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Occupational Health Programs Manual – Chapter 21

Hazard Assessment/Exposure Assessment Program w/Change 3 (9/30/2015)

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Change Record

Revision	Effective Date	Expiration Date	GRC25, Change Request #	Description
B	4/2/2012	4/2/2017	293	Biannual Review
Change 1	4/11/2014	4/2/2017	n/a	Administrative change to add front cover and change history log to comply with NPR 1400.1, added "The GRC shall follow the requirements of NPR 1800.1C" in Section 4.0 Policy.
Change 2	11/3/2014	4/2/2017	n/a	Administrative change to correct title of chapter from Synthetic Inorganic Fibers to Hazard Assessment/Exposure Assessment Program.
Change 3	9/30/2015	4/2/2017	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 21—Hazard and Exposure Assessments

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 April 2012. The current version is located on the Glenn Research Center intranet within the BMS Library. Approved by the Chief of Safety and Health Division.*

1.0 PURPOSE

The objective of the Hazard and Exposure Assessment (HEA) Program is to provide healthful working environments throughout Glenn Research Center (GRC) Lewis Field and Plum Brook Station (PBS) by reviewing potentially hazardous operations and conducting personal and, where appropriate, area monitoring to evaluate worker exposure to hazardous chemical agents. This program also provides guidance on documentation of the potential hazards and a mechanism for prioritizing data collection.

> ***Note****: Policies regarding the safe use of and specific regulatory requirements for certain hazardous agents (e.g., Occupational Safety and Health Administration (OSHA)-regulated chemicals, lead, asbestos, mercury, bloodborne pathogens, radiation, and noise) are covered in other Occupational Health Programs Manual (OHPM) chapters.*

2.0 APPLICABILITY

This chapter is applicable to all civil servant and support service contractor (SSC) employees assigned to GRC sites, construction contractors, students, and visitors.

SSCs and construction contractors are responsible for the health and safety of their employees and for hazard analyses, training, personal protective equipment (PPE), medical surveillance, and other requirements to ensure compliance with NASA policy.

This chapter applies to hazardous chemicals that are currently used or that will be used in the future at GRC. Where chemicals such as asbestos, lead, mercury, etc., are covered under other chapters, those requirements supersede these.

3.0 BACKGROUND

Occupational Safety and Health Administration (OSHA) promulgated compliance standards for a number of toxic chemicals and physical hazards. To determine the potential for exposure, hazard assessments are required. Where the potential for significant exposure is present and/or the need for protective equipment deemed necessary, an exposure assessment is warranted. Job hazard analyses (JHAs) or hazard assessments are needed as an integral part of assessing risk of exposure to various contaminants. Therefore, JHAs or equivalent hazard assessments are required as indicated in the Glenn Safety Manual, Chapter 33 and Chapter 15.

The Center for Disease Control regulates biological hazards. See OHPM Chapter 11 for more information regarding biological hazards.

4.0 POLICY

GRC's policy is to comply with all applicable regulations regarding chemicals or biological substances and to prevent illness to workers and damage to the environment from their use, removal, and disposal. To accomplish this, all personnel shall comply with the requirements of this chapter.

It is also NASA's policy to adhere to OSHA permissible exposure limits (PELs), the American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit values (TLVs), or NASA internal Occupational Exposure Limits (OELs), whichever are most restrictive, to ensure worker protection. The GRC shall follow the requirements at NPR 1800.1C.

5.0 RESPONSIBILITIES

5.1 SHeD Program Lead

The following shall be the responsibilities of the SHeD Program Lead, along with support from SHeD Chemical Management and FE Waste Management as indicated,

- Provides guidance on the requirements of Federal, state, and local occupational health regulations
- Reviews safety permits, standard operation procedures (SOPs), JHAs, or equivalent information and conducts hazard assessments or assists others with conducting them
- Performs exposure assessments
- Recommends procedures to control and/or minimize exposure
- Recommends employees for inclusion in a medical surveillance program, when required
- Maintains the task and exposure databases for all related operations
- Conducts additional training beyond that provided under the Hazard Communication Program
- Maintains sampling equipment and performs calibrations as needed
- Maintains the chemical inventory (Chemical Management)
- Reviews chemical purchases and notifies SHeD industrial hygienists (IHs), as appropriate, when hazardous chemicals, biological substances or products containing them are requested (Chemical Management)
- Conducts Hazard Communication (HAZCOM) training
- Provides guidance for handling spill situations (see Environmental Programs Manual, Chapter 8) (Waste Management, FE)
- Assists in the collection and disposal of hazardous chemicals or biological materials and waste products containing these (Waste Management)

5.2 Supervisors

Supervisors shall

- Identify users of hazardous chemicals or those performing hazardous operations within the guidelines of this policy and notify the appropriate SHeD personnel of the user's name and the particular material prior to its use
- Perform hazard assessments
- Ensure areas where hazardous chemicals or biological substances are used are properly marked and access is restricted
- Ensures employees for inclusion in a medical surveillance program receive exams.
- Ensure employees follow good work practices and wear required PPE
- Ensure employees meet training requirements

5.3 Employees

Employees shall

- Procure chemicals or biological substances in compliance with Occupational Health Program Manual, Chapter 14
- Use hazardous chemicals or perform hazardous operations in accordance with procedures established for safe use of the chemicals or biological substances.

- Use PPE as specified in established work procedures or by the applicable hazard assessment
- Complete required medical surveillance exams
- Notify Medical Services or their medical provider and their supervisor if they experience any signs or symptoms of overexposure
- Notify their supervisors of any operational changes or new uses of the regulated chemicals or biological agents
- Discard waste material through NASA waste management
- Attend training, when required

5.4 Medical Director, Occupational Medicine Services

- The Occupational Medical Services Director shall maintain medical surveillance programs for civil servant and contractor employees exposed to hazardous chemicals that require medical monitoring
- Maintain complete, accurate records of all medical examinations for personnel in the medical surveillance program. Records are to be retained for at least 30 yr. Results of examinations are to be discussed with employees as needed. The Medical Director shall also identify examination elements following an exposure incident and assisting with providing that information to other medical service providers.

5.5 Human Capital Development Branch Chief

The Human Capital Development Branch Chief shall Schedule employee training

- Maintain records for employees who complete NASA-sponsored training and any associated examinations

6.0 REQUIREMENTS

The Safety and Health Division (SHeD) shall be kept apprised of the use of chemical or biological hazards or other operations (e.g., welding, forklift operation, etc.) that can generate hazardous chemical exposures throughout GRC and shall be notified by the area supervisor when a process that requires the use of hazardous materials changes, or when new tasks not previously assessed require the use of hazardous materials. This information shall be provided in a timely manner in order to arrange for hazard assessments and to prevent delay in the user's work.

6.1 Hazard Assessment *(29CFR1910.132(d); NPR 1800.1C Section 4.3)*

6.1 - The SHeD verification procedure to ensure compliance with the requirements listed in this section shall be accomplished by reviewing chemical purchase information and all applicable hazard assessment information.

All those using hazardous materials or potentially exposed to hazardous materials generated from a particular operation at GRC shall have a hazard assessment. This assessment shall be performed during the next scheduled use of the material using the appropriate forms for a hazard analysis (HA), a JHA (NASA GRC82, GRC237 PPE Hazard Analysis and Assessment), or an equivalent form. The user or area supervisor shall develop a HA, JHA, or an equivalent form of hazard analysis, whichever is most appropriate, or shall review the information developed by an employee and contact a SHeD IH prior to the use of the material and arrange for SHeD to observe the handling of the material, assess the hazards, and perform exposure monitoring, if necessary.

Results of the hazard assessments for all current users of a given material will enable the SHeD IH to determine if exposure monitoring is needed and whether specific controls are required for the operation.

A hazard assessment shall involve an IH when

- An extremely or highly hazardous material, such as an OSHA-regulated chemical, a non-regulated carcinogen, a biological toxin, or a reproductive or developmental hazard, etc., is being requested
- An operation involves the use of materials that may generate a hazardous chemical or biological exposure

- A process involved with the aforementioned materials or operations changes
- A new task, not previously assessed, requires the use of such materials or involves an operation generating hazardous materials

Hazard assessments shall include a

- Review of the HA, JHA, or other hazard assessment information for all tasks involving hazardous materials
- Review of related regulated or recommended standards to determine regulatory requirements
- Meeting with the requester to discuss usage, handling procedures, possible engineering controls, PPE, and scheduling of exposure monitoring

In order to be useful and effective, hazard assessments need to be current. Hazard assessments shall be reviewed and updated at least every 3 years or whenever changes to equipment, materials, work procedures, or other changes affect potential exposure. In addition, whenever a new operation, type of work or work-related activity is introduced, a hazard assessment shall be conducted. This includes worksite redesign, new equipment, new processes introduced, different materials being used, etc.

6.2 Exposure Assessment *(NPR 1800.1C Section 4.3)*

6.2 The SHeD verification procedure to ensure compliance with the requirements listed in this section shall be accomplished by reviewing Medgate survey and monitoring information and previous database information.

Using the hazard assessment information, exposure monitoring needs are identified based upon the various characteristics of potentially hazardous chemical or biological substance. The exposure needs are ranked or prioritized and this information is maintained in a database to allow for the SHeDIHs to systematically evaluate the jobs or tasks. Those tasks with the highest ranking will be monitored first. The hazard assessment information will be recorded in the MedGate database system, when available. Until that time, they will be recorded on the forms listed in Section 6.1.

Similar exposure groups shall be established and monitored. Exposure monitoring shall be conducted during typical or “worst case” use of the hazardous material and, where deemed appropriate, conducted routinely based upon use and exposure potential. The exposure assessment(s) shall be documented in the Medgate database, when available, and by standard reports and/or data tables.

Periodically, exposures shall be reassessed to

- Update exposure groups and profiles
- Document changes that may influence exposures
- Identify unacceptable exposures requiring control
- Identify uncertain exposures for further information gathering

This reassessment information will lead to a prioritized schedule for reevaluation, updated basic workplace characterization, and updated exposure groups and exposure profiles.

6.3 Occupational Exposure Limits *(NPR 1800.1C Section 4.2)*

6.3 The SHeD verification procedure to ensure compliance with the requirements listed in this section shall be accomplished by reviewing current exposure limits as listed in Medgate software.

NASA GRC strives to comply with applicable regulations of other Federal agencies as well as NASA’s health and safety requirements. In the event of conflicting regulations, the more protective requirements will be used. In general the OSHA PELs will be met, but other occupational exposure limits (OELs) recommended and established by other knowledgeable authorities such as the ACGIH TLVs, National Institute for Occupational Safety and Health

(NIOSH) recommended exposure limits (REL), American Industrial Hygiene Association (AIHA) workplace environmental exposure limits (WEELs), and others may be used.

Where no established OEL exists for a specific chemical, a working OEL may be established and used after thorough review of the data available for the chemical and according to established industrial hygiene exposure limit setting guidelines. This includes reviewing analogous chemical data, animal experimentation studies and extrapolation data, human experience, and epidemiology data. The review process shall be thoroughly documented and a written rationale produced.

6.4 Training *(29CFR1910.1200; NPR 1800.1C Section 4.1.6)*

6.4 The SHeD verification procedure to ensure compliance with the requirements listed in this section shall be accomplished by reviewing SATERN records or other personal training records as available. Training can also be verified through Facility inspections, reviewing JHA, PPE hazard assessment, training records, and SOPs/LSOPs.

All employees using chemicals or performing operations that generate potential chemical exposure shall receive Hazard Communication (HazCom) training so they understand the information presented on a Material Safety Data Sheet (MSDS) and know how to protect themselves from the hazards of the toxic material. Refer to the Occupational Health Programs Manual, Chapter 16**,** and the associated HazCom Program for requirements.

All employees using highly hazardous chemicals or performing operations that generate potential chemical exposure shall have specific training for the particular chemical being used or handled. The training shall cover the specific hazards of the material, requirements of the standard, and other information regarding controlling exposure.

6.5 Elimination and Control of Hazards *(NPR 1800.1C Section 4.4.3.2)*

6.5 The SHeD verification procedure to ensure compliance with the requirements listed in this section shall be accomplished by reviewing hazardous tasks and Safety Permits, LSOPs, JHAs or equivalent information and other documents that indicate controls required for activities involving chemical, physical, or biological hazards conducted at GRC.

Whenever possible, hazards shall be eliminated. Hazards that can be eliminated promptly and cost-effectively shall be performed quickly to eliminate potential exposure and the need for further evaluation. When working on eliminating or controlling hazards, those knowledgeable about the work shall be involved either through consultation or direct participation. The high-risk hazards shall be addressed first.

Where elimination is not feasible, engineering or administrative controls should be implemented. When such controls do not completely eliminate the hazard or when they are not feasible, protective equipment shall be required. Protective equipment may also be used when the task is infrequent or non-routine.

Controls shall also be prioritized such that the chemical or biological hazards presenting the greatest risk are managed first. Short- and long-term control options shall be reviewed and included as part of the control strategy.

6.6 Medical Surveillance (*29 CFR 1910; NASA NPR 1800.1C*)

6.6 The SHeD verification procedure to ensure compliance with the requirements listed in this section shall be accomplished by reviewing medical surveillance program records to determine if those required to be in such programs are and have received the appropriate exams.

Individuals using, handling, or otherwise exposed to hazardous chemicals may be required to receive baseline and routine medical examinations depending upon the material and the extent of “exposure” or for approval to wear protective equipment. Once a SHeD IH determines an exposure requires medical surveillance, the individual(s) shall be notified to contact Medical Services or their medical provider to schedule an exam. The minimum exam requirements shall be determined by Medical Services and that information shared with outside medical service providers. The individual supervisors shall be kept informed about these requirements.

Any employee involved in an incident where there is known or suspected excessive exposure to chemicals shall immediately contact SHeD, as appropriate, for evaluation and Medical Services or their medical provider to arrange for a post-exposure exam. This exam shall include tests deemed necessary by the physician. The employee's supervisor shall also be kept informed.

6.7 Construction Chemical Use *(NPR 1800.1C Section 4)*

6.7 The SHeD verification procedure to ensure compliance with the requirements listed in this section shall be accomplished by reviewing health and safety plans.

In general, proper controls or proper PPE shall be required when using chemicals or performing operations that have the potential to generate chemical or biological exposures at GRC. Construction contractors and their subcontractors bringing chemicals on the site shall include the MSDSs for them along with the method of exposure control as part of the site specific health and safety plan (HASP). The SHeD HASP reviewerIH or their alternate charged with reviewing and approving HASP's shall approve or deny the use chemicals and ensure proper controls are in place to protect NASA employees. Each construction contractor or subcontractor shall be responsible for assessing hazards, providing for exposure monitoring, training for their employees, using engineering controls where feasible, providing proper PPE, medical surveillance where required, posting warning signs, etc.

7.0 RECORDS

- Hazard analyses.—Maintained by SHeD.
- Job hazard analyses.—Maintained by SHeD.
- Hazard assessments.—Maintained by SHeD.
- Exposure assessments.—Maintained by SHeD.
- Medgate database—Maintained by SHeD team, as appropriate.
- Medical examinations.—Maintained by Medical Services.
- Chemical inventory.—Maintained by SHeD.

8.0 REFERENCES

Document Number	Document Name
29 CFR 1910.132(d)(1)&(2) 29 CFR 1910.1000 (Z Tables) 29 CFR 1926, Subpart Z	Occupational Safety and Health Administration (OSHA) Standard for General Industry and Construction, as appropriate http://www.osha.gov/ (Hazard Assessment/PPE Requirements, Z-Tables and limits, other sections)
29 CFR 1910.1200 29 CFR 1926.59	OSHA Hazard Communication Standard for General Industry and Construction, as appropriate
GLM–QSA–1700.1	NASA Glenn Safety Manual, Chapter 33, Job Hazard Analysis
NPR 1800.1B/4.1–4.3	NASA Procedural Requirement, "NASA Occupational Health Program Procedures"
C–82	Job Hazard Analysis Form
C-237	PPE Hazard Analysis and Assessment Form

APPENDIX A.—DEFINITIONS AND ACRONYMS

8-hr TWA.—Time-weighted average concentration to which an employee is exposed over an 8-hr day.

American Conference of Governmental Industrial Hygienists (ACGIH).—Professional society made up of Government employed IHs as well as IHs from the private sector. The ACGIH is devoted to administrative and technical aspects of occupational and environmental health.

American Industrial Hygiene Association (AIHA)

Carcinogen.—A substance or agent capable of causing or producing cancer in mammals, including humans. A chemical is considered to be a carcinogen or potential carcinogen if (a) it has been evaluated by the International Agency for Research on Cancer (IARC) and found to be a carcinogen or potential carcinogen, (b) it is listed as a carcinogen or potential carcinogen in the annual report on carcinogens published by the National Toxicology Program (NTP), or (c) it is regulated by the National Institute for Occupational Safety and Health (NIOSH) or Occupational Safety and Health Administration (OSHA) as a carcinogen.

Disposal.—Final placement for destruction of toxic, radioactive, or other wastes, surplus or banned pesticides or other chemicals, polluted soils, and drums containing hazardous materials from remedial actions or accidental releases. Disposal may be accomplished through use of approved secure landfills, surface impoundments, land farming, incineration, etc.

Engineering controls.—Designing out the hazard by process changes, substitution of harmful materials, isolation, ventilation, and source modification.

Glenn Research Center (GRC)

Hazard analysis (HA)

Hazard Communication (HazCom)

Hazard and Exposure Assessment (HEA)

Health and safety plan (HASP)

Industrial hygienist (IH)

Job hazard analysis (JHA)

Material Safety Data Sheet (MSDS)

National Institute for Occupational Safety and Health (NIOSH)

National Toxicology Program (NTP)

Occupational exposure limit (OEL).—A health-based workplace standard to protect workers from adverse exposure.

Occupational Health Programs Manual (OHPM)

Occupational Safety and Health Administration (OSHA)

Operations (Ops)

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

Personal protective equipment (PPE)

Plum Brook Station (PBS)

Recommended exposure limit (REL).—The recommended exposure limit for a substance in air established and published by the National Institute for Occupational Safety and Health (NIOSH).

Standard operating procedure (SOP).—A written document that details an operation, analysis, or action whose mechanisms are thoroughly prescribed and that is commonly accepted as a method for performing certain routine or repetitive tasks.

Support service contractor (SSC)

Threshold limit value (TLV).—Established by the American Conference of Governmental Industrial Hygienist (ACGIH) to designate degree of exposure to contaminants at an exposure level under which it is believed most people can work consistently for 8 hr 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-hr 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-min time-weighted average (TWA) exposure that is not to be exceeded at any time during a workday even if the 8-hr TWA is within the TLV–TWA. Exposures above the TLV–TWA up to the STEL should not be longer than 15 min, shall not occur more than 4 times per day, and there should be at least 60 min between successive exposures in this range.

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

Workplace environmental exposure limit (WEEL)