

A.14 Sound Pressure Level. A sound measurement expressed in decibels obtained with a sound level meter that has a flat frequency response (slow time) equivalent to twenty times the common logarithm of the ratio of the measured A-weighted sound pressure to the Standard Reference pressure of 20 micropascals (measured in decibels).

A.15 Sound Level Meter. An electronic instrument, which measures sound levels conforming to the requirements for a Type II sound level meter as specified in ANSI S1.4-1971.

A.16 Time-Weighted Average (TWA). The constant sound level, over an 8-hour workday exposure, which is equivalent to the percent noise exposure as is measured by an audiodosimeter.

Appendix B**B. ACRONYMS**

B.1	ANSI	American National Standards Institute
B.2	BQ/QBD	Buy Quiet and Quiet by Design
B.3	CFR	Code of Federal Regulations
B.4	CIH	Certified Industrial Hygienist
B.5	CMO	Chief Medical Officer
B.6	HTL	Hearing Threshold Limit
B.7	IH	Industrial Hygiene
B.8	LPR	Langley Procedural Requirements
B.9	LaRC	Langley Research Center
B.10	NASA	National Aeronautics and Space Administration
B.11	HCP	Hearing Conservation Program
B.12	HCPO	Hearing Conservation Program Officer
B.13	NHB	NASA Handbook
B.14	NHS	NASA Health Standard
B.15	NPR	NASA Procedural Requirements
B.16	OHO	Occupational Health Officer
B.17	OHCM	Office of Human Capital Management
B.18	OHS	Occupational Health Services
B.19	OHC	Occupational Health Clinic
B.20	OSHA	Occupational Safety and Health Administration
B.21	SFAB	Safety and Facility Assurance Branch
B.22	SPL	Sound Pressure Level
B.23	TWA	Time-weighted average

Appendix C**C. ELEMENTS OF THE NASA LARC HEARING CONSERVATION PROGRAM**

The basic elements of the LaRC Hearing Conservation Program includes noise hazard evaluation, posting of hazardous noise areas and equipment, personal hearing protection devices, and monitoring audiometry.

C.1 NOISE HAZARD EVALUATION

C.1.1 Noise measurements should be made by industrial hygienists or other personnel who have been trained in noise evaluation techniques whenever any information, observation, or calculation indicates that an employee may be exposed to noise at or above the action level. 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 3 feet.

C.1.2 A noise survey should be conducted with a sound level meter to identify areas and equipment which have intensity levels of:

- a. 85 dBA or greater for steady and/or intermittent noise.
- b. 140 dB peak sound pressure or greater for impact/impulse noise.

C.1.3 Sound Level Meter

C.1.3.1 The sound level meter should conform, as a minimum, to the requirements for a Type 2 sound level meter as specified in ANSI Standard S1.4-1983(R2006)/S1.4A-1985(R2006).

C.1.3.2 Measurements should be taken at the approximate position of the worker's more exposed ear, using the A-weighting network and slow meter response for continuous noise and C-weighting for impulse noise.

C.1.3.3 A sufficient number of readings should be taken to account for variations in noise levels.

C.1.4 Acoustical Calibrator (Pistonphone)

C.1.4.1 The sound level meter should be calibrated with the acoustic calibrator, before and after noise measurements, on the day that measurements are to be made.

C.1.4.2 The Industrial Hygienist using the sound level meter should maintain a record of these daily calibrations.

C.1.5 Annual Calibration

C.1.5.1 Annually, the acoustic calibrator should be comprehensively calibrated by the factory or factory equivalent.

C.1.5.2 The results of these procedures should be maintained on calibration worksheets.

C.1.5.3 When the equipment is found to be out of calibration, the Hearing Conservation Program Officer should be notified that corrective actions are being taken.

C.2 POSTING OF HAZARDOUS NOISE AREAS AND EQUIPMENT

C.2.1 Caution signs, visible to personnel entering or working in the area, should be posted at entrances to or on the periphery of hazardous noise areas to alert workers and visitors that a noise hazard exists and that proper precautions should be taken.

C.2.2 Signs should have wording in black letters on a yellow background as follows:

CAUTION - NOISE AREA - MAY CAUSE HEARING LOSS - USE PROPER HEARING PROTECTION
--

C.2.3 Caution decals, designed for individual pieces of equipment, should be affixed on each tool or piece of equipment which produces hazardous noise levels.

C.2.4 These decals should have black lettering on a yellow background as follows:

CAUTION - NOISY EQUIPMENT - MAY CAUSE HEARING LOSS - USE PROPER HEARING PROTECTION

NOTE: Exceptions may be made when an entire space is designated as a hazardous noise area and the tools/equipment are stationary.

C.3 PERSONAL HEARING PROTECTION DEVICES

Personal hearing protection devices include earplugs and earmuffs.

C.3.1 Care of Earplugs

C.3.1.1 Properly fitted earplugs will not cause damage to the normal ear canal provided the plugs are kept reasonably clean.

C.3.1.2 Prefformed earplugs (single and triple flange) and foam earplugs should be cleaned with a mild soap and water solution and rinsed thoroughly.

C.3.2 Hand-Formed Earplug Inserts (Disposable)

C.3.2.1 Hand-formed earplug inserts do not require medical fitting or an inventory of multiple sizes.

C.3.2.2 Employees should be instructed how to use hand-formed earplug inserts.

C.3.2.3 Cutting hand-formed plugs into halves should not be permitted since this will result in an inadequate mass and markedly reduced noise attenuation.

C.3.2.4 For hygienic reasons, hands should be clean when preparing hand-formed earplugs for insertion.

C.3.3 Earmuffs

C.3.3.1 Earmuff requirements include:

- a. Type II earmuffs are designed to be worn with the suspension system over the head, in back of the head, or under the chin.
- b. Earmuffs are readily seen by supervisors.
- c. When earmuffs are used, the headband should be properly adjusted to ensure a snug fit.
- d. When eyeglasses are worn with earmuffs, it is important that the ear cup seals of the earmuffs fit well around the temples of the eyeglasses. Even a small "leak" defeats the purpose of wearing earmuffs.
- e. Earmuffs should be periodically inspected for torn, punctured, or hardened seals.
- f. Damaged units should be discarded and replaced.
- g. Units issued to individuals should be kept clean from dirt or other debris that could cause possible health problems.

C.4 MONITORING AUDIOMETRY

All monitoring audiometry should comply with Occupational Safety and Health Act (OSHA) 29 CFR 1910.95 (g), (h), Appendices C, D, and E.

C.5 RECORDS

C.5.1 The CMO should ensure that records pertaining to the HCP are maintained for 40 years.

C.5.2 Records should include as a minimum:

- a. Records relative to disposition of personnel for whom administrative noise controls have been recommended and those who are being carefully monitored, including:
 - (1) special actions and/or recommendations, which are directed at engineering controls.
 - (2) data and information concerning the calibration and repair of sound measuring equipment and audiometers.
 - (3) data and information on audiometric test booths, personnel hearing protectors, and auditory risk criteria.
 - (4) data and information for use in the education program of personnel exposed in hazardous noise areas.

- b. Records and results of all audiometric examinations and all other pertinent information should also be maintained as a permanent part of the individual's medical record and include:
 - (1) the audiometric test results and training performed for hearing conservation purposes.
 - (2) an occupational noise exposure history and pertinent noise survey data and/or relevant non-occupational noise exposure.

C.5.3 A current Center-wide register of personnel who are enrolled in the HCP should be kept and appropriate entries should be made in the individual's medical record.

Appendix D

D. ELEMENTS OF THE NASA BUY QUIET AND QUIET BY DESIGN PROGRAM

D.1 "Buy Quiet and Quiet by Design" Programs shall:

- a. Meet realistic and achievable baseline noise criteria and optimize noise emission criteria based on individual and specific operational and site conditions;
- b. Encompass 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, to minimize noise-exposure hazards to personnel;
- c. Require review of all equipment expected to produce noise which is approaching hearing conservation levels of 80 dBA and higher under a variety of site and operational considerations.
- d. Identify noise emission and control requirements for equipment procurement, specifications, and design;
- e. Contain provisions for "Buy Quiet and Quiet by Design" program support, promotion, training, and management sponsorship;
- f. Be individualized to meet Center-specific needs, configuration, and other relevant factors;
- g. Contain provisions for a documented waiver process that accommodates specialized research project items or flight hardware.