

Document Number: GLM-QS-1800.1.4

Revision: Revision F

Effective Date: 5/9/2012

Expiration Date: 5/9/2017

Occupational Health Programs Manual –Chapter 4

Respiratory Protection Program w/Change 2 (9/30/2015)

Approved by: QS/Chief, Safety and Health Division

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Change Record

Rev.	Effective Date	Expiration Date	GRC25, Change Request #	Description
F	5/9/2012	5/9/2017	285	Biannual update
Change 1	4/11/2014	5/9/2017	N/A	Administrative change to add front cover and change history log to comply with NPR 1400.1, deleted "The agency policy providing guidance for the selection and use of respiratory protection," in Section 4.0 and added "The GRC shall implement requirements of"
Change 2	9/30/2015	5/9/2017	N/A	Administrative change to remove hyperlinks.

***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 4—Respiratory Protection 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 March 2012. The current version is located on the Glenn Research Center intranet within the BMS Library. Approved by 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 potential respiratory hazard concerns in the workplace and to provide for the safe use of respiratory protection equipment. This Chapter details the current procedures and practices for the selection and use of respiratory protection at the NASA Glenn Research Centers Lewis Field and Plum Brook Station sites.

2.0 APPLICABILITY

This chapter is applicable to all civil servant (CS) and support service contractor (SSC) employees assigned to Glenn Research Center (GRC) sites, construction contractors, students, and visitors. SSCs, construction contractors, and visitors' employers are responsible for the health and safety of their employees. Employers with employees using respiratory protection equipment shall have a written Respiratory Protection Program, as required by OSHA, and shall ensure employees comply with all program requirements including medical clearance training, respirator fit tests, proper use and maintenance of respiratory protection equipment, and any other requirements as set forth in this Chapter.

3.0 BACKGROUND

GRC, as part of its effort to provide a safe and healthful work environment, is committed to protect all employees from exposure to harmful concentrations of hazardous or toxic fibers, dust, fumes, mists, vapors, gases, or oxygen-deficient atmospheres. Where effective engineering controls are not feasible or while they are being instituted, respiratory protection measures described herein shall be used to protect workers. The Respiratory Protection Program encompasses all aspects of respiratory protection, from the initial hazard assessment, where the need for a respirator is determined, to the program evaluation, where the effectiveness of the program is assessed. The flow chart in Appendix B provides an outline of the Respiratory Protection Program managed by the Safety and Health Division (SHeD) Respiratory Protection Program Lead.

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, wherein it 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 Respiratory Protection Standard for General Industry (29 CFR 1910.134) and the OSHA Respiratory Protection Standard for Construction (29 CFR 1926.103), 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)

It is NASA's policy to adhere to OSHA or ACGIH occupational exposure limits (OELs), whichever is more protective, to ensure worker protection. Given the inherent unknowns common to research operations, in the absence of an established OEL, the most protective approach shall be employed. The SHeD industrial hygienists (IHs) provide technical support in determining OELs to ensure worker protection.

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5.0 RESPONSIBILITIES

5.1 SHed Respiratory Protection Program Lead

The NASA GRC Respiratory Protection Program is implemented with the support of multiple personnel. The OSHA Respiratory Protection Program Administrator is SAIC/Margaret Bold, SHed IHs support hazard and exposure assessments, Singleton/Medical Services provides medical clearance exams, NASA/SHed Specialists provide technical support. Expertise for SCBA tasks is procured on an as-needed basis.

The Respiratory Protection Program Lead shall:

- Develop and implement a written Respiratory Protection Program to govern the selection and use of respiratory protective devices
- Conduct or facilitate baseline hazard assessments of operations, tasks, or procedures that possess the potential to create harmful airborne contaminants or oxygen-deficient atmospheres to determine specific respiratory protection needs
- Provide GRC Medical Services with an employee-specific respirator selection and use information to support medical clearance decision making
- Provide initial respiratory protection training and facilitate annual refresher training.
- Provide the Human Capital Development Division (HCDD) with the course content for the respiratory protection 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 employee training history; provide a list of employees assigned the SATERN curriculum for Respiratory Protection.
- Provide employees and supervisors with a respirator selection and cartridge change schedule (RSCCS) to document the respiratory protective equipment selected for the respiratory hazard(s), and to provide a cartridge change schedule to protect against gases and vapors
- Facilitate the performance of personal exposure assessments representative of the exposures of employees in similar exposure groups
- Facilitate self-contained breathing apparatus (SCBA) inspection and maintenance tasks to ensure program compliance
- Respond to requests for voluntary use of disposable filtering facepiece respirators (dust masks) to assess the hazard and ensure compliance with Appendix C of the written respiratory protection program

5.2 SHed Environmental Protection or Occupational Health Specialists

The SHed Specialists shall

- Provide annual respirator fit testing, including a hands-on training component
- Maintain an annual documentation file for each employee including the fit test results, training quiz, the hazard assessment, and the RSCCS
- Issue the completed RSCCS to each employee and their supervisor
- Maintain the Respiratory Protection Program database to track program enrollment status, training, fit testing and medical clearance dates, hazard assessment data, and respiratory protection equipment selection
- Provide employees, and supervisors as needed, with reminders to ensure compliance with annual training, fit testing, and medical clearance requirements
- Assist the Respiratory Protection Program Lead with SCBA inspection and maintenance tasks to ensure program compliance, including SCBA inventory, SCBA annual bench testing, SCBA breathing air cylinder requalification, SCBA hands-on training, and the annual purge and refilling of all SCBA breathing air cylinders

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- Facilitate and maintain a permanent record of SCBA breathing air cylinder recharging by the Brook Park Fire Chief, as requested by research users
- Assist SHeD IHs with personal exposure assessment sampling
- Perform annual program evaluations of CSs in the program to ensure continued program compliance and effectiveness
- Perform periodic audits of the onsite SSC respiratory protection programs for compliance and effectiveness

5.3 Supervisor of Respirator User

Supervisors shall

- Ensure a hazard analysis and/or assessment, job hazard analysis (JHA), or a Chemical Hygiene Plan standard operating procedure (SOP) has been developed for each task in their area requiring respiratory protection, whichever is most appropriate
- Ensure SHeD IH, has reviewed the operation or task to ensure the hazard assessment, JHA, or Chemical Hygiene Plan SOP has captured all of the elements of the tasks and the associated hazards, prior to the use of the material
- Ensure that employees are knowledgeable about the hazards posed, the safe work practices required, and the prescribed PPE, including respiratory protective devices, required for areas in which they work and for the tasks they perform
- Ensure areas, where the use of hazardous chemicals requires respiratory protection, are properly ventilated, properly marked, and access is restricted
- Be aware of the proper use and limitations of respiratory protection devices by completing a respirator training class or similar awareness training
- Enforce the requirements of the Respiratory Protection Program in their area, including employee compliance with training, medical clearance, fit testing, and where required, adherence to the respirator cartridge change schedule

5.4 Respirator Users

Those using respiratory protection shall

- Support their supervisor in ensuring a hazard assessment, JHA, or SOP has been conducted of their operation or task, potentially requiring a respirator, prior to the use of the potentially hazardous material(s)
- Notify their supervisors of any operational changes or new uses of the materials requiring respiratory protection
- Coordinate with the SHeD IH for an exposure assessment, prior to the performance of the task requiring the use of a respirator; where possible, the respirator user shall provide the SHeD IH with advance notification of respirator use (ideally 1 week), so that the appropriate sampling media and scheduling can be arranged
- Comply with the RSCCS provided by the Respiratory Protection Program Lead for each task requiring a respirator
- Comply with all aspects of the respirator program, including but not limited to, annual respirator fit testing, annual respirator training, annual medical evaluation, proper use, cleaning, maintenance, and storage
- Ensure proper respirator fit by performing a user seal check before entering into a hazardous environment
- Notify Medical Services and their supervisor if they experience any signs or symptoms of overexposure

5.5 Medical Director, Occupational Medicine Services

The Medical Director shall

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- Provide medical evaluations of personnel identified by their organizations as respirator users, in conformance with protocols established by OSHA, NASA, and where required, other nationally recognized standards, as applicable
- Provide a written opinion, to the Respiratory Protection Program Lead, stating the employee is medically able to use the respirator, or any limitations on respirator use related to a medical condition, or related workplace conditions in which the respirator will be used, and the need for any follow-up evaluations (In addition, they shall maintain records of all occupational medicine activities associated with the support of the GRC Respiratory Protection Program.)
- Provide employee access to medical records in accordance with 29 CFR 1910.1020

5.6 Human Capital Development Division Chief

The HCDD shall

- Maintain SATERN records for employees who have completed respiratory protection training
- Coordinate with the Respiratory Protection Program Lead to ensure the SATERN Respiratory Protection Training curriculum is current and activated to issue annual training reminders for CS employees active in the Respirator Program

5.7 Safety and Health Division Chief

The Chief of SHeD shall ensure a qualified individual is identified as the OSHA Respiratory Protection Program Administrator, to carry out the responsibilities as set forth in the GRC Respiratory Protection Program. The qualified individual shall be identified by the organization tasked with the implementation of the Respiratory Protection Program. The Chief of SHeD shall provide support to the Respiratory Protection Program Lead in the performance of their duties and shall maintain respiratory protection program records and documentation provided by the Respiratory Protection Program Lead.

6.0 REQUIREMENTS

6.1 Hazard Assessment (*OSHA 29 CFR 1910.132(d) and 29 CFR 1910.134(d)*)

The selection of any PPE including respirators is based on an assessment of the hazards. Guidance for this process is covered in the Glenn Safety Manual (GSM), Chapter 33, Job Hazard Analysis. Respiratory hazards may exist in the workplace in the form of dust, fibers, nanoparticles, fumes, mists, gases, vapors, and biological materials.

During the hazard assessment, several factors must be investigated including

- The nature of the task being performed and the potential for generation of airborne contaminants
- The physical, chemical, and toxic properties of the material
- The contaminant concentration and duration of exposure
- The environmental factors (heat and humidity)
- Worker exertion level while performing the task
- The potential for engineering and administrative controls
- Additional PPE needed

If an inhalation hazard is identified based on information from the hazard assessment, the SHeD IH will recommend the use of controls. Engineering and administrative controls, such as ventilation, chemical substitution, and limiting or restricting personnel access to areas, will be used whenever feasible and practical. When engineering controls are not feasible and practical, or do not completely eliminate the hazard, respiratory protection will be used. For tasks that are of short duration, infrequent or non-routine, respiratory protection can be used.

To meet the hazard assessment requirement, respirator users shall complete the following documentation:

- Job Hazard Analysis for the task requiring a respirator, as detailed in the GSM Chapter 33

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- Respiratory Protection Hazard Assessment form completed and reviewed during each respirator training session and during each respirator fit test.

6.1 – The SHed verification procedure to ensure compliance with the requirements listed in this section shall be a review of the employee’s Respiratory Protection Hazard Assessment Form, which is kept in the employee’s respiratory protection file.

Verification of the completion of a JHA is covered in the GSM, Chapter 33.

6.2 Exposure Assessment (*OSHA 29 CFR 1910.134(d)*)

For the selection of respiratory protection, the employer is required to assess the employee’s actual inhalation exposure to the worksite hazard(s). The exposure assessment is done in the workplace, by way of air sampling, modeling, or some other means, to determine what airborne hazards are present, what the concentration is, and what level of respiratory protection is needed. Exposure assessment data provides the basis for the respirator users written RSCCS, incorporating OSHA assigned protection factors (APFs) and maximum use concentration (MUC) requirements, and respirator manufacturer’s canister and cartridge service life specifications.

If there is more than one employee in an area performing the same task requiring respiratory protection, one exposure assessment can be performed for all employees performing that task. These are referred to as exposure assessments for similar exposure groups.

It is the responsibility of the respirator user to notify the SHed IH, as appropriate, when they are going to perform the task requiring the use of a respirator. This notification shall give the SHed IH as much notice as possible (ideally 1 week) so the appropriate sampling media and scheduling can be arranged.

6.2 – The SHED verification procedure to ensure compliance with the requirements listed in this section shall be a review of the exposure assessment data referenced on the employees’ RSCCS, which is kept in the employee’s respiratory protection file. Copies of all respiratory protection exposure assessment data are kept on the SHed server

6.3 Selection of Respirators (*OSHA 29 CFR 1910.134(d)*)

6.3.1 General Requirements

For each employee, the Respiratory Protection Program Lead shall choose either an air-purifying respirator or an atmosphere-supplying respirator for the airborne hazard based upon the JHA and, where possible, exposure assessment data. Proper selection of respirators shall be made according to the OSHA Respiratory Protection Standard, 29 CFR 1910.134. Only National Institute for Occupational Safety and Health (NIOSH) certified respirators shall be used in accordance with the conditions of certification.

When a negative pressure respirator has been selected for an employee, and the physician or other licensed health care professional (PLHCP) finds a medical condition that may place the employee’s health at risk, a powered-air purifying respirator (PAPR), which provides a positive pressure in the facepiece, shall be provided by the employer, subject to the approval of the PLHCP. Employees may choose to use a PAPR in lieu of a negative pressure respirator; however, the use of a PAPR is subject to the approval of the Respiratory Protection Program Lead and the employee’s supervisor.

6.3.2 Air-Purifying Respirators for Non-Immediately Dangerous to Life or Health Atmospheres (*OSHA 29 CFR 1910.134(d)(3)*)

Air-purifying respirators (APR) function by removing contaminants from the ambient air by passing the air, which is moved by the user’s breathing action or by a blower, through an air-purifying filter, cartridge, or canister. The respirator filters, cartridges, or canisters contain a particulate filter or an adsorbent, or a combination of both, used to remove the airborne contaminants. The respirator selected shall maintain the employee’s exposure to the hazardous substance, when measured outside the respirator, at or below MUC.

Respirator filters, cartridges or canisters have a limited service life, thus the respirator user shall be knowledgeable about “end-of-service-life” indicators, and shall be provided with a written RSCCS for each respiratory hazard

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identified. The RSCCS enables the respirator user to easily identify the respirator and filtering devices required for the identified tasks, and specifies the change schedule for the selected filters, cartridges, or canister.

Full-facepiece respirators shall be used when there is potential for flying particles, liquid or chemical splashes, or a corrosive atmosphere.

Air-purifying respirators shall not be used in immediately dangerous to life and health (IDLH) atmospheres including oxygen-deficient atmospheres and unknown atmospheres.

6.3.1 & 6.3.2 – The SHed verification procedure to ensure compliance with the requirements listed in these sections shall be a review of the employees RSCCS which is kept in the employee’s respiratory protection program file and the employees Medical Records file kept by Medical Services.

6.3.3 Voluntary Use of Disposable Filtering Facepiece Respirators (*OSHA 29 CFR 1910.134, Appendix D*)

A disposable filtering facepiece respirator (also referred to as a dust mask or disposable respirator) may only be used on a voluntary basis for exposures to low concentrations of nuisance particulate matter and for protection against some types of biohazard agents such as mold. Use of filtering facepiece respirators requires the completion and submission of the form located in Appendix C of the written respiratory protection program, “Voluntary Use of Disposable Filtering Facepiece Respirators”.

Requirements include a review of OSHA 29 CFR 1910.134, Appendix D, a review of an online manufacturer training video for the disposable filtering facepiece, and compliance with all other aspects of the Respiratory Protection Program, except for respirator medical evaluation and the respirator fit test.

For involuntary or required use of a filtering facepiece, compliance with all aspects of the Respiratory Protection Program, including medical evaluation and respirator fit testing, is required.

6.3.3 – The SHed verification procedure to ensure compliance with the requirements listed in this section shall be a review of the employee’s “Voluntary Use of Disposable Filtering Facepiece Respirators”, form located in the respiratory protection file “dust masks”, and where applicable, the employee’s respiratory protection program file. The form is found in Appendix C of the written RPP.

6.3.4 Atmosphere-Supplying Respirators for IDLH Atmospheres (*29 CFR 1910.134 (d)(2)*)

IDLH atmospheres, including oxygen-deficient atmospheres and unknown atmospheres, require the highest level of respiratory protection and reliability. Atmosphere-supplying respirators provide a continuous supply of compressed breathing air to the user. Employees entering IDLH atmospheres shall be provided with either 1) a full-facepiece pressure-demand SCBA, certified by NIOSH for a minimum service life of 30 min, or 2) a combination full-facepiece pressure-demand supplied-air respirator (SAR) with an escape auxiliary self-contained air supply.

For atmosphere-supplying respirators, a stationary source of compressed breathing air is delivered to the respirator user through a pressure-demand device. A pressure-demand device ensures a positive pressure inside the facepiece relative to ambient air, so that any leakage of air is outward rather than into the facepiece. More breathing air is introduced into the facepiece as a result of a pressure drop when the wearer takes a breath. Atmosphere-supplying respirators shall be of the pressure-demand, open-circuit type.

The advantages and disadvantages of using atmosphere-supplying respirators should be considered prior to selection for use. SCBAs have a limited service life of 30 to 60 min, depending on the size of the breathing air tank and the conditions of use. A SAR can be used for a longer duration than a SCBA, but the trailing airline may restrict the movement of the user and has the potential to come into contact with machinery or vehicles that could sever the line or restrict the flow of air.

Atmosphere-supplied respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used. Currently, escape-only respirators are located in the PBS B–2 facility, the PBS Space Power Facility (SPF), and the PBS Hypersonic Test Facility (currently inactive)

6.3.4 – The SHed verification procedure to ensure compliance with the requirements listed in this section shall be a review of employee’s RSCCS and the SCBA equipment list, which identifies the type of equipment being used by

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the employee.

6.4 Medical Evaluation (29 CFR 1910.134 (c)(1)(ii) and Appendix C and NASA NPR 1800.1, Chapter 2.9)

The use of respiratory protection places a physiological burden on the respirator user. A medical evaluation shall be performed for each employee required to use a respirator in the workplace to determine the employee's ability to wear the selected respiratory protection. The employee's medical evaluation shall be performed by a PLHCP prior to the initial fit test or use of a respirator and annually thereafter. Prior to the medical evaluation, the Respiratory Protection Program Lead shall provide the PLHCP information on the type and weight of the respirator selected, the duration and frequency of use, the expected physical workload, additional protective clothing to be worn, and any temperature and humidity extremes encountered. The PLHCP shall perform a medical evaluation that includes using a medical questionnaire that meets the requirements of 29 CFR 1910.134, Appendix C, and a review any other health or physical conditions that are pertinent. The PLHCP shall provide a written opinion to the employee and the Respiratory Protection Program Lead regarding the employee's physical ability to use a respirator and any limitation of use including the need for any follow-up evaluations.

When a negative pressure respirator has been selected for an employee and the PLHCP finds a medical condition that may place the employee's health at risk, a PAPR, which provides a positive pressure in the facepiece, shall be provided if the PLHCP determines that such a respirator can safely be used.

If respirator user experiences physical symptoms related to respirator use, they shall contact Medical Services immediately for a review of their medical status.

6.4 – The SHed verification procedure to ensure compliance with the requirements listed in this section shall be a review of SHed IH database shared with Medical Services, and the employees' medical file.

6.5 Training (29 CFR 1910.134 (k))

Respiratory protection training is required for all employees who are required to use respirators, prior to the use of a respirator and annually thereafter. The training shall be comprehensive and understandable and recur annually or more often, if necessary. Respiratory protection training can consist of classroom instruction including a hands-on component or a combination of viewing training videos followed by an annual fit test that includes a hands-on review of critical information. Employees shall be able to demonstrate they understand

- Why the respirator is necessary and how improper fit, usage, or maintenance can compromise the protective effect of the respirator
- What the limitations and capabilities of the respirator are
- How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions
- How to inspect, put on and remove, use, and check the seals of the respirator
- What the procedures are for cleaning, maintenance, and storage of the respirator
- How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators
- How to recognize filter and cartridge "end-of-service-life" indicators

Employees who use a filtering facepiece on a voluntary basis shall be provided with the basic advisory information required by 29 CFR 1910.134, Appendix D, as well as completing Appendix C of the written respiratory protection program.

In addition to respirator training, hazard communication training is a component of the program, where employees are trained in the respiratory hazards to which they are potentially exposed during routine and emergency situations. Training about the respiratory hazards is specific to the task and hazard. SHed offers training for the following:

- Hazard Communication Program
- Chemical Hygiene Plan

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- OSHA-regulated materials training
- Silica awareness
- Nanomaterials
- Lunar dust and/or simulants awareness
- Asbestos, lead, and mercury awareness
- Hexavalent chromium awareness

Also, supervisors provide on-the-job training where a Material Safety Data Sheet (MSDS) is reviewed and the hazards discussed.

6.5 – The SHeD verification procedure to ensure compliance with the requirements listed in this section shall be a review of the respiratory protection training records kept by the HCDD, the employee’s respiratory protection program file, and the annual respirator program evaluation file.

6.6 Fit Testing (*OSHA 29 CFR 1910.134 (f) and Appendix A*)

All employees using a tight-fitting facepiece respirator shall pass an appropriate quantitative fit test (QNFT) or qualitative fit test (QLFT). The QNFT is the preferred method of testing a proper facepiece fit and is required for SCBA and full-facepiece pressure-demand SAR.

The Respiratory Protection Program Lead shall select the appropriate type of respirator for each employee, utilizing hazard assessment and exposure assessment data specific to the task. The employee shall then be able to choose their respirator from a sufficient number of respirator models and sizes so that the respirator is acceptable to and correctly fits the employee.

The employee shall be fit tested by a SHeD Specialist, after the initial medical clearance but prior to the first use of the respirator and annually thereafter. Additional fit tests shall be conducted when there are changes in an employee’s physical condition that could affect respirator fit.

The effectiveness of a tight-fitting respirator is dependent on an airtight seal between the respirator and the user’s face. Thus, an employee will not be fit tested if facial hair comes between the user’s face and the respirator facepiece seal. Spectacles, goggles, face shields, or welding helmets shall also be worn so as to not interfere with the seal. Prior to being fit tested, employees shall demonstrate the ability to perform a user seal check by conducting a negative and positive pressure test. Upon completion of the fit test, each employee will be issued a certification card, which identifies the employee, the type of respirator fit tested, and the fit test expiration date.

Upon completing the fit test and compliance with annual training and medical clearance requirements, respirator users will be issued a RSCCS that provides ordering information for their respirator, the appropriate filters and cartridges, and the cartridge change schedule to protect against gases and vapors.

6.6 - The SHeD verification procedure to ensure compliance with the requirements listed in this section shall be a review of the annual fit test record and the RSCCS in the employee’s respiratory protection program file.

6.7 Use of Respirators (*OSHA 29 CFR 1910.134 (g) and Appendix B-1*)

6.7.1 General

Requirements are established for the use of respirators: to prohibit conditions that may result in facepiece seal leakage; to prevent employees from using respirators in hazardous environments; to ensure continued effective respirator operation throughout the work shift; and to establish procedures for the use of respirators in IDLH atmospheres.

The effectiveness of a tight-fitting respirator is dependent on an airtight seal between the respirator and the user’s face, and properly functioning valves. Facial hair that comes between the sealing surface of the facepiece and the face or that interferes with valve function is not permitted. Spectacles, goggles, face shields, or welding helmets

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shall be worn so as not to interfere with the seal. Employees who wear spectacles (glasses) and are required to use a full-facepiece respirator shall be issued a respirator spectacle kit with prescription lenses from Medical Services.

For all tight-fitting respirators, a user seal check, as mandated by OSHA 29 CFR 1910.134 Appendix B-1, shall be performed to ensure an adequate face-to-facepiece seal. Respirator users shall perform a user seal check by conducting the negative and positive pressure test each time the respirator is worn.

Air-purifying respirators can only be worn in environments with sufficient oxygen and known contaminants. The Respiratory Protection Program Lead shall develop a respirator cartridge change schedule for each task, using information from the hazard assessment, exposure assessment, and cartridge manufacturer. The cartridge change schedule determines when the respirator user must replace the filters or cartridges. The respirator user is responsible maintaining compliance with the cartridge change schedule. Organic vapors can migrate through the respirator cartridge carbon bed without airflow; thus, the use of organic vapor cartridges is limited to one shift.

Respirator users shall be permitted to leave the work area when they need to wash their faces and respirator facepiece to prevent eye or skin irritation, if they detect vapor or gas breakthrough, if they experience changes in breathing resistance or leakage of the facepiece, and/or they need to change the filter, cartridge, or canister elements as specified in the RSCCS. Reentry into hazardous atmosphere shall not be undertaken until the respirator is replaced or repaired. If employees experience physical symptoms, they shall immediately leave the area and report to Medical Services and notify their supervisor.

Respirator users shall not wear respirators in the presence of hazardous atmospheres other than those identified in the respirator user's RSCCS.

6.7.2 Use of Respirators in IDLH Atmospheres (OSHA 29 CFR 1910.134 (g))

Only full-facepiece pressure-demand SCBA certified by NIOSH for a minimum service life of 30 min or a combination full-facepiece pressure-demand SAR with an auxiliary self-contained air supply may be used in IDLH atmospheres including oxygen-deficient and unknown atmospheres.

One employee or when needed, more than one employee, shall be located outside the IDLH atmosphere. Visual, voice, or signal line communication shall be maintained between the employee in the IDLH atmosphere and the employees located outside the IDLH atmospheres.

The employee(s) located outside the IDLH atmosphere shall be trained and equipped with an atmosphere-supplied respirator and retrieval equipment to provide effective emergency rescue; shall call 911, GRC Dispatch, before they enter the IDLH atmosphere to provide emergency rescue; and shall provide the necessary assistance appropriate to the situation.

6.7 - The SHeD verification procedure to ensure compliance with the requirements listed in this section shall be a review of the annual program evaluation records, the research SOP's for research tasks requiring the use of SCBA's, and the SCBA maintenance records.

6.8 Care and Maintenance of Respirators (OSHA 29 CFR 1910.134 (h) and Appendix B-2)

Respirator users are responsible for the cleaning, disinfection, inspection, and maintenance of their personal respirators. Respirator users needing support for respirator care and maintenance should contact the Respiratory Protection Program Lead or the SHeD specialists. Cleaning, Disinfection, and Storage of Respirators

Respirators shall be cleaned and disinfected as often as necessary to be maintained in a sanitary condition, in a manner that prevents damage to the respirator and does not cause harm to the user. OSHA 29 CFR 1910.134, Appendix B-2, Respirator Cleaning Procedures, shall be followed or procedures recommended by the manufacturer, where equivalently effective. If the respirator is used periodically throughout the day, at a minimum, it must be cleaned at the end of the day or shift. Individually wrapped cleaning towelettes issued by NASA stock may be used, but they must be supplemental to OSHA or manufacturer respirator cleaning procedures.

Respirators shall be stored to protect them from damage, contamination, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals, and they shall be stored to prevent deformation of the facepiece and the inhalation and exhalation valves.

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6.8.1 Respirator Inspections

Respirators used in routine situations shall be inspected by the user before each use and during cleaning. Respirator inspections shall include a check of respirator function, tightness of connections, and the condition of the various parts, including but not limited to, the facepiece, head straps, valves, connecting tube, cartridges, canisters, or filters. The inspection shall also include a check of the elastomeric parts for pliability and signs of deterioration. Defective respirators shall be turned into SHED for repair or replacement.

6.8.2 Additional Care and Maintenance for Atmosphere-Supplying Respirators (NFPA 1852, CGA 7.1, and DOT 49 CFR Part 178)

SCBA used for research, and not maintained for emergency use, shall be inspected before and after each use. SCBA used for emergency use shall be inspected before and after each use and monthly. The external surface of the SCBA and the facepiece components shall be cleaned, disinfected, and stored after each use according to the manufacturer's instructions. The SCBA inspections shall be performed by the respirator users to assure continuing familiarity with the respirator and shall include a determination that the regulator and warning devices are functioning properly.

If defects are found during an inspection, they shall be brought to the attention of the Respiratory Protection Program Lead. The defective SCBA shall be marked "Danger—Defective SCBA—Do Not Use" and returned to Respiratory Protection Program Lead for immediate repair. The Respiratory Protection Program Lead shall ensure that all repairs shall be performed by the manufacturer or personnel trained by the manufacturer of the equipment and shall maintain a detailed record of all repairs conducted on these systems.

SCBA shall be tested at least annually on a breathing machine, or SCBA "bench tested." The testing shall meet the requirements specified in National Fire Protection Association (NFPA) 1852 (2008). The Respiratory Protection Program Lead shall facilitate the SCBA annual breathing machine testing (bench testing).

SCBA breathing air cylinders shall be maintained in a fully charged state and shall be recharged when the pressure falls to 90 percent of the manufacturer's specified pressure level. The SHED Specialist shall facilitate the recharging of the SCBA breathing air cylinders upon request; currently, the SHED Specialist transports SCBA cylinders to the City of Brook Park Fire Station for recharging with Grade E breathing air. Compressed breathing air stored in SCBA breathing air cylinders shall be replaced at least annually. The SHED Specialists shall maintain a permanent record of cylinder recharging.

Compressed breathing air used for respiration shall meet at least the requirements for Grade D breathing air as described in American National Standards Institute (ANSI)/Compressed Gas Association Commodity Specification for Air, Compressed Gas Association (CGA) G7.1-1989. Breathing air cylinders shall meet the following requirements: the cylinders shall be hydrostatically tested by a licensed cylinder retester in accordance with the appropriate Department of Transportation (DOT) regulation and cylinders of purchased air shall have a certificate of analysis from the supplier for a minimum of Grade D breathing air.

The Respiratory Protection Program Lead shall facilitate the periodic SCBA cylinder requalification, including hydrostatic testing, according to DOT specifications. The retest facility shall be a qualified DOT Research and Special Programs Administration retest facility with a valid retester identification number. Generally, composite cylinders are requalified every 5 years and all-metal cylinders are requalified every 5 years. Composite cylinders have a service life of 15 years and the service life of all-metal cylinders is determined at the time of requalification. Requalified cylinders are marked with the retester identification number and the retest date.

Compressors used to supply compressed breathing air shall be constructed and situated so as to prevent entry of contaminated air in the air-supply stream and minimize moisture content. Compressors used to supply breathing air shall be in compliance with 29 CFR 1910.134(i) specifications.

NASA GRC at Lewis Field and PBS does not have any personnel approved for the emergency-use respirators. Emergency response is provided for GRC by the City of Brook Park and for PBS by Perkins Township.

6.8.3 Emergency Escape-Only Respirators (OSHA 29 CFR 1910.134(c)(1)(iv))

Emergency escape-only respirators shall be inspected before being placed in the workplace, and in accordance with the manufacturer's recommendations. Emergency escape-only respirators must be clearly marked and stored where they are always accessible. Currently, escape-only respirators are located in the PBS B-2, and PBS SPF facilities.

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6.8 - The SHeD verification procedure to ensure compliance with the requirements listed in this section shall be a review of the annual program evaluation records and the SCBA maintenance records.

6.9 Program Evaluation (*OSHA 29 CFR 1910.134(l)*)

Respirator program evaluations of the workplace shall be conducted annually by the SHeD Specialists and the results shall be reviewed by the Respiratory Protection Program Lead. The purpose of the program evaluation is to ensure that the written program is being properly implemented; to consult with employees to ensure that they are using their respirators properly; and to ensure the program continues to be effective. The evaluation shall be conducted in the workplace, and can include but not be limited to, respirator fit, appropriate respirator selected for the hazard, proper use in the workplace, and proper maintenance. The Respiratory Protection Program Lead shall correct any problems identified during the program evaluation.

SSCs shall conduct program evaluations of their respiratory protection program at a frequency that ensures that all elements of the OSHA Respiratory Protection Standard are being effectively implemented. SHED shall perform periodic audits of the onsite SSC respiratory protection programs for compliance and effectiveness.

6.9 - The SHeD verification procedure to ensure compliance with the requirements listed in this section shall be a review of the annual program evaluation records.

6.10 Compliance

Respirator users who fail to comply with respirator program requirements will be referred to their supervisors, and may be removed from the program or may receive a corrective and preventive action report if compliance with all requirements is not met.

7.0 RECORDS

- Job hazard analyses.—Maintained as detailed in Glenn Safety Manual (GSM), Chapter 33, Job Hazard Analysis
- Respiratory Protection Program Hazard Assessments - Maintained in employee's respirator program file.
- Exposure assessments - Maintained on the SHeD server, IH Exposure Assessments file and in Medgate.
- RSCCS – Maintained on SHeD server, IH Respirator Program and in employee's respirator program file.
- Voluntary Use of Disposable Filtering Facepiece Respirators (dust masks) – Maintained in respirator program files.
- Medical evaluations.—Maintained by Medical Services and kept for the duration of an employee's employment plus 30 years.
- Respiratory Protection Training Records – Maintained in SATERN by HCDD
- Respirator Fit Test records – Maintained in employee's respirator program file, until the next fit test.
- SCBA Equipment List – Maintained on SHeD server, IH Respirator Program.
- SCBA cylinder requalification certifications – Maintained in the respirator program files, kept for the life of the cylinder.
- SCBA breathing machine test (bench test) certifications.—Maintained in the respirator program files, kept until the next bench test is completed.
- Annual Respirator Program Evaluation Records – Maintained in respirator program files and on SHeD server

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8.0 REFERENCES

Document Number	Document Name
29 CFR 1910.134	Occupational Safety and Health Administration (OSHA) Respiratory Protection Standard
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.
NPR 1800.1	NASA Occupational Health Program Procedures
29 CFR 1910.1020	OSHA Access to Employee Exposure and Medical Records
29 CFR 1910.1001 to 1045	Chemical Specific Regulations, U.S. Department of Labor, Occupational Safety and Health
NFPA 1852	National Fire Protection Association, Standard on Selection, Care, and Maintenance of Open-Circuit SCBA, 2008 edition (available from SHED)
ANSI/CGA G 7.1	American National Standards Institute (ANSI)/Compressed Gas Association Commodity Specification for Air, 2004 edition
NASA GRC82	NASA GRC Job Hazard Analysis Form
OSHA 3352-02	Assigned Protection Factors for the Revised Respiratory Protection Standard, 2009 edition
OSHA Small Entity	Small Entity Compliance Guide for the Revised Respiratory Protection Standard, 2011 edition
42 CFR Part 84	National Institute for Occupational Safety and Health, Respiratory Protection Devices
ANSI/AIHA Z88.6	American National Standard Institute (ANSI)/American Industrial Hygiene Association (AIHA), Respiratory Protection—Physical Qualifications for Personnel, 2006 edition (available from SHED)
ANSI/AIHA Z88.10	American National Standard Institute (ANSI)/American Industrial Hygiene Association (AIHA), Respirator Fit Test Methods, 2010 edition (available from SHED)

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APPENDIX A.—DEFINITIONS AND ACRONYMS

American Conference of Governmental Industrial Hygienists (ACGIH)

American Industrial Hygiene Association (AIHA)

Air-purifying respirator (APR).—Respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.

American National Standards Institute (ANSI)

Assigned Protection Factor (APF).—The workplace level of respiratory protection that a respirator or class of respirators is expected to provide.

Atmosphere-supplying respirator.—Respirator that supplies the respirator user with breathing air from a source independent of the ambient atmosphere, and includes supplied-air respirators and self-contained breathing apparatus units.

Canister or cartridge.—Container with a filter, sorbent, or catalyst, or combination of these items, which removes specific contaminants from the air passed through the container.

Compressed Gas Association (CGA)

Code of Federal Regulations (CFR)

Civil servant (CS)

Department of Transportation (DOT)

Emergency situation.—Any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that may or does result in an uncontrolled significant release of an airborne contaminant.

Employee exposure.—Exposure to a concentration of an airborne contaminant that would occur if the employee were not using respiratory protection.

End-of-service-life indicator.—A system that warns the respirator user of the approach of the end of adequate respiratory protection, for example, that the sorbent is approaching saturation or is no longer effective.

Engineering controls.—Methods of controlling employee exposures to toxic materials by modifying the source or reducing the quantity of contaminants released into the workroom environment.

Escape-only respirator.—Respirator intended to be used only for emergency exit.

Filter or air purifying element.—Component used in respirators to remove solid or liquid aerosols from the inspired air.

Filtering facepiece.—Negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium (commonly known as a disposable dust mask or a N95 dust mask).

Fit test.—A protocol to qualitatively or quantitatively evaluate the fit of a respirator on an individual (see also qualitative fit test (QLFT) and quantitative fit test (QNFT)).

Glenn Research Center (GRC)

Glenn Safety Manual (GSM)

Hazard assessments.—Industrial hygiene evaluation of the health hazards posed by a specific operation or task.

Human Capital Development Division (HCDD)

High-efficiency particulate air (HEPA) filter.—A filter that is at least 99.97 percent efficient in removing monodisperse particles of 0.3 μm in diameter. The equivalent NIOSH 42 CFR 84 particulate filters are the N100, R100, and P100 filters.

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Immediately dangerous to life or health (IDLH).—atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.

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

Job hazard analysis (JHA)

Material Safety Data Sheet (MSDS)

Maximum use concentration (MUC).—The maximum atmospheric concentration of a hazardous substance from which an employee can be expected to be protected when wearing a respirator and is determined by the assigned protection factor of the respirator or class of respirators and the exposure limit of the hazardous substance. The MUC can be determined mathematically by multiplying the assigned protection factor specified for a respirator by the required OSHA permissible exposure limit, short-term exposure limit, or ceiling limit. When no OSHA exposure limit is available for a hazardous substance, an employer must determine an MUC on the basis of relevant available information and informed professional judgment.

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

N95.—A NIOSH-approved particulate filtering facepiece respirator that filters at least 95 percent of airborne particles. The N95 is not resistant to oil.

Negative pressure respirator (tight fitting).—A respirator in which the air pressure inside the facepiece is negative during inhalation with respect to the ambient air pressure outside the respirator.

National Fire Protection Association (NFPA)

National Institute for Occupational Safety and Health (NIOSH).—An agency of the Health and Human Services Department under the Centers for Disease Control (CDC).

NASA Procedural Requirement (NPR)

Occupational exposure limit (OEL).—The most stringent of

- the permissible exposure limit (PEL) for the hazardous chemical as listed in 29 CFR Part 1910, Subpart Z
- the threshold limit value (TLV) for the hazardous chemical assigned by the American Conference of Governmental Industrial Hygienists (ACGIH) in the latest edition of “Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment”
- a NASA PEL when published as a NASA Health standard
- where there is no PEL, TLV, or NASA standard for the chemical, an exposure level based on available published scientific information such as Material Safety Data Sheets

Occupational Safety and Health Administration (OSHA)

Oxygen-deficient atmosphere.—Atmosphere with oxygen content below 19.5 percent by volume.

Permissible exposure limit (PEL).—The occupational exposure limit established by OSHA; the permissible concentration in air of a substance to which nearly all workers may be repeatedly exposed 8 hours a day, 40 hours a week, for 30 years without adverse effects.

Personal protective equipment (PPE)

Physician or other licensed health care professional (PLHCP).—A physician or other licensed health care provider who must be legally permitted by his or her professional license to conduct the type of medical evaluation required by the respiratory standard.

Positive pressure respirator.—Respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.

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Powered air-purifying respirator (PAPR).—Air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.

Pressure-demand respirator.—Positive pressure atmosphere-supplying respirator that admits breathing air to the facepiece when the positive pressure is reduced inside the facepiece by inhalation.

Qualitative fit test (QLFT).—A pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent. QLFT provides only a pass/fail result.

Quantitative fit test (QNFT).—An assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

Respirator selection and cartridge change schedule (RSCCS).—A document issued to each respirator user by the Respiratory Protection Program Lead to provide the user with information on the respiratory protection devices selected, the cartridge change schedule, and the exposure assessment data used to determine the selections.

Supplied-air respirator (SAR)

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

Self-contained breathing apparatus (SCBA).—Atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.

Service life.—The period of time that a respirator, filter, sorbent, or other respiratory equipment provides adequate protection to the wearer.

Safety and Health Division (SHeD)

Standard operating procedure (SOP)

Space Power Facility (SPF)

Support service contractor (SSC)

Supplied-air respirator (SAR) or airline respirator.—An atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user.

Threshold limit value (TLV).—Established by the American Conference of Governmental Industrial Hygienists (ACGIH) to designate degree of exposure to contaminants and expressed as parts of vapor or gas per million parts of air by volume at 25 °C and 760 mmHg pressure, as approximate milligrams of particles per cubic meter of air (mg/m³) or as number of fibers per cubic centimeter of air (f/cc). An exposure level under which it is believed most people can work consistently for 8 hours a day, day after day, with no harmful effects.

Threshold limit value–time-weighted average (TLV–TWA).—The time-weighted average concentration for a normal 8-hr workday and a 40-hour workweek to which nearly all workers may be exposed repeatedly, day after day, without adverse effects.

Threshold limit value–ceiling (TLV–C).—The concentration of a contaminant that should not be exceeded at any time.

Threshold limit value–short-term exposure limit (TLV–STEL).—A 15-minute TWA exposure that is not to be exceeded at any time during a workday even if the 8-hour TWA is within the TLV–TWA. Exposures above the TLV–TWA up to the STEL should not be longer than 15 minutes must not occur more than four times per day, and there should be at least 60 minutes between successive exposures in this range.

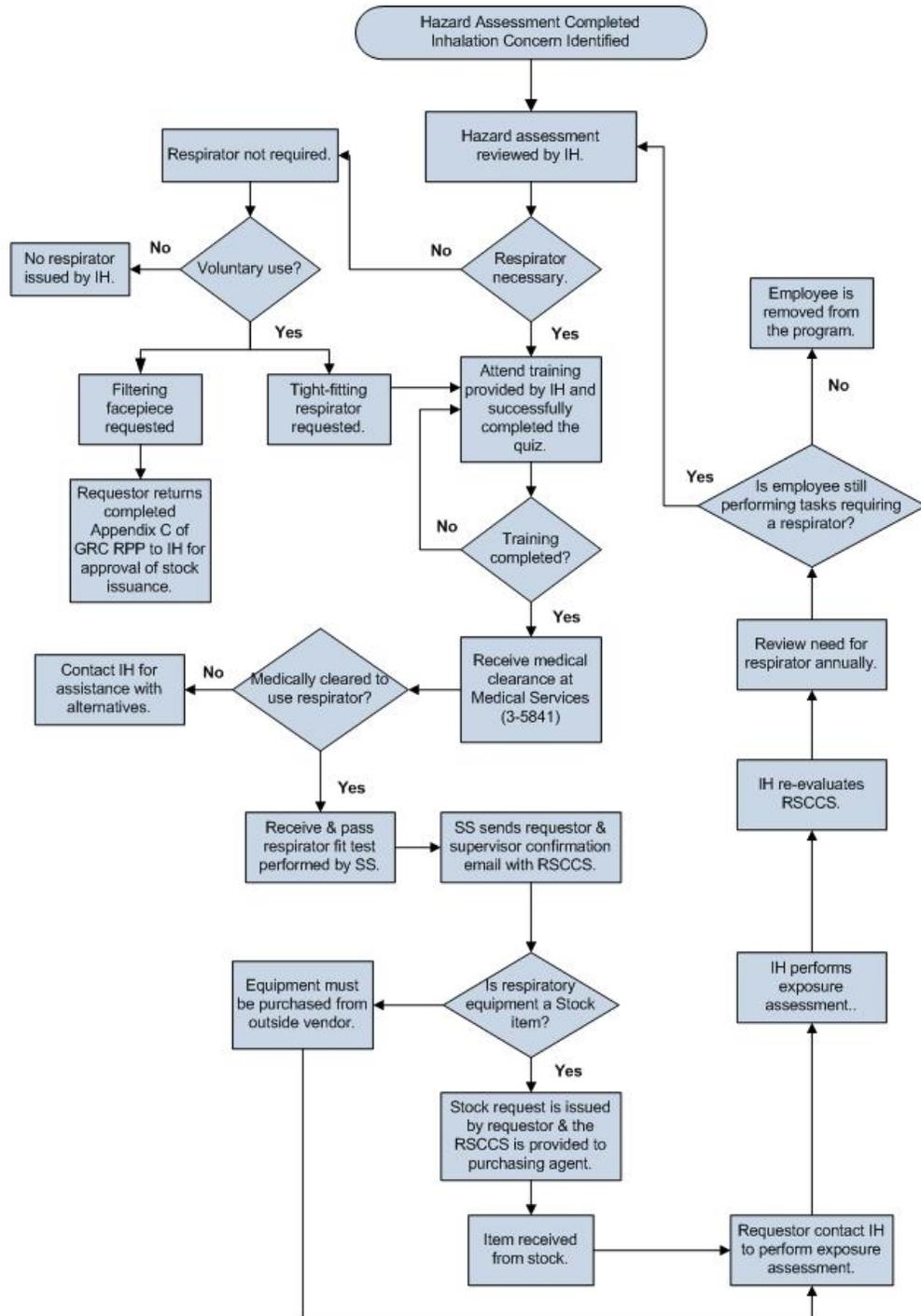
Tight-fitting facepiece.—A respiratory inlet covering that forms a complete seal with the face.

Time-weighted average exposure.—Average concentration of an agent over a given working period of a person's exposure, as determined by sampling.

User seal check.—An action conducted by the respirator user each time a respirator is worn to determine if the respirator is properly seated to the face.

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**Appendix B
Respiratory Protection Program (RPP) Flowchart**



SHeD = Safety and Health Division
 IH = SHeD Industrial Hygiene (3-2870)
 SS = SHeD Specialist (3-6762)
 RSCS = Respirator Selection & Cartridge Change Schedule form completed by IH.

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APPENDIX C-VOLUNTARY USE OF DISPOSABLE FILTERING FACEPIECE RESPIRATORS
(DUST MASKS or N95)

Use of a disposable filtering facepiece respirator (dust mask) at NASA GRC requires: 1) SHeD Industrial Hygiene hazard assessment and approval of the proposed use; 2) employee review of OSHA 29 CFR 1910.134, Appendix D; 3) employee review of a manufacturer training video or instruction manual for the selected dust mask; and 4) completion and return of this form to the SHeD Respirator Program Lead. A respirator fit test and a respirator medical evaluation are not required for the voluntary use of filtering facepiece respirators.

Note: Dust Masks or Filtering Facepiece Respirators may be used for nuisance particulate levels only

- Particulate levels must be below the action level (solid and non-oil-based particles).
- Not for paints, oils, an aerosol, gases, vapors, asbestos or sandblasting.
- Not for particulates smaller than 0.3 microns including ultrafine and nanoparticles.
- Examples for use: grinding, sanding, sweeping, bagging, dusty operations

STEP 1) Request a SHeD IH hazard assessment, Marne Bold, phone 433-2870.

STEP 2) Review OSHA 29 CFR 1910.134, Appendix D

OSHA 29 CFR 1910.134 Appendixes D:

Information for Employees Using Respirators When Not Required under the Standard (Mandatory)

“Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for workers. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the worker. Sometimes, workers may wear respirators to avoid exposures to hazards, even if the amount of hazardous substance does not exceed the limits set by OSHA standards. If your employer provides respirators for your voluntary use, or if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not present a hazard.

You should do the following:

- 1. Read and heed all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirators limitations.*
- 2. Choose respirators certified for use to protect against the contaminant of concern. NIOSH, the National Institute for Occupational Safety and Health of the U.S. Department of Health and Human Services, certifies respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is designed for and how much it will protect you.*
- 3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke.*
- 4. Keep track of your respirator so that you do not mistakenly use someone else's respirator.”*

STEP 3) Complete Dust Mask Training

- Users of dust masks shall view the manufacturer training video or instruction manual for the selected filtering facepiece, as posted on the SHeD Website. The basic steps generally apply:
- Hold the mask with nosepiece at fingertips and the headbands hanging free.
 - Place mask firmly against face with nosepiece over the bridge of your nose.
 - Stretch top headband to the back of head above the ears then stretch bottom headband over head and position below ears. Adjust the respirator for a comfortable fit.
 - Conduct a positive pressure fit check by cupping hands over mask and exhale slightly. If air leaks around the edges try to reposition the mask for a better fit.
 - Change respirator mask if breathing becomes difficult or if mask becomes damaged or distorted.

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**VOLUNTARY USE OF DISPOSABLE FILTERING FACEPIECE RESPIRATORS
(DUST MASKS or N95)**

First Name: _____ Last Name: _____ Phone: _____

Supervisor: _____

Area where dust mask will be used: Building: _____ Room/Area: _____

Circle the best choice any controls being used to minimize the respiratory concern:

Dust Suppression/General Room Exhaust/Local Exhaust - hood or snorkel/Enclosure/Wetting Agent/None

Job Task/Description (task that dust mask will be used):

Respiratory Contaminant(s) of concern: (Please be specific such as dust, mold)

Circle best choice for frequency of use:

Daily (250/year)/Weekly (50/year)/Monthly (12/year)/Rarely (<6 days/year)

Circle the best choice for how many hours it will be used each time it is worn:

Less than 1 hour/1 hour/2 hours/3 hours/4 hours/5 hours/6 hours/7 hours/more than 7 hours

Additional Comments:

STEP 4) Complete form and return to Marne Bold, via email, interoffice mail, or fax.

I have read and understand information provided in Appendix C of the RPP and have viewed the manufacturer's training video or manufacturer's instructions for the filtering facepiece. By completing and signing this document, I agree to comply with the requirements of Voluntary Use of Disposable Filtering Facepiece Respirators and the Glenn Respiratory Protection Program, Occupational Health Programs Manual, Chapter 4.

Employee Name(s) (legible) and Signature(s) _____

Supervisor Name and Signature _____

Date _____ SHeD Respirator Program Lead _____

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