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Glenn Safety Manual – Chapter 14

Shop Safety

Approved by: QS/Chief, Safety and Health Division

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Change Record

Rev.	Effective Date	Expiration Date	GRC25, Change Request #	Description
A	7/19/2012	7/19/2017	99	Insertion of Verification Boxes in the Requirements section.
Change 1	4/14/2014	7/19/2017	N/A	Administrative change to add front cover and change history log to comply with NPR 1400.1. Deleted "()" and added "The GRC shall follow the requirements of" in Section 6.1 Administrative Policies and Procedures
Change 2	9/30/2015	7/19/2017	N/A	Administrative change to remove hyperlinks.
B	6/26/2017	6/26/2022	17-017	Stream-lined chapter by moving shop safety guidelines into a separate document entitled "Shop Safety Quick Reference Guide" that is being published to the SHeD Shop Safety Web site. Content remains the same. Added Job Hazard Analysis descriptions to be consistent with the Job Hazard Analysis Safety Programs Manual Chapter.
Change 1	4/25/2018	6/26/2022	N/A	Updated supervisor and employee responsibilities to address unauthorized shop equipment use
Change 2	5/12/2021	6/26/2022	N/A	Administrative changes to update NPR and Neil A. Armstrong Test Facility
Change 3	7/7/2022	12/26/2022	N/A	Extend GSM Chapter 14 Shop Safety for 6 months to December 26, 2022, which expired on June 26, 2022. The chapter is going out for 30 days Center Focus review and will require a few more months to complete renewal.

Rev.	Effective Date	Expiration Date	GRC25, Change Request #	Description
C	8/22/2022	8/22/2027	22-009	Section 6.1.2.2 "Shop Safety Attire" was changed to "Adhere to all posted signage within shop areas. Safety glasses shall be required while machines are operating unless otherwise posted." This is recommended to give smaller more diverse machine shops that are used very little for machining, more flexibility. They have signs that read “Eye protection required when machines are being operated”. Otherwise posted will mean “Safety glasses required at all times.” 6.1.2.1 - Shop area boundaries or controlled zones shall be designated by doors, walls, tape on the floor, or by other defining means. Some shop areas are in larger rooms and need a way to show their safety boundaries. 6.1.2.3 – Added: Ensure that electrical disconnects are not blocked. 6.1.2.5 – Added: Operate the equipment in accordance with the user's manual. 6.1.2.5 – Added LOTO: When maintenance or servicing is being performed, NASA GRC LOTO shall be followed.

***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 14—Shop Safety

__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 August 2022. 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

1.1 This chapter describes the policies and procedures for working safely in machine and fabrication shops as well as for working with typical machining and metal-forming equipment and tools. This document is intended to be a compilation of several requirements and standards from the Occupational Safety and Health Administration (OSHA) and NASA. When implemented properly, these policies and procedures provide the framework to protect employees and visitors working in or near shop areas as well as protect hardware and equipment.

1.2 This document does not replace safety programs specified by OSHA or NASA; it only acts as a collection of primary information and the practical application of that information. Personnel using this document should also review the corresponding references to obtain knowledge and understanding of the regulations in their entirety.

2.0 APPLICABILITY

2.1 The provisions of this chapter are applicable to civil servants, support service contractors, construction contractors, students and visitors at the NASA Glenn Research Center's (GRC) Lewis Field and Neil A. Armstrong Test Facility.

2.2 In this chapter, all mandatory actions (i.e., requirements) are denoted by statements containing the term "shall." The term "may" denotes a discretionary privilege or permission, "can" denotes statements of possibility or capability, "should" denotes a good practice and is recommended, but not required, "will" denotes expected outcome, and "are/is" denotes descriptive material

3.0 BACKGROUND

3.1 The majority of the jobs in the manufacturing sector are labor intensive. Workers are engaged in the mechanical, physical, or chemical transformation of materials, substances, or components into products. Manufacturing facilities characteristically use power-driven machines and material-handling equipment.

3.2 Workers in the manufacturing fields are at risk for illness and injuries because of long hours; changing shifts; contact with machinery and equipment; slips and falls; physical exertion and repetitive motions causing musculoskeletal disorders; hazardous exposure to toxic substances such as heavy metals, organic solvents, dust, isocyanates, chemicals, aerosols, nanoparticles, and carbon monoxide; explosions and structural failures; noise; ototoxicants; and stress.

4.0 POLICY

4.1 It is GRC policy for all GRC personnel to manage and conduct their operations in such a manner as to eliminate or minimize all potential hazards and to avoid accidents involving injury to personnel, damage to property, or loss of research operating time and effectiveness. In addition, it is GRC policy to eliminate pollution to the atmosphere, ground water, or land and to minimize potential exposure to hazardous materials.

4.2 Shop operations, design, fabrication, and assembly shall follow all applicable Federal, State, and local laws, NASA safety, health, and environmental standards and policies. All recognized professional organizations' "best practices" should also be utilized.

4.3 Measurement and Verification

Compliance with the responsibilities and requirements of this chapter are measured and verified through the use of programmatic self-assessments, regulatory and Agency audits and internal field inspections and surveys.

5.0 RESPONSIBILITIES

5.1 Safety and Health Division

Safety and Health Division (SHeD) professionals are responsible for:

a. Providing safety and health input on regulatory and best-practice shop requirements and for supporting shop activities.

b. Assisting in developing solutions to challenges that provide minimal impact to budget and schedule while meeting safety and health requirements.

c. Assisting GRC organizations with job hazard analysis (JHA) development.

d. Working with personnel, projects, and organizations in a team format to meet mission goals.

5.2 Supervisors

(Note: Supervisors can also refer to Work Leads, Area Leads, Foreman, or whoever is assigning a job/task.)

Supervisors are responsible for:

a. Supporting SHeD and shop employees in implementing safety and health policies and procedures.

b. Developing and ensuring that all applicable JHA's have been completed and certified with the Supervisors' signature. Consult JHA Chapter 15 of the GRC Safety Manual for further instructions.

c. Immediately correcting recognized unsafe conditions affecting personnel and facilities under their oversight.

d. Securing funding to ensure that shop facilities and equipment meet safety and health standards.

e. Ensuring that all incidents and injuries are reported in NASA Mishap Information System (NMIS).

f. When applicable, using the collective JHA's of a shop/buildup area for establishing general controls (personal protective equipment (PPE), signage, and barricades) for all personnel entering the shop area, including visitors.

g. Preventing untrained/unqualified employees from using shop equipment.

h. Maintaining training records and ensuring that equipment operators are trained and qualified.

i. Consult with SHeD for new shop operations with hazardous chemicals, lasers, and/or hot works.

5.3 Employees

Employees are responsible for:

a. Following all safety rules, regulations, and practices.

b. Participating in the development, population, and maintenance of a JHA for their task(s).

c. Reading, understanding, and signing JHA's applicable to the equipment they operate.

d. Obtaining shop lead's approval to operate equipment within any shop.

e. Maintaining training requirements and only operating equipment that they are qualified to operate.

f. Providing proof of current training records to the shop lead prior to using any equipment within a shop.

g. Informing management of unsafe conditions that need to be addressed.

h. Immediately reporting all incidents and injuries to their supervisors.

6.0 REQUIREMENTS

6.1 Administrative Policies and Procedures

The GRC shall follow the requirements of 29 Code of Federal Regulation (CFR) 1910.

6.1.1 Visitor Information for Machine Shops

Visitors should arrive to the facility prepared to walk through a working machining and fabrication environment. We ask our visitors to follow the following safety procedures:

a. Visitors must wear ankle-length slacks or pants. We respectfully ask that you not wear skirts, shorts, or capris. Please wear closed-toed and closed-heeled shoes. Clogs, sandals, and high heels are not permitted.

b. Visitors may be asked to wear hard hats, safety glasses, and hearing protection. These items will be provided to visitors by the facility. Visitors must wear these items throughout the duration of their visit.

c. Visitors must stay with their escort.

d. Visitors-need to refrain from touching items in the shop area. Some pieces may contain sharp edges or may be hot from welding processes.

6.1.2 General Shop Safety Procedures

6.1.2.1 Shop Area

a. Shop areas should be controlled to prevent unqualified and unauthorized personnel from using equipment.

b. Proper signage, including the type of PPE required for the area, must be displayed alerting individuals to the hazards and PPE requirements in the shop. Signage and PPE must correlate with a completed and certified hazard assessment i.e., JHA, hot work, or other comparable documents.

c. Shops that have designated walkways must be marked and be consistent with emergency evacuation routes and provide a safe path through the shop area.

d. Shop area boundaries or controlled zones shall be designated by doors, walls, tape on the floor, or by other defining means.

6.1.2.2 Safety Attire

a. Safety glasses shall meet American National Standards Institute (ANSI) Z87.1 (prescription safety glasses ANSI Z87.2), have side shields and are required throughout all shop areas as posted.

b. Safety shoes are required unless inside designated walkways.

c. Inside walkways, closed-toed and closed-heeled shoes are required.

d. Loose clothing, neckties, scarves, jewelry, gloves, lanyards and other loose items must not be worn when outside of the designated walkways. Secure long hair and roll sleeves above the elbow to prevent them from being caught in revolving parts.

e. Hearing protection must be worn when workers are grinding, torch cutting, operating a water knife, a brake, and other tools where hearing protection is indicated for use.

6.1.2.3 Equipment Inspection

a. Always inspect equipment before using.

b. Check and adjust all safety devices before each job.

c. Ensure that the guards are in position and in good working condition before operating.

d. Ensure that all stationary equipment is anchored securely to the floor.

e. Ensure that equipment electrical disconnects are not blocked.

f. Ensure that all machines have a start/stop button within easy reach of the operator.

g. Have any alterations or major repairs made by a qualified machine repairman.

6.1.2.4 Housekeeping

a. Ensure that the area around the machine is free of clutter, debris, and oil to prevent slip and trip hazards.

b. Ensure that there is enough room around the machine to do the job safely.

c. Ensure that the working surfaces are clean of scraps, tools, and materials.

6.1.2.5 Equipment Operation

6.1.2.5.1 All equipment must be operated by or under the direct supervision of a trained and qualified operator. Supervisors shall certify personnel as being trained and qualified. They shall ensure that the individual understands how to use the equipment accurately and safely. All On the Job Training (OJT) records shall be in compliance with Glenn Procedural Requirements (GLPR) 3410.1.

6.1.2.5.2 Please consult the Shop Safety Quick Reference Guide on the GRC Safety and Mission Assurance Shop Safety Web page for tips on safe operation of specific types of equipment. For safe operation:

a. Operate the equipment in accordance with the user's manual.

b. Keep rags, brushes, hands, and other tools away from moving machine parts.

c. Avoid awkward operations and hand positions. A sudden slip could cause your hand to move into the cutting tool or blade or contribute to a fall.

d. Ensure that machines that are running are attended at all times.

e. Use a vacuum, brush, or rake to remove cuttings. Do not handle cuttings by hand.

f. Lockout/Tagout (LOTO): When maintenance or servicing is being performed, NASA GRC LOTO Program shall be followed.

6.1.2.6 Buddy System

All shops shall follow the "no-one alone system." As defined in The Glenn Buddy System, Chapter 22 (Section 6.1.4) of the Glenn Safety Manual, the "no-one alone system involves situations in which two or more persons, not necessarily having the same skills or training, are working in the same area and checking with reasonable frequency on the continuing well-being of each other." Under this system, at least two individuals must be present in the shop together within line of sight and hearing.

6.2 Chemical and Waste Management

Follow the procedures outlined in the Occupational Health Program Manual (OHPM) GLP-QS-1800.1, including OHPM Chapter 14: Acquisition of Hazardous Chemicals and Materials for procurement of chemicals; OHPM Chapter 25: Chemical Hygiene Policy and Chemical Hygiene Plan for handling and storage of chemicals and OHPM Chapter 20: Hazard Communication Policy for hazard communication training. For Chemical Storage, Dispensing, and Disposal-refer to the GRC Chemical Hygiene Plan. For guidance on waste management-refer to the Environmental Programs Manual (GLM-FE-8500.1).

7.0 REFERENCES

Document number	Document name
29 CFR 1910 Subpart D	Walking-Working Surfaces
29 CFR 1910 Subpart H	Hazardous Materials
29 CFR 1910 Subpart I	Personal Protective Equipment
29 CFR 1910.212 - 1910.219	General Requirements for all Machines
29 CFR 1910.107	Spray Finishing Using Flammable and Combustible Materials
29 CFR 1910.147	The Control of Hazardous Energy (LOTO)
NPD 1800.1	NASA Policy Directive, NASA Occupational Health Program Procedures
NPR 8715.1	NASA Procedural Requirements, NASA Safety and Health Programs
GLP-QS-1800.1	Occupational Health Programs Manual
GLP-QS-8715.1	Glenn Safety Manual
GLM-FE-8500.1	GRC Environmental Programs Manual

APPENDIX A.— ACRONYMS

ANSI	American National Standards Institute
CFR	Code of Federal Regulations
GLM	Glenn Manual
GRC	Glenn Research Center
JHA	Job Hazard Analysis
LOTO	Lock Out/Tag Out
NMIS	NASA Mishap Information System
NPD	NASA Policy Directive
NPR	NASA Procedural Requirement
OHPM	Occupational Health Programs Manual
OSHA	Occupational Safety and Health Administration
OJT	On the Job Training
PPE	Personal Protective Equipment
SHeD	Safety and Health Division