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Occupational Health Programs Manual – Chapter 19

Synthetic Inorganic Fibers w/Change 2 (9/30/2015)

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Page 1 of 13

Glenn Research Center Occupational Health Programs Manual	Title: Synthetic Inorganic Fibers	
	Document No.: GLM-QS-1800.1.19	Rev.: B

Change Record

Revision	Effective Date	Expiration Date	GRC25, Change Request #	Description
B	5/2/2012	5/2/2017	249	Added gray verification boxes throughout the document.
Change 1	4/11/2014	5/2/2017	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	9/30/2015	5/2/2017	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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Glenn Research Center Occupational Health Programs Manual	Title: Synthetic Inorganic Fibers	
	Document No.: GLM-QS-1800.1.19	Rev.: B

Contents

1.0	PURPOSE	4
2.0	APPLICABILITY	4
3.0	BACKGROUND	4
4.0	POLICY	4
5.0	RESPONSIBILITIES	4
5.1	Operations and Plum Brook Station Teams	4
5.2	Facilities Division	5
5.3	Supervisors	5
5.4	Employees	5
5.5	Medical Director, Occupational Medicine Services	6
5.6	Human Capital Development Branch Chief	6
6.0	REQUIREMENTS	6
6.1	Notification of Use of SIFs (<i>NASA NPR 1800.1, Section 4.7.1</i>)	6
6.2	Hazard Assessment (<i>NASA NPR 1800.1, Sections 4.2 and 4.7.1; 29 CFR 1910.132</i>)	6
6.3	Exposure Assessment (<i>NASA NPR 1800.1, Sections 4.2 and 4.7.1; ACGIH 2009 TLVs</i>)	6
6.3.1	Air Monitoring	6
6.3.2	Sampling Methodology	7
6.3.3	Occupational Exposure Limits (<i>NASA NPR 1800.,1 Section 4.2; ACGIH 2009 TLVs</i>)	7
6.4	Safe Work Practices	7
6.4.1	General Requirements	7
6.4.2	Workareas	7
6.5	Engineering Controls (<i>NASA NPR 1800.1, Section 4.43.2; 29 CFR 1910.1000(e)</i>)	8
6.6	Personal Protective Equipment (<i>NASA NPR 1800.1 Section 4.43.2; 29 CFR 1910, Subpart D</i>)	8
6.6.1	Mineral Wool and Rock and Glass Wool PPE Requirements	8
6.6.2	RCF PPE Requirements	8
6.7	Training (<i>29 CFR 1910.1200</i>)	8
6.7.1	Hazard Communication Training	8
6.7.2	Specific Hazard Training	8
6.8	Medical Surveillance (<i>NASA NPR 1800.1</i>)	8
6.9	Construction Use of SIFs	9
6.10	Disposal	9
6.11	Recordkeeping (<i>29 CFR 1910.1020</i>)	9
7.0	RECORDS	9
8.0	REFERENCES	9
	APPENDIX A.—DEFINITIONS AND ACRONYMS	11

List of Tables

TABLE 6.1.—GLENN OCCUPATIONAL EXPOSURE LIMITS AND ACTION LEVELS	7
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Printed copies are uncontrolled and are not to be used for operational purposes.

Glenn Research Center Occupational Health Programs Manual	Title: Synthetic Inorganic Fibers	
	Document No.: GLM-QS-1800.1.19	Rev.: B

Chapter 19—Synthetic Inorganic Fibers

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 Chief of Safety and Health Division.

1.0 PURPOSE

This chapter describes the Glenn Research Center (GRC) Synthetic Inorganic Fiber (SIF) Program and establishes minimum requirements to reduce the risk of occupational illness resulting from exposure to synthetic fibers. To provide an environment free from excess fibers, priority will be given to the use of engineering controls such as local exhaust ventilation for employees working with synthetic fibers.

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.

3.0 BACKGROUND

SIFs, which include fiberglass, rock and slag wool, and refractory ceramic fibers (RCFs), have been under review by the scientific community to determine health effects of these fibers. The International Agency for Research on Cancer (IARC) states that fiberglass and mineral and rock wool materials show “no evidence of increased risks of lung cancer or of mesothelioma from occupational exposures during manufacture of these materials, and inadequate evidence overall of any cancer risk.” The IARC has classified RCF as “possibly carcinogenic to humans.” Animal toxicology studies of RCFs have indicated the development of lung cancers and mesothelioma, a rare cancer of the pleura. For this reason, the GRC occupational exposure limit (OEL) for RCF has been set to a lower level than either fiberglass or mineral wool. In addition, RCFs exposed to temperatures above 1800 °F form crystalline silica, a suspect human carcinogen. SIFs are available in various forms, including loose fill bulk insulation, blanket insulation, paper-type wrap insulation, and compressed products such as gaskets.

4.0 POLICY

GRC’s policy is to comply with all applicable regulations regarding SIF use 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 Occupational Safety and Health Administration (OSHA) or the American Conference of Governmental Industrial Hygienists (ACGIH) OELs (whichever are more restrictive) to ensure worker protection. GRC has adopted recommended exposure limits for work with synthetic fibers. See Table 6.1. in Section 6.3.3. The GRC shall follow the requirements of NPR 1800.1C.

5.0 RESPONSIBILITIES

5.1 Operations and Plum Brook Station Teams

The Operations (Ops) and Plum Brook Station (PBS) teams shall be responsible for

- Providing guidance on the requirements of Federal, state, and local occupational health regulations
- Managing and overseeing the proper use of SIFs at GRC in accordance with the guidelines of this chapter
- Working with other SHeD teams, the Facilities Division, and researchers to identify uses of SIFs
- Conducting baseline and routine exposure surveys of work activities and procedures that require SIFs

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Glenn Research Center Occupational Health Programs Manual	Title: Synthetic Inorganic Fibers	
	Document No.: GLM-QS-1800.1.19	Rev.: B

- Reviewing standard operating procedures (SOPs) and job hazard analyses (JHAs) and conducting hazard assessments or assisting others conducting them
- Maintaining and calibrating sampling equipment, collecting samples, and forwarding samples for analysis
- Recommending appropriate SIF control procedures to minimize exposure
- Maintaining a record of all air and wipe sampling data, hazard assessments, and exposure monitoring
- Providing employee access to exposure data
- Notifying employee supervisors and Occupational Medicine Services for NASA civil servants about employees recommended for inclusion in the medical surveillance program
- Reviewing chemical purchases
- Maintaining the chemical inventory
- Conducting Hazard Communication (HAZCOM) training and specific SIF training, when appropriate
- Assisting in the collection and disposal of SIFs and waste SIF products
- Providing guidance for handling spill situations (see Environmental Programs Manual (EPM), Chapter 8)
- Providing information on any air, water, or soil pollution issues

5.2 Facilities Division

The Facilities Division Project Managers shall be responsible for

- Notifying the appropriate Ops or PBS team industrial hygienists (IHs) about facility renovations, modifications, and operations that require the removal or use of SIFs
- Identifying SIFs and control procedures in construction contract specifications and drawings
- Ensuring that contractors use the appropriate controls and implement safe work practices to control SIF exposure during work with these materials

5.3 Supervisors

Supervisors shall be responsible for

- Ensuring their employee HAZCOM training includes specific training on the hazards of SIF and how to minimize exposures
- Requesting SIF hazard evaluations, when appropriate
- Enforcing the use of engineering and administrative controls including PPE

5.4 Employees

Employees shall be responsible for

- Notifying supervisor when using or handling SIFs
- Using SIFs in accordance with established procedures
- Using PPE as specified in established work procedures
- Notifying Medical Services or their medical provider and their supervisor if they experience any signs or symptoms of overexposure
- Notifying their supervisors of any operational changes or new uses of SIFs
- Discarding waste material through the SHed waste management operation
- Attending required training

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Glenn Research Center Occupational Health Programs Manual	Title: Synthetic Inorganic Fibers	
	Document No.: GLM-QS-1800.1.19	Rev.: B

5.5 Medical Director, Occupational Medicine Services

The Medical Director of Occupational Medicine Services shall be responsible for

- Maintaining medical surveillance programs for civil servant and contractor employees exposed to hazardous chemicals that require medical monitoring
- Maintaining complete accurate records of all medical examinations for personnel in the medical surveillance program. Records are to be retained for at least 30 years. Results of examinations are to be discussed with employees as needed.
- Identifying examination elements following an exposure incident and communicating the elements with outside physicians, as necessary
- Notifying employees of medical surveillance results
- Notifying the appropriate Ops or PBS team IH about employees who may require an exposure evaluation based on clinical findings

5.6 Human Capital Development Branch Chief

The Human Capital Development Branch Chief shall be responsible for

- Scheduling NASA-sponsored employee training
- Maintaining records of employees who complete NASA-sponsored training and any associated examinations

6.0 REQUIREMENTS

This section includes procedures to assess and evaluate potential hazards, methods to reduce and control exposure to SIF through the use of safe work practices, engineering controls and PPE, training and medical surveillance requirements, and disposal and recordkeeping requirements.

6.1 Notification of Use of SIFs (*NASA NPR 1800.1, Section 4.7.1*)

SHed shall be kept apprised of SIF use throughout the Center and shall be notified by area supervisors when a process that uses SIFs changes or when new tasks, not previously assessed, require the use of SIFs. This information shall be provided in a timely manner to arrange for hazard assessments and prevent delay in the user's work.

6.2 Hazard Assessment (*NASA NPR 1800.1, Sections 4.2 and 4.7.1; 29 CFR 1910.132*)

All SIFs handled at GRC shall have a hazard assessment reviewed or performed by the appropriate Ops or PBS team IH. This assessment shall be performed when the material is first scheduled to be used. The SIF user or area supervisor shall contact the appropriate IH prior to use and arrange for a member of the team to observe how the material is handled, assess the hazards, and conduct exposure monitoring, if deemed necessary.

Where SSCs perform the hazard assessment and analysis, copies shall be made available to the Ops or PBS team IHs.

Refer to Occupational Health Programs Manual (OHPM), Chapter 21, for more information on hazard and exposure assessments.

6.3 Exposure Assessment (*NASA NPR 1800.1, Sections 4.2 and 4.7.1; ACGIH 2009 TLVs*)

6.3.1 Air Monitoring

Using the hazard assessment information, exposure monitoring needs are identified based upon the specific material. The exposure needs are ranked or prioritized and the information maintained in a database to allow for the appropriate team to schedule sampling. Air sampling shall be conducted by an IH, industrial hygiene technician or environmental specialist, a contractor representative, or a third party. Air sampling may be conducted at the employer's or employee's request, as a result of a safety permit review, hazard analysis, facility renovation, maintenance activity, or emergency response such as a spill of SIF. Requests for assistance shall be directed to the appropriate Ops or PBS team IH.

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Glenn Research Center Occupational Health Programs Manual	Title: Synthetic Inorganic Fibers	
	Document No.: GLM-QS-1800.1.19	Rev.: B

6.3.2 Sampling Methodology

The National Institute for Occupational Safety and Health (NIOSH) 7400 method for fibers shall be used to assess worker exposures. Area monitoring shall be conducted. Where possible, sampling should be conducted before, during, and after operations. Sampling conducted during a particular work activity shall reflect worst-case exposures for the employee. Supervisors and employees shall be notified of the sample results.

6.3.3 Occupational Exposure Limits (NASA NPR 1800.,1 Section 4.2; ACGIH 2009 TLVs)

The following table provides GRC OELs and action levels (ALs) for SIFs. The AL is one-half the recommended OEL, and when such an exposure level is reached, certain requirements, such as the use of PPE, are mandatory.

TABLE 6.1.—GRC OCCUPATIONAL EXPOSURE LIMITS AND ACTION LEVELS

Synthetic inorganic fibers	Occupational exposure limit	Action level
	1 fiber/cubic centimeter (f/cc) ^a (inhalable)	0.5 f/cc (inhalable)
Continuous filament glass fibers	1 f/cc	0.5 f/cc
Continuous filament glass fibers	5 milligrams/cubic meter (mg/m ³)	2.5 mg/m ³
Glass wool fibers	1 f/cc	0.5 f/cc
Rock wool fibers	1 f/cc	0.5 f/cc
Slag wool fibers	1 f/cc	0.5 f/cc
Special purpose glass fibers	1 f/cc	0.5 f/cc
Refractory ceramic fibers	0.1 f/cc	0.05 f/cc

^aFibers are >5 microns long with an aspect ratio of ≥3:1.

6.3.1 - SHeD shall verify requirements for this section to ensure compliance with the Chapter. SHeD verification shall be accomplished by documenting air monitoring test results in the Medgate database.

6.4 Safe Work Practices

Note: Large-scale installation or removal tasks involving RCF may require remediation by an experienced remediation or abatement contractor. Contact SHeD for assistance.

6.4.1 General Requirements

Work involving SIF shall be preplanned to control and minimize employee exposure and to protect against the contamination of work surfaces and equipment. For operations that cannot be accomplished using local exhaust ventilation to control exposures, workers shall use PPE, as listed in Section 6.6 (below). See Glenn Safety Manual, Chapter 15, on PPE.

6.4.2 Workareas

Where necessary, facility and equipment work surfaces shall be protected from contamination by the use of plastic sheeting. The area in which work is to be done shall be secured by the use of warning signs and tape to prevent entry of the unprotected persons in accordance with the Glenn Safety Manual.

A high-efficiency particulate air (HEPA) vacuum cleaner shall be used to clean any debris once a task is completed and wet wiping shall follow the vacuuming, where appropriate.

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Glenn Research Center Occupational Health Programs Manual	Title: Synthetic Inorganic Fibers	
	Document No.: GLM-QS-1800.1.19	Rev.: B

6.5 Engineering Controls (NASA NPR 1800.1, Section 4.43.2; 29 CFR 1910.1000(e))

To the extent feasible, priority shall be given to reducing employee exposure by the use of engineering controls such as using local exhaust ventilation and wet methods for activities involving SIF such as installation, removal, cutting, grinding, sawing, and operations that generate airborne fibers and dusts.

Where SIF materials are in place, they shall be enclosed and/or encapsulated to prevent the release of airborne fibers that may result from physical disturbance or air moving across the exposed SIF surface. Wherever possible, alternative materials shall be considered for RCF.

6.6 Personal Protective Equipment (NASA NPR 1800.1 Section 4.43.2; 29 CFR 1910, Subpart I)

Where engineering controls cannot be used to control exposures below half of the GRC exposure limit or the AL, the following PPE shall be used to prevent occupational exposure to SIF.

6.6.1 Mineral Wool and Rock and Glass Wool PPE Requirements

- Long-sleeved work clothing or disposable protective coveralls and head coverings
- Respiratory protection such as an air-purifying respirator equipped with HEPA filter where exposure requires they be used or filtering facepiece for N100 or P100 when not required based upon airborne exposure levels; cotton gloves may be worn
- Safety eyewear

Note: Contact IH for advice on selection of an appropriate respirator; see OHPM, Chapter 4, on Respiratory Protection Program for more information.

6.6.2 RCF PPE Requirements

- Disposable coveralls with head covering
- Disposable shoe covers
- Respiratory protection shall be selected based on IH hazard assessment of proposed work task; the minimum respirator is air purifying type, equipped with HEPA cartridges
- Eye protection

6.7 Training (29 CFR 1910.1200)

6.7.1 Hazard Communication Training

All employees using or handling SIFs shall receive HAZCOM training so they understand the information presented on a material safety data sheet (MSDS) and know how to protect themselves from the hazards.

6.7.2 Specific Hazard Training

All employees handling SIFs shall receive specific training that covers the specific hazards of the material, requirements of the HAZCOM standard and written program, and other information about how to prevent and/or control exposure.

6.7.2 - SHeD shall verify requirements for this section to ensure compliance with the Chapter. SHeD verification shall be accomplished by reviewing SATERN records or other personnel training records, as required.

6.8 Medical Surveillance (NASA NPR 1800.1)

Individuals using or handling chemicals may be required to receive baseline and routine medical examinations depending upon the material used and the extent of “exposure” or for approval to wear protective equipment. An individual requiring an exam, or their supervisor, shall contact the Ops team, IH, or Medical Services to receive directions on scheduling the examination or contact their employer’s medical service provider according to their employer’s guidelines.

Printed copies are uncontrolled and are not to be used for operational purposes.

Glenn Research Center Occupational Health Programs Manual	Title: Synthetic Inorganic Fibers	
	Document No.: GLM-QS-1800.1.19	Rev.: B

Any employee involved in an incident where there is known or potential for excessive exposure to chemicals shall contact SHed Ops Team for evaluation and Medical Services or their employer’s medical provider to arrange for a post-exposure exam. This exam shall include tests deemed necessary by the physician handling the case.

6.9 Construction Use of SIFs

In general, proper controls or proper PPE are required when using chemicals at GRC. Construction contractors and their subcontractors bringing SIFs onto the site shall include the MSDSs for each, along with the method of exposure control as part of the Health and Safety Plan (HASP). The SHed staff members in charge of reviewing and approving HASPs shall approve or deny the use of chemicals and ensure proper controls are in place. Each construction contractor or subcontractor shall be responsible for assessing hazards, providing exposure monitoring, posting signs, providing training and PPE, and complying with OSHA regulations and NASA policy. See Glenn Safety Manual, Chapter 17, for more information on construction safety.

6.10 Disposal

Those disposing of waste SIFs shall contact Waste Management for the disposal of materials containing SIF. Materials containing SIF will be handled and disposed of as a solid waste by using the same procedures that are currently being used by GRC for the disposal of asbestos-containing materials (ACMs). Although the U.S. Environmental Protection Agency does not currently regulate SIFs, it remains prudent for GRC to follow the most conservative methods of disposal for these materials in anticipation of future regulations.

6.11 Recordkeeping (29 CFR 1910.1020)

In accordance with the requirements of the 29 CFR 1910.1020, OSHA Employee Access to Medical and Exposure Records Standard, both medical and industrial hygiene sampling records shall be made available to affected employees or their representatives. Medical Services and/or IH shall maintain copies of records collected at NASA.

7.0 RECORDS

- Job Hazard Analyses (JHAs).—Maintained by SHed Ops and PBS teams, as appropriate.
- JHA equivalent form.—Maintained by contractor-generated form.
- Hazard assessments.—Maintained by SHed Ops and PBS teams, as appropriate.
- Exposure assessment.—Maintained by SHed Ops and PBS teams, as appropriate.
- Exposure assessment database.—Maintained by SHed Ops and PBS teams.
- Medical examinations.—Maintained by Medical Services.
- Chemical inventory.—Maintained by SHed Ops and PBS teams, as appropriate.

8.0 REFERENCES

Document Number	Document Name
29 CFR 1910.1200 and 29 CFR 1926.59	Occupational Safety and Health Administration, “Hazard Communication Standard”
29 CFR 1910, Subpart I	OSHA, “PPE Standard”
GLM-QS-1800.1	NASA Glenn Occupational Health Programs Manual, Chapter 21, Hazard and Exposure Assessments
GLM-QS-1700.1	NASA Glenn Safety Manual, Chapter 15, Personal Protective Equipment

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Glenn Research Center Occupational Health Programs Manual	Title: Synthetic Inorganic Fibers	
	Document No.: GLM-QS-1800.1.19	Rev.: B

GLM-QS-1800.1	NASA Glenn Occupational Health Manual, Chapter 4, Respiratory Protection Program
GLM-QS-1700.1	NASA Glenn Safety Manual, Chapter 17, Construction Safety
NPR 1800.1	NASA Procedural Requirements, "NASA Occupational Health Program Procedures"
IARC Vol. 81 (2002)	IARC Monographs on the Evaluation of Carcinogenic Risks to Humans "Man-Made Vitreous Fibers"
GRC82	Job Hazard Analysis form
29 CFR 1910.1020	Occupational Safety and Health Administration, "Employee Access to Medical and Exposure Records" http://www.osha.gov/
2009 TLV Book	American Conference of Governmental Industrial Hygienists, "2009 TLVs and BEIs, Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices."

Printed copies are uncontrolled and are not to be used for operational purposes.

Glenn Research Center Occupational Health Programs Manual	Title: Synthetic Inorganic Fibers	
	Document No.: GLM-QS-1800.1.19	Rev.: B

APPENDIX A.—DEFINITIONS AND ACRONYMS

Action level (AL).—The concentration or level of an agent at which it is deemed that some specific action should be taken. The action can range from monitoring the exposure on a routine basis to making engineering adjustments. In general, the action level is set at one-half of the adopted occupational exposure limit.

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

Asbestos-containing material (ACM).—Any product or material that contains >1 percent asbestos.

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 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, or (c) it is regulated by the National Institute for Occupational Safety and Health or Occupational Safety and Health Administration 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.

Epidemiology.—The science that deals with incidence distribution and control of disease in a population.

Environmental Programs Manual (EPM)

Excursion limits.—Criteria for substances that have 8-hr TLV–TWA but no TWA–STEL or TLV–C, due to the lack of sufficient toxicological data. These limits are based on the maximum concentration above the established 8-hr TLV–TWA, which short-term exposure events can occur during the working day without exceeding the accepted occupational exposure limit. Excursions in a worker exposure levels may exceed 3 times the TLV–TWA for no more than 30 min during the workday, and under no circumstances should they exceed 5 times the TLV–TWA, provided that the 8-hr TLV–TWA is not exceeded.

Fiber.—An elongated particle having an aspect ratio (i.e., a ratio of length to width) of greater than 3:1. A fiber may be naturally occurring (such as plant fibers and asbestiform silicate minerals) or synthetic (such as vitreous or graphite fibers).

Glenn Research Center (GRC)

Hazardous Communication (HazCom)

Health and Safety Plan (HASP)

High-efficiency particulate air (HEPA)

International Agency for Research on Cancer (IARC)

Industrial hygienist (IH).—Industrial hygienists are scientists and engineers committed to protecting the health and safety of people in the workplace and the community. Industrial hygiene is considered a “science,” but it is also an art that involves judgment, creativity, and human interaction.

Job hazard analysis (JHA).—A technique that focuses on job tasks as a way to identify hazards before they occur. It focuses on the relationship between the worker, the task, the tools, and the work environment.

Mesothelioma.—Cancer of the membranes that line the chest and abdomen.

Material Safety Data Sheet (MSDS)

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Glenn Research Center Occupational Health Programs Manual	Title: Synthetic Inorganic Fibers	
	Document No.: GLM-QS-1800.1.19	Rev.: B

N100.—a NIOSH-approved particulate filtering facepiece respirator that filters at least 99.97 percent of airborne particles. The N100 is not resistant to oil.

National Institute for Occupational Safety and Health (NIOSH)

Occupational Health Programs Manual (OHPM)

Occupational exposure limit (OEL).—A health-based workplace standard to protect workers from adverse exposure (e.g., permissible exposure limits, threshold limit values, etc.).

Occupational Safety and Health Administration (OSHA)

P100.—a NIOSH-approved particulate filtering facepiece respirator that filters at least 99.97 percent of airborne particles. The P100 is strongly resistant to oil.

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

Personal protective equipment (PPE)

Plum Brook Station (PBS)

Refractory ceramic fiber (RCF).—Synthetic, vitreous, noncrystalline, aluminum silicate-based fibers.

Recommended exposure limit (REL).—The recommended exposure limit for a substance in air established and published by NIOSH.

Respirable fiber.—Fibers with a diameter less than 3 microns, and a length greater than 5 microns.

Safety and Health Division (SHeD)

Sensitizer.—A material that is capable of causing an immune response in an individual. In most cases, initial exposure results in a normal response, but repeated exposures lead to progressively strong and abnormal responses.

Skin notation.—Denotes the possibility that dermal absorption may be a significant contribution to the overall body burden of the chemical (i.e., the airborne occupational exposure limit may not be adequate to protect the worker because the compound also readily penetrates the skin). Other reactions to the skin such as irritation, dermatitis, and sensitization are not sufficient to warrant the skin notation.

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.

Synthetic inorganic fiber (SIF).—See synthetic vitreous fiber.

Synthetic vitreous fiber.—A group of fibrous, inorganic materials that contain aluminum or calcium silicates made from rock, clay, slag, or glass. These fibers differ from natural mineral fibers such as asbestos because they do not have a molecular structure that is crystalline. The randomly oriented molecular structure of synthetic vitreous fibers is called an amorphous structure. There are three categories of synthetic vitreous fibers: (1) glass fibers, including glass wool and continuous filament (textile) glass, (2) mineral wool, which contains stone wool and slag wool, and (3) refractory ceramic fibers. They are also referred to as synthetic inorganic fibers.

Systemic effect.—Adverse effect that occurs at a site other than at the site of contact.

Support service contractor (SSC)

Suspect human carcinogen.—Human data are accepted as adequate in quality but are conflicting or insufficient to classify the agent as a confirmed human carcinogen; or, the agent is carcinogenic in experimental animals at dose(s), by route(s) of exposure, at site(s), of histologic type(s), or by mechanism(s) considered relevant to worker exposure. This classification is used primarily when there is limited evidence of carcinogenicity in humans and sufficient evidence of carcinogenicity in experimental animals with relevance to humans.

Printed copies are uncontrolled and are not to be used for operational purposes.

Glenn Research Center Occupational Health Programs Manual	Title: Synthetic Inorganic Fibers	
	Document No.: GLM-QS-1800.1.19	Rev.: B

Target organs.—The organ of the body most affected by exposure to a particular substance, or the body organs that are affected by exposure to a hazardous chemical, physical, or biological agent.

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 mm Hg 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 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 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 (TWA) exposure.—Average concentration of an agent over a given working period of a person's exposure, as determined by sampling.

Toxicity.—A relative property of a chemical agent that refers to harmful effects on some biologic mechanism and the conditions under which the effect occurs.

Toxicology.—Scientific study of poisons, their actions, their detection, and treatment of conditions produced by them.

Toxic effect.—Harmful or poisonous effect of a chemical agent.

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

Wet methods.—The use of amended water (water with ≤10 percent surfactant dish washing liquid, etc.) to adequately wet the synthetic organic fiber material to prevent the release of fibers and dust during the removal, repair, and cleanup operation.

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