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Glenn Safety Manual –Chapter 34

Fall Protection w/Change 2 (9/30/2015)

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Cleveland, OH 44135**

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Change Record

Revision	Effective Date	Expiration Date	GRC25, Change Request #	Description
B	12/19/2012	12/19/2017	125	Bi-annual review.
Change 1	4/15/2014	12/19/2017	N/A	Administrative change to add front cover and change history log to comply with NPR 1400.1. Inserted "The GRC shall follow the requirements of 29 CFR Part 1926 and 29 CFR Part 1910." in Section 6.0 Requirements. Administrative change to include in detail the following NPR 8715.3C requirement: 6.19Waiver Process: All waivers to requirements listed in NPR 8715.3C, paragraph 3.18 shall be documented in the Center's fall protection implementation plan after submission of requests to waive/deviate are completed per NPR 8715.3C, paragraph 1.13. Submit GRC83B to request a waiver.
Change 2	9/30/2015	12/19/2017	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 34—Fall Protection

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 (GRC) intranet with the BMS Library. Approved by Chief of Safety and Health Division.

Inter Directive 34-01 has been issued for this chapter. Please review before proceeding. The contents of this interim directive will be officially incorporated into the chapter in the near future.

1.0 PURPOSE

This chapter describes policies and the minimal safe practices relating to all activities where fall protection is required at the NASA Glenn Research Center at Lewis Field and Plum Brook Station (GRC). All personnel performing activities where fall protection is required shall do so in a safe manner. All personnel utilizing fall protection systems shall meet or exceed the minimum safety requirements defined herein, and shall comply with all other Federal, State, and local requirements and standards. Exception: The provisions of this chapter do not apply when employees are making an inspection, investigation, or assessment of workplace conditions prior to the actual start of the work or after all the work has been completed.

2.0 APPLICABILITY

The provisions, responsibilities, and requirements as set forth in this chapter apply to

- All NASA GRC employees
- All GRC contractors, other NASA contractors, and non-NASA and noncontractor individuals present at GRC in accordance with the terms of their contracts or agreements with NASA
- Other Government organizational elements that are tenants at GRC or any other locations under GRC jurisdiction

3.0 BACKGROUND

Each year, falls consistently account for the greatest number of fatalities in the construction industry. A number of factors are often involved in falls, including unstable working surfaces, misuse or failure to use fall protection equipment, and human error. Studies have shown that using guardrails, fall arrest systems, safety nets, covers, and restraint systems can prevent many deaths and injuries from falls.

4.0 POLICY

NASA GRC endeavors to protect all government employees, contractors, subcontractors, and persons who are exposed to falls through the course of their work. Fall hazards shall be eliminated, mitigated, and/or controlled before an employee is exposed to the hazard. This policy is meant to strengthen existing fall protection programs, policies, and regulations. It does not replace Occupational Safety and Health Administration (OSHA) regulations, NASA, GRC, or contractor safety programs except where this policy is more stringent.

The GRC fall protection program states that persons involved in OSHA 1910 general industry activities on any walking/ working surface where a person is exposed to a fall to a lower level of 4 ft or greater shall be provided with fall protection. Fall hazards lower than 4 ft require protection if the work is over an uncommon hazard (moving machinery, chemicals, electrical, impalement hazards, etc.). For activities defined as construction under the OSHA 1926 regulation where a person is exposed to a fall to a lower level of 6 ft or greater shall be provided with fall protection. Fall hazards lower than 6 ft require protection if the work is over an uncommon hazard (moving machinery, chemicals, electrical, impalement hazards, etc.).

Construction contractors working at GRC shall submit a site-specific Fall Prevention Plan that will address project-specific fall hazards that will be encountered while working at heights. This site-specific Fall Prevention Plan shall become a part of the contractors Health and Safety Plan (HASP).

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5.0 RESPONSIBILITIES

The GRC Center Director and designated Fall Protection Program Administrator, as well as the appropriate procurement entity and all personnel at NASA GRC who meet the requirements for fall protection, are responsible for understanding this chapter and conforming to its practices and provisions.

Safety and Health Division (SHeD) shall perform all HASP reviews.

5.1 Center Director

The Center Director shall

- Implement a Center fall protection program to protect all Government employees, contractors, subcontractors, international partners, and persons who are exposed to falls at onsite facilities through the course of their work (Requirement)
- Ensure that the Center's fall protection program complies with the requirements of 29 CFR 1910, General Industry, and 29 CFR 1926, Construction Industry; utilizes as guidelines (these versions), American National Standards Institute (ANSI)/American Society of Safety Engineers (ASSE) Z359, Fall Protection Code series (Z359.0–2007, Z359.1–2007, Z359.2–2007, Z359.3–2007, and Z359.4–2007); and complies with any more stringent requirements necessary for the Center's specific fall hazards (Requirement)
- Designate, in writing, a Center Fall Protection Program Administrator who is responsible for the development, implementation, and management of the Center's fall protection program (Requirement)
- Ensure that the designated Center Fall Protection Program Administrator and/or team has a working knowledge of current fall protection regulations, standards, and fall protection equipment and systems and the skills, experience, and abilities to effectively manage the Center's fall protection program (Requirement)

5.2 Center Fall Protection Program Administrator

- The Center Fall Protection Program Administrator shall implement and coordinate the Center's fall protection program (Requirement)
- Appoint a Fall Protection Program LeadProvide guidance and oversight to ensure that NASA fall protection requirements are included in contracts where contractor employees of the acquisition will be working in situations that require fall protection
- Provide oversight to ensure that NASA fall protection requirements are included in work instructions where individuals will be working in situations that require fall protection
- Provide oversight to ensure that anyone who is identified as a qualified person (per ANSI/ASSE Z359.0–2007, paragraph 2.109) to serve as a subject matter expert in support of the Center's fall protection program has an engineering degree or access to a person with an engineering degree to identify and to evaluate unique situations and nonstandard equipment and has been trained by an industry-recognized trainer, NASA-recognized trainer/training center, or NASA-developed training program equivalent to ANSI- and OSHA-compliant training
- Provide oversight to ensure that for each situation that requires fall protection at the Center (NASA or contractor led) there is a competent person (per ANSI/ASSE Z359.0–2007, paragraph 2.27) assigned responsibility for the immediate application of fall protection work where fall protection is required, whose education and training has been administered by an industry-recognized trainer, NASA-recognized trainer/training center, or NASA-developed training program equivalent to ANSI- and OSHA-compliant training (Requirement)
- Remain current with changing OSHA and ANSI fall protection requirements, NPR 8715.3, local laws, and new fall protection systems (Requirement)
- Conduct an annual review and audit of the Center's fall protection program to ensure compliance. Use of new technology, regulations, and industry practices should be considered during the annual review.

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5.3 Fall Protection Program Lead

Fall Protection Program Lead shall

- Evaluate the Center wide hazards, determine where protection from falls from elevation is required, and establish any additional, more-stringent requirements necessary to protect against Center-specific fall hazards (delegated from the Fall Protection Administrator)
- Coordinate with the Fall Protection Administrator regarding fall protection program development.
- Maintain certification to fulfill role of Qualified Person as defined by NPR 8715.3
- Perform Qualified Person duties
- Chair the Fall Protection Committee
- Coordinate meetings with the organizations competent persons
- Develop and maintain the Fall Prevention Plan (GRC979)
- Conduct annual binder reviews
- Provide consultation on appropriate equipment selection
- Conduct fall hazard site validation survey
- Remain current with changing OSHA and ANSI fall protection requirements, NPR 8715.3, local laws, and new fall protection systems

5.4 Fall Protection Committee

- A committee consisting of Competent Persons, appointed by their organizations, and chaired by the Fall Protection Program Lead. The purpose is to meet periodically to discuss recent updates in standards, equipment and protocol. The information shared at the meeting is communicated to their organization by the Competent Person. General discussions regarding activities at GRC and any questions or comments that members might have are addressed. Also, any information on recalled fall equipment is communicated.

5.5 Supervisors

Supervisors shall

- Ensure that NASA fall protection requirements are included in work instructions where NASA employees and/or contractors will be working in situations that require fall protection
- Ensure that anyone who is identified as a qualified person (per ANSI/ASSE Z359.0–2007, paragraph 2.109) to serve as a subject matter expert in support of the Center's fall protection program has been trained by an industry-recognized trainer, NASA-recognized trainer/training center, or NASA-developed training program equivalent to ANSI- and OSHA-compliant training (ANSI/ASSE Z359.2–2007, Section C.5)
- For each situation that requires fall protection at the Center (NASA or contractor led), ensure that there is a competent person (per ANSI/ASSE Z359.0–2007, paragraph 2.27) assigned responsibility for the immediate application of fall protection work where fall protection is required whose education and training has been administered by an industry-recognized trainer, NASA-recognized trainer/training center, or NASA-developed training program equivalent to ANSI- and OSHA-compliant training
- Remain current with changing OSHA and ANSI fall protection requirements, NPR 8715.3, state and local laws, and new fall protection systems

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- Ensure that employees under their supervision who are required to use a fall protection system are trained to recognize the hazards associated with falls from elevated heights and shall ensure that employees under their supervision comply with the requirements of this chapter and with the applicable fall protection procedures
- Ensure that employees requiring fall protection utilize the necessary fall protection systems in a safe manner and in accordance with the manufacturer’s recommendations for use of the specific fall protection systems
- Ensure that employees have a complete understanding of the rescue plan (GRC979) procedures in case of an emergency

5.6 Procurement Personnel

Procurement personnel shall

- In coordination with the Center Office of Safety and Mission Assurance, ensure that NASA fall protection requirements within NPR 8715.3 are included in contracts where contractor employees will be working on NASA property in situations that require fall protection

5.7 Civil Servant Employees

All employees at NASA GRC shall understand and conform to the policies, safe practices, and provisions of this chapter. All civil servants shall understand and conform to the policies, safe practices, and provisions of this chapter.

All civil servant employees utilizing fall protection at GRC shall have an organizational competent person designated with training as defined in NPR 8715.3. The competent person shall develop a GRC979 Fall Prevention Plan, for each task requiring the use of fall protection equipment. The competent person shall review the GRC979 Fall Prevention Plan with the fall protection users prior to the start of work.

5.8 Support Service Contractor Employees

All Support Service contractor employees shall comply with this chapter. All contractors shall understand and conform to the policies, safe practices, and provisions of this chapter.

All support service contractor employees utilizing fall protection at GRC shall have a competent person designated with training as defined in NPR 8715.3. The competent person shall develop a GRC979 Fall Prevention Plan, for each task requiring the use of fall protection equipment. The competent person shall review the GRC979 Fall Prevention Plan with the fall protection users prior to the start of work.

5.9 Construction Contractor Employees

All construction contractor employees shall comply with this chapter. All contractors shall understand and conform to the policies, safe practices, and provisions of this chapter.

All construction contractor employees utilizing fall protection at GRC shall submit in writing a site-specific HASP that include a GRC979 Fall Prevention Plan, which identifies

- Hazardous conditions requiring fall protection
- Methods of fall protection that will be used to ensure a safe and healthful working environment
- How the contractor plans to protect both the health and safety of NASA and contractor employees and government property and equipment
- A written rescue plan to retrieve a fallen or suspended worker from the area
- Contractors are required to have a competent person that has received industry recognized fall protection competent person training and have documentation of this training available upon request.

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5.10 Competent Person

For the purposes of this chapter, the competent person shall be qualified in the following areas of fall protection:

- Nature of fall hazards
- Erecting, maintaining, disassembling, and inspection of the fall protection systems
- Use and operations of fall protection systems
- Handling and storage of equipment and materials and erection of overhead protection
- Role of employees in fall protection plans
- All standards contained in 29 CFR Part 1926, Subpart M
- All standards contained in ANSI Z359

After successful completion of an industry-recognized competent person training program, the competent person, as defined by NPR 8715.3, is an individual who, by way of said training and experience, is knowledgeable of applicable standards, is capable of identifying workplace hazards relating to the specific operation, is designated by the contracting manager, and has authority to take appropriate actions. For construction contractors the competent person shall be listed on the applicable site-specific HASP.

The competent person is responsible for the following

- Completion of the GRC979 Fall Prevention Plans for tasks
- Educating fall protection users on the requirements designated within the GRC979 Plan
- Maintaining a list of authorized users for their assigned organization
- Maintain an inventory of fall protection equipment
- Performing and documenting the annual inspection of fall protection equipment
- Establishing and maintaining the organizational fall protection implementation work instruction.

5.11 Employer

It is the responsibility of the employer to determine if the walking/working surfaces on which employees are to work have the strength and structural integrity to support employees safely. Employees are permitted to work on those surfaces only when the surfaces have the necessary strength and structural integrity. The employer shall select fall protection measures compatible with the type of work being performed and specific to the site of the work. The employer shall assign a competent person that meets the requirements in Section 5.10 and Section 5.9 of this chapter.

6.0 REQUIREMENTS

The GRC shall follow the requirements of 29 CFR Part 1926 and 29 CFR Part 1910.

6.1 General Fall Protection Requirements

The SHed verification procedure to ensure compliance with the requirements listed in this section, shall be accomplished by reviewing Design Reviews, HASP's (Health and Safety Plans), GRC979's and conducting on site safety inspections

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6.1.1 Rule Where Fall Protection Is Required

6.1.1.1 General Industry Worker (29 CFR 1910)

When a worker is on a walking/working surface an unprotected side or edge which is 4 ft or more above a lower level, or when workers could fall into or onto dangerous equipment from 4 ft or less, the worker shall be protected from falling by using guardrail systems, safety net systems, or personal fall arrest systems.

6.1.1.2 Construction Worker (29 CFR 1926)

Anytime a worker is on a walking/working surface or constructing a leading edge with an unprotected side or edge, which is 6 ft (1.8 m) or more above a lower level, or when workers could fall into or onto dangerous equipment from 6 ft (1.8 m) or less, the worker must be protected from falling by using guardrail systems, safety net systems, or personal fall arrest systems.

6.1.2 Exception to the Rule

If the employer can demonstrate that it is not feasible or creates a greater hazard to use these systems, the competent person shall develop and implement a written Fall Prevention Plan. The Fall Prevention Plan shall be prepared by a competent person, shall be specific to the site, and shall be maintained up to date. See Section 6.10 of this chapter.

6.1.3 The Fall Prevention Plan shall be reviewed by SHeD Where Protection Is Needed (29 CFR 1926)

Below is a list of possible exposures that shall require a fall protection system(s). It is the responsibility of the employer to determine the fall protection required as it pertains to the work to be accomplished and the specific worksite. (List may not be all inclusive.).

- Unprotected sides and edges—Each employee on a walking/working surface (horizontal and vertical surface) with an unprotected side or edge, which is 6 ft (1.8 m) or more above a lower level shall be protected from falling by the use of guardrail systems, safety net systems, or personal fall restraint/fall arrest systems.
- Leading edges—Each employee who is constructing a leading edge 6 ft (1.8 m) or more above lower levels shall be protected from falling by guardrail systems, safety net systems, or personal fall restraint/fall arrest systems. Exception: When the employer can demonstrate that it is infeasible or creates a greater hazard to use these systems, the employer shall develop and implement a Fall Prevention Plan (see Section 6.10). The Fall Prevention Plan shall be reviewed by SHeD.
- Hoist areas—Each employee in a hoist area shall be protected from falling 6 ft (1.8 m) or more to lower levels by guardrail systems or personal fall restraint/fall arrest systems. If guardrail systems (or chain, gate, or guardrail) or portions thereof, are removed to facilitate the hoisting operation (e.g., during landing of materials), and an employee must lean through the access opening or out over the edge of the access opening, that employee shall be protected from fall hazards by a personal fall restraint/fall arrest system.
- Holes—Each employee on walking/working surfaces shall be protected from falling through holes (including skylights) more than 6 ft (1.8 m) above lower levels, by personal fall restraint/fall arrest systems, covers, or guardrail systems erected around such holes.
- Formwork and reinforcing steel—Each employee on the face of formwork or reinforcing steel shall be protected from falling 6 ft (1.8 m) or more to lower levels by personal fall restraint/fall arrest systems, safety net systems, or positioning device systems.
- Ramps, runways, and other walkways—Each employee on ramps, runways, and other walkways shall be protected from falling 6 ft (1.8 m) or more to lower levels by guardrail systems.
- Excavations—Each employee at the edge of an excavation 6 ft (1.8 m) or more in depth shall be protected from falling by guardrail systems, fences, barricades, or covers. Where walkways are provided to permit employees to cross over excavations, guardrails are required on the walkway if the fall would be 6 ft (1.8 m) or more to the lower level.

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- Pit, well, or shaft—Each employee at the edge of a well, pit, shaft, and similar excavation 6 ft (1.8 m) or more in depth shall be protected from falling by guardrail systems, fences, barricades, or covers.
- Dangerous equipment less than 6 ft—Each employee less than 6 ft (1.8 m) above dangerous equipment shall be protected from falling into or onto the dangerous equipment by guardrail systems or by equipment guards.
- Dangerous equipment more than 6 ft.—Each employee 6 ft (1.8 m) or more above dangerous equipment shall be protected from fall hazards by guardrail systems, personal fall restraint/fall arrest systems, or safety net systems.
- Overhand bricklaying and related work—Each employee performing overhand bricklaying and related work 6 ft (1.8 m) or more above lower levels shall be protected from falling by guardrail systems, safety net systems, or personal fall arrest systems or shall work in a controlled access zone. Each employee reaching more than 10 in. (25 cm) below the level of the walking/working surface on which they are working shall be protected from falling by a guardrail system, safety net system, or personal fall restraint/fall arrest system. Note that bricklaying operations performed on scaffolds are regulated by Subpart L of 29 CFR 1926.
- Roofing work on low-slope roofs—Each employee engaged in roofing activities on low-slope roofs with unprotected sides and edges 6 ft (1.8 m) or more above lower levels, shall be protected from falling by guardrail systems, safety net systems, personal fall restraint/fall arrest systems, or a combination of warning line system and guardrail system, warning line system and safety net system, warning line system and personal fall restraint/fall arrest system. The use of a warning line and safety monitoring system is not permitted unless it can be demonstrated that it is the only viable option and concurred by SHeD.
- Precast concrete erection—Each employee engaged in the erection of precast concrete members (including, but not limited to the erection of wall panels, columns, beams, and floor and roof “tees”) and related operations such as grouting of precast concrete members, who is 6 ft (1.8 m) or more above lower levels, shall be protected from falling by guardrail systems, safety net systems, or personal fall restraint/fall arrest systems. Exception: When the employer can demonstrate that it is infeasible or creates a greater hazard to use these systems, the employer shall develop and implement a Fall Prevention Plan (see Section 6.10). The Fall Prevention Plan shall be reviewed by SHeD.
- Wall openings—Each employee working on, at, above, or near wall openings (including those with chutes attached) where the outside bottom edge of the wall opening is 6 ft (1.8 m) or more above lower levels and the inside bottom edge of the wall opening is less than 39 in. (1.0 m) above the walking/working surface, shall be protected from falling by the use of a guardrail system, a safety net system, or a personal fall restraint/fall arrest system.
- Walking/working surfaces not otherwise addressed—Each employee on a walking/working surface 6 ft (1.8 m) or more above lower levels shall be protected from falling by a guardrail system, safety net system, or personal fall restraint/fall arrest system.

6.2 Fall Protection Systems Criteria and Practices

The SHeD verification procedure to ensure compliance with the requirements listed in this section, shall be accomplished by reviewing HASP's (Health and Safety Plans), design reviews, GRC979's and on site safety inspections.

- The fall protection system, selected by the competent person, is to be one which the competent person deems is most appropriate for protecting the worker.
- Employers shall provide and install all fall protection systems before an employee begins the work that necessitates the fall protection.

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- Components and systems that are commercial off the shelf shall be supplied with complete installation and operation instructions, and those instructions shall be followed. Only a qualified person may change the instructions, and those changes are documented prior to use.

6.3 Safety nets are allowed at GRC only as a last resort. They must be an engineered system and a Fall Prevention Plan must be submitted and reviewed by SHED. Guardrail Systems

The SHED verification procedure to ensure compliance with the requirements listed in this section, shall be accomplished by reviewing HASP's (Health and Safety Plans), design reviews and on site safety inspections.

Guardrail systems means a barrier erected to prevent employees from falling to lower levels. Guardrail system components shall be selected and constructed in accordance with Appendix B to Subpart M of 29 CFR 1926. Guardrails constructed in accordance with Subpart M, 29 CFR 1926.502(b) will meet the requirement.

6.3.1 Specifications for Guards and Guardrails

- Top edge height of top rails, or equivalent guardrail system members, shall be 42 in. (1.1 m) plus or minus 3 in. (8 cm) above the walking/working level. When conditions warrant, the height of the top edge may exceed the 45-in. height, provided the guardrail system meets all other criteria of this paragraph.
- Midrails, screens, mesh, intermediate vertical members, or equivalent intermediate structural members shall be installed between the top edge of the guardrail system and the walking/working surface when there is no wall or parapet wall at least 21 in. (53 cm) high.
- Guardrail systems shall be capable of withstanding, without failure, a force of at least 200 lb (890 N) applied within 2 in. (5.1 cm) of the top edge, in any outward or downward direction, at any point along the top edge.
- Guardrail systems shall prevent punctures, lacerations, or snagged clothing.
- Steel and plastic banding shall not be used as top rails or midrails.
- When guardrail systems are used at holes, they shall be erected on all unprotected sides or edges of the hole.
- Guardrail systems used on ramps and runways shall be erected along each unprotected side or edge.

6.3.2 Temporary Removal of Guardrails

- If a guardrail must be removed to accommodate work
 - only that portion of the guardrail necessary to allow the work to be done may be removed
 - workers exposed to a fall hazard must be protected by another fall protection system when the guardrail is absent
- The guardrail must be replaced
 - when the unguarded area is left unattended
 - after the work is completed if the circumstances still require guardrails
- Safety nets are allowed at GRC only as a last resort. They must be an engineered system and a Fall Prevention Plan must be submitted and reviewed by SHED.
- Safety nets must meet the requirements of 29 CFR 1926.502(c), Safety and Health regulations for Construction, Subpart M, or other standard, appropriate to the type of net involved, which is acceptable to SHED.
- Safety nets and their installation shall be capable of absorbing an impact force equal to that produced by the drop test specified in the requirements of 29 CFR 1926.502©.

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6.4 Personal Fall Arrest Systems

The SHeD verification procedure to ensure compliance with the requirements listed in this section, shall be accomplished by reviewing HASP's (Health and Safety Plans), design reviews, GRC979's and on site safety inspections.

- Personal fall arrest systems shall meet the requirements of 29 CFR 1926.502(d) and ANSI/ASSE Z359, Fall Protection Code Series, (Z359.0-2007, Z359.1-2007, Z359.2-2007, Z359.3-2007, and Z359.4-2007)
- All employees who use fall protection equipment shall be able to calculate the fall arrest distance for each individual task.
- Connectors and devices used to couple parts of the personal fall-arrest system and positioning device system together shall be drop-forged, pressed or formed steel, corrosion-resistant, and smooth-surfaced to prevent damage to interfacing parts.
- Dee-rings and snaphooks shall have a minimum tensile strength of 5000 lb and shall be proof-tested to a minimum tensile load of 3600 lb without cracking, breaking, or taking permanent deformation.
- Connecting nonlocking snaphooks to an incompatibly shaped object, where rollout or unintentional disengagement could occur, or to horizontal lifelines is prohibited.
- Design, install, and use horizontal lifelines shall be under the supervision of a qualified person, as part of a complete personal fall-arrest system that maintains a safety factor of two.
- Employees shall have their own vertical lifeline with a breaking strength of at least 5000 lb.
- Two employees may be attached to the same lifeline during elevator construction if they meet the requirements of 29 CFR 1926.502(d)(10)(ii).
- Lifeline shall be protected from being cut or abraded.
- Self-retracting lifelines that do not limit the free-fall distance to 2 ft, and rip stitch, tearing, and deforming lanyards, shall have a minimum tensile load of 5000 lb when the device is fully extended.
- Self-retracting lifelines and lanyards that automatically limit the free-fall distance to 2 ft or less shall have a minimum tensile load of 3000 lb.
- Anchorage of personal fall-arrest equipment shall support 5000 lb per employee attached.
- Do not anchor personal fall-arrest equipment to anything used to support or suspend platforms.
- Personal fall-arrest systems shall not be attached to guardrail systems.
- When possible, anchor locations should be located at or above the employees head. If work is done above an anchorage point, which would allow for a free fall greater than 6ft, the organizations competent or qualified person should be consulted.
- Anchorages used for attachment of personal fall-arrest system shall be designed, installed, and used under the supervision of a qualified person.
- The employer shall provide for prompt rescue of employees in the event of a fall or shall assure that employees are able to rescue themselves.

6.5 Positioning Devices

The SHeD verification procedure to ensure compliance with the requirements listed in this section, shall be accomplished by reviewing HASP's (Health and Safety Plans), design reviews, GRC979's and on site safety inspections.

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- Positioning-device systems means a body harness rigged to allow an employee to be supported on an elevated vertical surface, such as a wall, and work with both hands free while leaning.
- Rig positioning devices so employees cannot free fall more than 2 ft.
- The anchorage shall be capable of supporting twice the potential impact load, or 3000 lb, whichever is greater.
- Connectors shall follow the same criteria as outlined in Section 6.4, Personal Fall Arrest Systems.

6.6 Warning Line Systems

The SHeD verification procedure to ensure compliance with the requirements listed in this section, shall be accomplished by reviewing HASP's (Health and Safety Plans), GRC979's and on site safety inspections.

- Warning line systems shall meet the requirements of 29 CFR 1926.502(f).
- Place the warning line on all sides of the roof work area, and erect it not less than 6 ft from the edge.
- Warning line shall consist of ropes, wires, or chains with supporting stanchions.
- Flag the rope, wire, or chain at 6-ft intervals with high-visibility materials.
- Stanchions shall be capable of resisting, without tipping over, a force of at least 16 lb applied horizontally against the stanchion.
- Stanchions shall be 30 in. above the walking/working surface.
- Stanchions shall be perpendicular to the warning line and in the direction of the edge.
- Rope, wire, or chain shall have a minimum of tensile strength of 500 lb, and be capable of supporting the loads applied to the stanchions.
- Employees are prohibited from the area between the warning line and the roof edge unless they are performing roof work in that area and a safety monitor is present.
- Equipment on roofs shall be used or stored only in areas where employees are protected by a warning line system, guardrail systems, or personal fall restraint/fall arrest systems.

6.7 Controlled Access Zones

The SHeD verification procedure to ensure compliance with the requirements listed in this section, shall be accomplished by reviewing HASP's (Health and Safety Plans), GRC979's and on site safety inspections.

- Controlled access zones (CAZ) shall meet the requirements of CFR 1926.502(g), Safety and Health Regulations for Construction, Subpart M
- Controlled access zones must incorporate a GRC979 Fall Prevention Plan.
- A CAZ may be used in overhead bricklaying, leading edge, and precast concrete erection operations.

6.8 Safety Monitoring Systems

The SHeD verification procedure to ensure compliance with the requirements listed in this section, shall be accomplished by reviewing HASP's (Health and Safety Plans), GRC979's and on site safety inspections.

- Safety monitoring systems shall meet the requirements of 29 CFR 1926.502(h).
- Safety monitors shall not have responsibilities that take their attention from the monitoring function.

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- Only employees performing low-slope roofing work shall be in areas guarded by a safety monitor system (see CFR 1926.501(b)(9) and 1926.502(k)).

6.9 Protective Covers

The SHeD verification procedure to ensure compliance with the requirements listed in this section, shall be accomplished by reviewing HASP's (Health and Safety Plans), GRC979's and on site safety inspections.

- Covers shall meet the requirements of 29 CFR 1926.502(i), Safety and Health Regulations for Construction, Subpart M.
- Covers are a method of protection for holes.
- Covers in roadways shall support at least twice the maximum axle load of the largest vehicle crossing the hole.
- Covers shall carry at least twice the weight of employees, equipment, and materials that may be imposed on them.
- Secure the cover to prevent displacement by wind, equipment, or employees.
- All covers shall be color coded or they shall be marked with the words "HOLE" or "COVER" to provide warning of the hazard.

NOTE: This provision does not apply to cast-iron manhole covers or steel grates used on streets or roadways.

6.10 Fall Prevention Plan (GRC979)

The SHeD verification procedure to ensure compliance with the requirements listed in this section, shall be accomplished by reviewing HASP's (Health and Safety Plans), GRC979's and on site safety inspections.

- The Fall Prevention Plan (GRC979) shall be prepared by a Competent Person and developed for a specific job when the use of traditional fall protection is being used. The Fall Prevention Plan (GRC979) shall include a written discussion of measures that will be taken to reduce or eliminate the fall hazard for workers. The plan details the task, fall protection equipment, fall hazards identified, the procedure and a rescue plan. The plan shall be reviewed by the Competent Person with the workers involved with the task. After reviewing the plan, all individuals involved will sign off, showing that they understand the hazards involved, the equipment to be used and the rescue plan.
- The Fall Prevention Plan shall
 - Be prepared by a competent person
 - Be specific to the site/job.
 - Be maintained at the jobsite
 - Be implemented under the constant supervision of a competent person
- Document why the use of conventional fall protection systems (guardrail systems, personal fall arrest systems, or safety net systems) is infeasible or why their use would create a greater hazard.
- Provide a written discussion of measures to reduce or eliminate fall hazards.
- Identify each location where conventional fall protection methods cannot be used. These locations shall then be classified as controlled access zones and the employer must comply with the criteria in 29 CFR 1926.502(g), Safety and Health Regulations for Construction, Subpart M.

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- Provide the name or other method of identification for each employee who is designated to work in controlled access zones. No other employees may enter controlled access zones.
- Where no other alternative measure has been implemented, the employer shall implement a safety monitoring system in conformance with 29 CFR 1926.502(h).
- In the event an employee falls, or any related mishap occurs, the employer shall provide a method to investigate the circumstances of the fall or mishap to determine if the fall protection plan needs to be changed (e.g., new practices, procedures, or training) and shall implement those changes to prevent similar types of falls or incidents.
- Be reviewed and concurred by SHeD for construction contractor activities, including any changes to the original GRC979.

6.11 Organizational Work Instructions

The SHeD verification procedure to ensure compliance with the requirements listed in this section shall be accomplished by conducting an annual review and audit process.

The GRC fall prevention program states that persons involved in OSHA general industry activities on any walking/working surface where a person is exposed to a fall to a lower level of 4ft. or greater shall be provided with fall protection. This work instruction provides procedures to comply with the requirement of NPR 8715.3, section 3.18, supervisors ensure NASA fall protection requirements are included in work instructions where NASA employees and/or contractors will be working in situations that require fall protection.

Supervisors are to perform a hazard analysis when working on vertical heights 4 ft. above a lower level. This will result in generating a GRC979 form (Fall Prevention Plan) by the organizational competent person. The GRC979 Fall Prevention Plan will serve as a work instruction to the employees working at height.

6.12 Organizational Fall Protection Binders

The SHeD verification procedure to ensure compliance with the requirements listed in this section, shall be accomplished by conducting an annual review and audit process.

The Organizational Fall Protection Binder will be reviewed annually and will contain:

- Chapter 34, Fall Protection
- Organizational Work Instructions
- GRC979 – Fall Prevention Plan
- List of Authorized users
- Equipment list / Inspection records
- Fall protection training records

6.13 Protection from Falling Objects

The SHeD verification procedure to ensure compliance with the requirements listed in this section shall be accomplished by on site safety inspections.

When employees are working in areas where there is a possible danger of injury from impact, or from falling or flying objects, the employer shall provide protective helmets to the employees and shall implement one of the following measures:

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- Erect toeboards—Toeboards shall be erected along the edge of the overhead walking/working surface for a distance sufficient to protect workers below, capable of withstanding, without failure, a force of at least 50 lb applied at any point along the toeboard, a minimum of 3.5 in. (9 cm) in vertical height from their top edge to the level of the walking/working surface and not more than 0.25 in. (0.6 cm) clearance above the walking/working surface and shall be solid or have openings not over 1 in. (2.5 cm) in greatest dimension. Where tools, equipment, or materials are piled higher than the top edge of a toeboard, paneling or screening shall be erected from the walking/working surface or toeboard to the top of a guardrail system's top rail or midrail, for a distance sufficient to protect employees below.
- Canopy structure—Canopies, when used as falling object protection, shall be strong enough to prevent collapse and to prevent penetration by any objects which may fall onto the canopy.
- Guardrail systems—Guardrail systems, when used as falling object protection, shall have all openings small enough to prevent passage of potential falling objects.
- Roof work—Materials and equipment shall not be stored within 6 ft (1.8 m) of a roof edge unless guardrails are erected at the edge. Materials that are piled, grouped, or stacked near a roof edge shall be stable and self supporting.
- Overhand bricklaying and related work—No materials or equipment except masonry and mortar shall be stored within 4 ft (1.2 m) of the working edge. Excess mortar, broken or scattered masonry units, and all other materials and debris shall be kept clear from the work area by removal at regular intervals.

6.14 Training Requirements (NPR 8715.3)

The SHed verification procedure to ensure compliance with the requirements listed in this section, shall be accomplished by reviewing HASP's (Health and Safety Plans), design reviews and on site audit of training records.

The following training provisions supplement and clarify the requirements of CFR 1926.21 regarding the hazards addressed in 29 CFR 1926, Subpart M.

Employers shall provide a training program for each employee who might be exposed to fall hazards. The program must enable each worker to recognize the hazards of falling, and be trained in the procedures to be followed to minimize these hazards. The employer must prepare and provide at the workplace a written certification record. The written certification record is to contain the name or other identity of the employee trained, the date(s) of the training, and the signature of the person who conducted the training or the signature of the employer. If the employer relies on training conducted by another employer, the certification record shall indicate date the employer determined the prior training was adequate rather than the date of actual training. The latest training certification shall be maintained and be made available to the SHed upon request. All training records shall be up to date.

Each employee shall be trained, as necessary, by a competent person qualified in the following areas:

- Nature of the fall hazard
- Correct procedures for erecting, maintaining, disassembling, and inspecting the fall protection systems to be used
- Use and operation of guardrail systems, personal fall arrest systems, safety net systems, warning line systems, safety monitoring systems, controlled access zones, and other protection systems to be used
- Role of each employee in the safety monitoring system when this system is used
- Limitations on the use of mechanical equipment during the performance of roofing work on low-sloped roofs
- Correct procedures for handling and storage of equipment and materials and the erection of overhead protection
- Role of employees in fall protection plans

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- Knowledge of applicable Federal, State, and local requirements and standards

6.14.1 Retraining

- Employees shall receive more training when it is believed that previously trained employees do not understand nor have the skills needed to recognize and minimize these hazards.
- Retraining shall be required when changes in the workplace or in the fall protection equipment render previous training obsolete.

6.15 Guidelines for Scaffolding

The SHed verification procedure to ensure compliance with the requirements listed in this section, shall be accomplished by reviewing HASP's (Health and Safety Plans), and on site safety inspections.

NOTE: The use of all scaffolding shall comply with OSHA CFR 1926, Subpart L, and CFR 1910.28. Erection and dismantling of scaffolding must be done under the direct supervision of a competent person.

6.15.1 Scaffold Training Requirements

The employer shall have each employee who performs work while on a scaffold trained by a person qualified in the subject matter to recognize the hazards associated with the type of scaffold being used and to understand the procedures to control or minimize those hazards.

6.15.2 Erection of Scaffolding—Prior to Erection—All Scaffold Assemblies

- A jobsite shall be inspected to determine ground conditions, proximity of electric power lines, overhead obstructions, wind conditions, and the need for overhead protection or weather protection coverings. These conditions must be evaluated and adequately provided for.
- Frame spacing and mud sill size can only be determined after the total loads to be imposed on the scaffold and the strength of the supporting soil or structure is calculated and considered. This analysis shall be done by a qualified person.
- Stationary scaffolds over 125 ft in height and rolling scaffolds over 60 ft in height shall be designed by a professional engineer.
- All equipment shall be inspected to see that it is in good condition and is serviceable. Damaged or deteriorated equipment shall not be used.
- Wood planks shall be inspected to see that it is graded for scaffold use, is sound and in good condition, straight grained, and free from saw cuts, splits, and holes. (Not all species and grades of lumber can be used as scaffold plank. Wood planks used for scaffolding shall be specifically graded for scaffold use by an approved grading agency.)

6.15.3 Erection of Fixed Scaffolds

NOTE: CFR 29 1926.451(g)(2) of CFR 29 1926.451 addresses fall protection for scaffold erectors and dismantlers.

- Scaffolding shall be erected, moved, or disassembled only under the supervision of qualified persons. Hardhats must be worn by all persons erecting, moving, dismantling, or using scaffolding.
- Mud sills shall be adequate size to distribute the loads on the scaffolding to the soil or supporting structure. Sills should be level and in full contact with the supporting surface.
- Base plates or screwjacks with base plates shall be in firm contact with both the sills and the legs of the scaffolding. Compensate for uneven ground with screwjacks with base plates. Unstable objects such as blocks, loose bricks, etc., shall not be used.
- Plumb and level scaffolding until connections can be made with ease. Be sure scaffold stays level and plumb as erection progresses.

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- The following general guides are minimum requirements when utilizing ties, guys, bracing, and/or outriggers for a safe stable scaffolding assembly:
 - Scaffolding shall always be secure when the height of the scaffold exceeds for four times the minimum base width.
 - The bottom tie shall be placed no higher than four times the minimum base width and every 26 ft vertically thereafter. Ties should be placed as close to the top of the scaffold as possible and, in no case, less than four times the minimum base width of the scaffold from the top.
 - Vertical ties shall be placed at the ends of scaffold runs and at no more than 30 ft horizontal intervals between.
 - Ties shall be installed as the erection progresses and not removed until the scaffold is dismantled to that height.
 - Side brackets, cantilevered platforms, pulleys or hoist arms, and wind conditions introduce overturning and uplift forces that must be considered and compensated for. These assemblies may require additional bracing, tying, or guying.
- Work platforms shall be fully planked either with scaffold-graded, solid-sawn, or laminated plank, in good sound condition, or with fabricated platforms in good condition.
- Each plank shall overlap the support by a minimum of 6 in. or be cleated, that is, 8-ft planks on 7-ft spans must be cleated.
- Plank shall not extend beyond the support by more than 18 in. Such overhangs should be separated from the work platform by guardrailing so that they cannot be walked on.
- Plank on continuous runs shall extend over the supports and overlap each other by at least 12 in.
- Spans of full thickness, 2- by 10-in. scaffold-grade planks, shall never exceed 10 ft. Loads on plank shall be evenly distributed and not exceed the allowable loads for the type of plank being used. No more than one person should stand on an individual plank at one time.
- Planks and/or platforms shall be secured to scaffolding when necessary to prevent uplift of displacement because of high winds or other job conditions. Guardrails shall be used on all open sides and ends of scaffold platforms. Both top and midrails shall be required.
- Toeboards shall be required whenever people are required to work or pass under or around the scaffold platform.
- Access shall be provided to all work platforms. If it is not available from the structure, access ladders and frames with built-in ladders or stairways must be provided. When frames with built-in ladders are used, cleated plank or fabricated plank must be used at platform levels to minimize or eliminate platform overhang. Access ladders must extend at least 3 ft above platforms.
- Side and end brackets are designed to support people only. Materials shall never be placed on cantilevered platforms unless the assembly has been designed to support material loads by a qualified person. (These types of platforms cause overturning and uplift forces, which must be compensated for. All frames shall be fastened together to prevent uplift an overturning moment compensated for with counterweights or adequate ties.)
- Putlogs shall never be used for the storage of materials. They are designed for personnel use only. Special care should be taken when putlogs are used.
- Scaffolds shall not be used as material hoist towers or for mounting derricks unless the assembly is designed by a qualified person.
- Check the erected assembly before use. A competent qualified person shall thoroughly inspect the completed assembly to see that it complies with all safety codes, that nuts and bolts are tightened, that it is

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level and plumb, that work platforms are fully planked, that guardrails are in place, and safe access is provided.

6.15.4 Erection of Rolling Scaffold—Compliance

- Height of the tower must not exceed four times the minimum base dimension. Outrigger frames or units on both sides of the tower may be used to increase base width dimension when necessary.
- All casters must be secured to frame legs or screwjacks with a nut and bolt or other secure means. Total weight of tower should not exceed the capacity of the casters.
- Screwjacks must not be extended more than 12 in. above the caster base. Tower must be kept level and plumb at all times.
- Horizontal/diagonal bracing must be used at the bottom and top of the tower and at intermediate levels of 20 ft. Fabricated planks with hooks may replace the top diagonal brace.
- All frames must be fully cross braced.
- Only prefabricated planks or cleated planks should be used.
- Casters must be locked at all times the scaffold is not being moved.

6.15.5 Use of Scaffolds—Compliance

NOTE: Each employee on a scaffold more than 10 ft (3.1 m) above a lower level shall be protected from falling to that lower level. (CFR 29 1926.451, Paragraphs (g)(1)(i) through (vii) establish the types of fall protection to be provided to the employees on each type of scaffold.)

- Inspect the scaffold assembly before each use to see that it is assembled correctly, that it is level and plumb, base plates are in firm contact with sills, bracing is in place and connected, platforms are fully planked, guardrails are in place, safe access is provided, that it is properly tied and/or guyed, and that there are no overhead obstructions or electric lines within 12 ft of the scaffold assembly.
- Use only the safe means of access that is provided. Do not climb bracing or frames not specifically designed for climbing. If such access is not provided, insist that it be provided.
- Climb safely, face the rungs as you climb up or down, use both hands, do not try to carry materials while you climb.
- Do not work on slippery rungs to avoid slipping.
- Do not overload platforms with materials.
- Working heights shall not be extended by planking guardrails or by use of boxes or ladders on scaffold platforms.
- Do not remove any component of a completed scaffold assembly except under the supervision of a qualified person. Any component that has been removed should be immediately replaced.

6.15.6 Rolling Towers—Precautions and Compliance

- Do not ride manually propelled rolling scaffold. No personnel should be on the tower while it is being moved.
- Lock all casters before getting on the tower.
- Work only within the platform area: do not try to extend overhead workarea by reaching out over guardrailing.
- Do not bridge between two rolling towers with planks or stages.
- Secure all materials before moving scaffolds.
- Be sure floor surface is clear of obstructions or holes before moving scaffold.

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- Be sure there are no overhead obstructions or electric power lines in the path of rolling scaffold.
- Rolling towers must only be used on level surfaces.
- Move rolling towers by pushing at the base level only. Do not pull from the top.

6.16 Guidelines for Aerial Lifting Equipment

The SHED verification procedure to ensure compliance with the requirements listed in this section, shall be accomplished by reviewing HASP's (Health and Safety Plans), and on site safety inspections.

6.16.1 Types of Aerial Lifting Equipment—Scissor and Boom Lifts

Supervisors are to assure the operation of any personnel lifting equipment is restricted to those who have gone through training, including the pre-use inspection, inspecting the worksite, traveling with the equipment, completing the work, parking, and all applicable manufacturers operational procedures.

6.16.2 All Aerial Lifting Equipment

- Personnel using personal fall arrest systems while working on aerial lifts at heights six feet or more above a lower level comply with §1926.502(d) of subpart M, specifically:
 - Personal fall arrest systems, when stopping a fall, shall:
 - (iii) be rigged such that an employee can neither free fall more than 6 feet (1.8 m), nor contact any lower level. [§1926.502(d)(16)(iii)]
 - As has been the Agency's longstanding policy, an employer may comply with OSHA's fall protection requirements for aerial lifts in one of three ways:
 - Use of a body belt with a tether anchored to the boom or basket (fall restraint system),
 - Use of a body harness with a tether (fall restraint system), or
 - Use of a body harness with a lanyard (fall arrest system).
- Personnel shall not enter or leave the platform when it is elevated unless 100 percent tie-off is achieved and SHED has given approval.
- Select the most appropriate aerial lifting equipment for the specific location, including height and reach.
- Personnel shall remain substantially within the confines of the work platform.
- Personnel shall stand on the floor of the aerial lifting equipment only, not on the handrails or items such as ladders, scaffolding, or boxes, either placed on the platform floor or handrails.

6.17 Scissor Lifts

The SHED verification procedure to ensure compliance with the requirements listed in this section, shall be accomplished by reviewing HASP's (Health and Safety Plans), and on site safety inspections.

Fall protection shall be worn in accordance with the manufacturer's recommendations. All guardrails shall meet the manufacturer's requirements.

6.17.1 Characteristics of a Scissor Lift

- Controls on the platform
- Large working platform
- Electrically- or propane-powered

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- For use in working around and “not” over equipment
- Safety rail around lifting platform
- Scissor lift action
- Kick plate on floor of platform

6.17.2 Recommended Scissor Lift Safety Checklist

- Always check the jobsite for unsafe working conditions.
- Inspect the machine before using—pinch points, pins at swivel points, hydraulic hoses, and cylinders for scoring and leaks. Do not use the machine if it is malfunctioning in any way.
- DO NOT override any hydraulic, mechanical, or electrical safety devices.
- Make sure the platform rail holding bolts are secure.
- Always distribute the load evenly over the platform floor area.
- A scissor lift is only safe on a level surface. Be sure the surface is flat and level.
- Never extend scissor lift with railings folded down.
- Electrocutation is always a danger. Be aware of high-voltage wires in the area where you are working.
- Never move a scissor lift in the raised position. Lower first, then after checking for a level surface and overhead obstructions, raise lift.
- DO NOT lean over any platform guardrails to perform work.
- DO NOT use ladders or scaffolding on the platform to obtain greater height.
- DO NOT drive on uneven, sloping, or soft terrain as this is hazardous and must be avoided.
- Hardhats shall be worn by all personnel in the work platform.
- Do not use machine if your physical or mental condition is uncertain in any way.
- When the machine is not in use, disable controls to prevent unauthorized use.

6.18 Boom Lifts

The SHed verification procedure to ensure compliance with the requirements listed in this section, shall be accomplished by reviewing HASP's (Health and Safety Plans), and on site safety inspections.

All personnel in the platform of boom lifts shall wear fall protection devices at all times.

6.18.1 Characteristics of a Boom Lift

- Used in areas where space is limited (especially for working over machinery or approaching overhead wires)
- Works on a hydraulic telescopic reach principle
- The operator operates the controls from the bucket or cage
- May have outrigger legs to add stability
- May be electrically- or propane-powered

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6.18.2 Recommended Boom Lift Safety Checklist

- Visually inspect the boom lift before it is used. Report any defects to supervisor. Do not use equipment if it is defective.
- Check for overhead obstructions and electrical lines.
- Ensure that the load on the boom lift is within the manufacturer's rated capacity.
- Ensure that outriggers and stabilizers are used, if the manufacturer's instructions so require.
- Ensure that all gates to work platform are closed.
- The operator and passenger(s) shall wear a harness and be connected to the boom lift with a lanyard at the work platform position.
- Railings, ladders, or any other device in or on the work platform shall not be used to achieve additional working height or reach.
- Any loading, which includes a horizontal load, shall be avoided unless the boom lift is designed for that application.
- The operator shall observe whether there are any defects in the equipment during all operations and stop and correct them as necessary.
- Secure tools and equipment.

6.19 Waivers

- All waivers to requirements listed in NPR 8715.3C, paragraph 3.18 shall be documented in the Center's fall protection implementation plan after submission of requests to waive/deviate are completed per NPR 8715.3C, paragraph 1.13. To request a waiver complete and submit a GRC-83B form as per it's instructions.

7.0 RECORDS

Fall Prevention Plan (NASA GRC979) shall be maintained by the organization generating the form. Organizational Work Instructions shall be maintained by each organizations competent person.

REFERENCES

Document number	Document name
ANSI Z 359	Fall Protection Code
Title 29 Code of Federal Regulations Part 1926	Safety and Health Regulations for Construction, Subpart M
	Construction Basic Safety Manual Ohio Division of Safety & Hygiene Bureau of Workers Compensation
NPR 8715.3C	NASA General Safety Program Requirements

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APPENDIX A.—DEFINITIONS AND ACRONYMS

Anchorage.—Secure point of attachment for a lifeline or lanyard.

Body harness.—Body support device with straps which may be secured about the employee in a manner that will distribute the fall arrest forces over at least the thighs, pelvis, waist, chest, and shoulders with means for attaching it to other components of a personal fall arrest system.

Competent person.—Individual designated by the employer to be responsible for the immediate supervision, implementation, and monitoring of the employer’s managed fall protection program, who, through industry-recognized training and knowledge, is capable of identifying, evaluating, and addressing existing and potential fall hazards, and who has the employer’s authority to take prompt corrective action with regard to such hazard.

Controlled access zone (CAZ).—Area in which certain work (e.g., overhand bricklaying) may take place without the use of guardrail systems, personal fall arrest systems, or safety net systems and access to the zone is controlled

Dangerous equipment.—Equipment such as galvanizing tanks, degreasing units, machinery, electrical equipment, and other units which, as a result of form or function, may be hazardous to employees who fall onto or into such equipment.

Equivalent.—Alternative designs, materials, or methods to protect against a hazard, which the employer can demonstrate will provide an equal or greater degree of safety for employees than the methods, materials, or designs specified in the standard.

Failure.—Load refusal, breakage, or separation of component parts. Load limit is the point where the ultimate strength is exceeded.

Fall arrest system.—System that will stop a worker's fall before the worker hits the surface below.

Fall protection system.—Any of the following when used to protect a worker from fall or minimize the risk from falling:

- guardrails
- safety belt or full body harness with a lanyard and/or lifeline and an anchor, and their related equipment
- safety net
- control zone
- safety monitor with a control zone
- other procedures acceptable to SHED

Fall restraint system.—Work positioning system used to prevent a worker from falling from a work position, or a travel restriction system such as guardrails or a personal fall protection system to prevent a worker from traveling to an edge from which the worker could fall.

Free fall distance.—Distance from the point where the worker would begin to fall to the point where the fall arrest system would begin to cause deceleration of the fall.

Full body harness.—Body support device consisting of connected straps designed to distribute a fall arresting force over at least the thigh, shoulders, and pelvis, with provision for attaching a lanyard, lifeline, or other components.

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Guard.—Protective barrier around an opening in a floor or along the open sides of stairs or a ramp, landing, balcony, mezzanine, raised walkway, or any other area to prevent a fall to a lower level, or inadvertent entry into a dangerous area.

Guardrail.—Guard consisting of a top rail 40 to 44 in. (102 to 112 cm) above the work surface, and an intermediate rail located approximately midway between the underside of the top rail and the top of the toeboard, if one is provided, or the work surface if no toeboard is provided.

Hole.—Gap or void, 2 in. (5.1 cm) or more in its least dimension, in a floor, roof, or other walking/working surface.

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Horizontal lifeline system.—System composed of a synthetic or wire rope, installed horizontally between two anchors, to which a worker attaches a personal fall protection system.

Lanyard.—Rope suitable for supporting one person. One end is fastened to a safety belt or harness and the other end is secured to a substantial object or a safety line.

Low-slope roof.—Roof having a slope less than or equal to 4 in 12 (vertical to horizontal).

Lower levels.—Areas or surfaces to which an employee can fall. Such areas or surfaces include, but are not limited to, ground levels, floors, platforms, ramps, runways, excavations, pits, tanks, material, water, equipment, structures, or portions thereof.

Lifeline.—Synthetic or wire rope, rigged from one or more anchors, to which a worker's lanyard or other part of a personal fall protection system is attached.

Opening.—Gap or void 30 in. (76 cm) or more high and 18 in. (48 cm) or more wide, in a wall or partition, through which employees can fall to a lower level.

Overhand bricklaying and related work.—Overhand bricklaying is the process of laying bricks and masonry units such that the surface of the wall to be jointed is on the opposite side of the wall from the mason, requiring the mason to lean over the wall to complete the work. Related work includes mason tending and electrical installation incorporated into the brick wall during the overhand bricklaying process.

Personal fall protection system.—Individual worker's fall protection system, composed of a safety belt or full body harness, lanyard, lifeline, and any other connecting equipment, that is used to secure the worker to an individual anchor or to a horizontal lifeline system.

Personal fall arrest system.—System designed to arrest an employee in a fall. It consists of anchorage, connectors, and body harness. A lanyard, deceleration device, lifeline, or combinations of these may be included.

Qualified person.—One who, by possession of a recognized degree, certificate, professional standing, extensive knowledge, training, and experience, has successfully demonstrated his/her ability to solve or resolve problems related to the subject matter, the work, or the project.

Roof.—Exterior surface on the top of a building. This does not include floors or formwork which, because a building has not been completed, temporarily becomes the top surface of a building.

Roofing work.—Hoisting, storage, application, and removal of roofing materials and equipment, including related insulation, sheet metal, and vapor barrier work, but not including the construction of the roof deck.

Safety monitor system.—System is a safety system in which a competent person is responsible for recognizing and warning employees of fall hazards.

Steep roof.—Roof having a slope greater than 4 in 12 (vertical to horizontal).

Unprotected sides and edges.—Any side or edge (except at entrances to points of access) of a walking/working surface, for example, floor, roof, ramp, or runway, where there is no wall or guardrail system at least 39 in. (1.0 m) high.

Walking/working surface.—Any surface, whether horizontal or vertical, on which an employee walks or works, including but not limited to floors, roofs, ramps, bridges, runways, formwork, and concrete reinforcing steel but not including ladders, vehicles, or trailers, on which employees must be located to perform their job duties.

Warning line system.—Barrier erected on a roof to warn employees they are approaching an unprotected roof side or edge, and designates an area in which roofing work may take place without the use of guardrail, body harness, or safety net systems to protect employees in the area.

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