

Section 16

Fall Protection

16.1 Scope

This section sets forth safety standards and work practices for all Bureau of Reclamation employees who are working at elevated levels, exposed to fall hazards, and/or using fall protection equipment to prevent falls from overhead platforms, elevated work stations, or into holes in the floor. The Occupational Safety and Health Administration (OSHA) requires that fall protection be provided at heights of 4 feet in general industry workplaces and 6 feet in construction industry workplaces. Reclamation requires the use of fall protection for all work performed at heights of 4 feet or greater. In addition, fall protection must be provided when employees are working over dangerous equipment and machinery, regardless of the fall distance. When the potential fall hazard into dangerous equipment is within 4 feet, protection must be provided by a guardrail or fall restraint system (unless the equipment is covered and guarded). When the potential fall hazard into dangerous equipment is at or greater than 4 feet, protection must be provided by guardrail, safety net, fall restraint, or fall arrest systems.

16.2 General Requirements

A personal fall protection system must be in place to protect employees who work on slopes steeper than 1-1/2:1 (horizontal:vertical), who work on unstable footing, or who could fall from heights greater than 4 feet (if not protected by fixed scaffolding, guardrails, or safety nets). Fall arrest systems have very specific requirements to catch a fall at or just past the 4 feet mark (when fall protection is required). Manufacturer's guidance regarding anchor points should be followed for all fall hazards, including when clearance to a lower level is at 4 feet. Typically, this means the anchor point must be above the dorsal D-ring and almost directly above the employee utilizing the fall arrest. A false sense of security can easily be gained at (or just past) the 4 feet requirement. Therefore, it is important to consider other options before donning a fall arrest system (especially when there is only 4 feet of clearance to the lower level). Furthermore, excluding ladder fall arrest systems, fall arrest systems are not designed to catch a person when a fall is less than 4 feet. If these systems are utilized below 4 feet, contact with the lower level will occur during the fall before the system can catch the person experiencing the fall. However, these requirements do not apply to rope-supported work (high angle work), such as high scaling, geologic mapping, structural inspections, or other operations that require specialized rope equipment or techniques (see paragraph 16.8.2, "Rope Access Safety Requirements").

16.3 Responsibilities

16.3.1 Reclamation Safety and Occupational Health Office

- 16.3.1.1** Shall provide Reclamation-wide oversight and direction for Fall Protection Programs.
- 16.3.1.2** Shall conduct reviews and evaluations of Fall Protection Programs and modify policies and procedures as needed.
- 16.3.1.3** Shall aid in the development and training of Fall Protection Programs.

16.3.2 Regional/Area Office Program Coordinators

- 16.3.2.1** Shall provide region-wide direction and oversight for administration of an appropriate Fall Protection Program.
- 16.3.2.2** Shall serve as the focal point for program development and implementation in the regions.
- 16.3.2.3** Shall provide technical advice to Safety Managers and Collateral Duty Safety Representatives.

16.3.3 First-Line Supervisors

- 16.3.3.1** Shall assist management in implementing the Fall Protection Program and providing training and education for employees.
- 16.3.3.2** Shall assist management in identifying personnel with potential for occupational exposure to falls and help conduct or coordinate appropriate training programs.
- 16.3.3.3** Shall assist management in the development of all fall protection plans when standard railings and personal fall arrest systems are not feasible.
- 16.3.3.4** Shall assist management in reviewing and updating programs as needed.
- 16.3.3.5** Shall provide employees with appropriate fall protection equipment and personal protective equipment (PPE).

16.3.4 People Doing the Work

- 16.3.4.1** Must participate in required training programs every other year.
- 16.3.4.2** Shall be familiar with requirements of this section and the facility's Fall Protection Program.
- 16.3.4.3** Must wear appropriate PPE and observe appropriate work practice controls.
- 16.3.4.4** Must report all unsafe conditions and fall hazards to supervisors or managers.

16.3.5 Regional Safety Manager

- 16.3.5.1** Shall provide professional safety and health services necessary to meet program expectations.
- 16.3.5.2** Shall assist with and/or monitor Fall Protection Programs.
- 16.3.5.3** Shall arrange training about Fall Protection Programs.
- 16.3.5.4** Shall review other RSHS sections for fall protection requirements.

16.4 Training Requirements

16.4.1 Initial

Before using fall protection equipment, each worker who might be exposed to fall hazards from heights must be trained by a competent person who is qualified to deliver fall protection training. Such training will include the recognition of fall hazards, application limits of the equipment, proper hookup, anchoring, and tie-off techniques, methods of equipment inspection and storage, and use of rescue equipment and rescue procedures.

16.4.2 Refresher/Recertification

The refresher for all personnel involved in Fall Protection Programs shall be in accordance with the requirements prescribed in the American National Standard Institute's ANSI/ASSE Z359.2, *Minimum Requirements for a Comprehensive Managed Fall Protection Program*.

16.4.3 Proficiency Qualification

Training of all personnel involved in Fall Protection Programs, including the program manager, qualified persons, competent persons, end users, authorized and competent rescuers, and any associated fall protection trainers, shall conform to ANSI/ASSE Z359.2 and ANSI/ASSE Z490.1, *Criterion for Acceptable Practices in Safety, Health and Environmental Training*.

16.5 Hazard Identification, Assessment, and Safety Measures

16.5.1 Procedures

Whenever a fall hazard is identified or present, a hierarchy of fall protection shall be considered. This hierarchy shall include (1) hazard elimination, which includes changing the work methodology such that the fall hazard no longer exists; (2) passive fall protection, including physical barriers that prevent access to unprotected edges (e.g., guardrails and

covered holes); (3) fall restraint systems designed to restrict a workers movement so prevent fall hazard; and (4) administrative controls designed to increase a worker's awareness of a fall hazard.

16.5.1.1 Proper Use. Use personal fall protection systems and their components only for employee fall protection. Inspect lifelines, lanyards, belts, hardware, and anchorages at the beginning of each day they will be used and discard questionable devices. Use and care of fiber lifelines and lanyards will be according to manufacturer's instructions, recommendations contained in the *Hoisting and Rigging Safety Manual* of the Infrastructure Health and Safety Association, or the procedures stated within this section, whichever is most protective.

16.5.1.2 Lifelines. Lifelines shall only be used for employee safeguarding. When using vertical lifelines, each employee must be provided with a separate lifeline. Lifelines shall be secured above the point of operation to an anchorage or structural member capable of supporting a minimum dead weight of 5,000 pounds. Any lifeline subjected to in-service loading, as distinguished from static load testing, shall be immediately removed from service and shall not be used again for employee safeguarding.

16.5.1.3 Rescue. Make provisions to promptly rescue employees who fall or provide the means for self-rescue within 4–6 minutes.

16.5.1.4 Protection. Protect lifelines from being cut, abraded, or damaged in any way.

16.5.1.5 Maintenance, Inspection, and Testing. All personal fall protection systems must be used by following the manufacturer's recommendations for maintenance, inspection, and testing.

16.5.2 Personal Fall Arrest System

A fall arrest system for an employee who might fall from a working level must consist of an anchorage, connectors, and a body harness. The system may also include a lanyard, deceleration device, lifeline, or a suitable combination of these. Fall arrest systems shall not allow a person to fall more than 6 feet (or contact a lower level). The fall arrest systems are allowed to operate per OSHA standard 29 CFR 1910.140 (d)(2)(ii), which states that a free fall may be more than 6 feet provided the employer can demonstrate the manufacturer designed the system to allow a free fall of more than 6 feet and tested the system to ensure a maximum arresting force of 1,800 pounds is not exceeded.

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- 16.5.2.1 Performance Criteria.** Personal fall arrest systems must have a label specifying that they meet the appropriate ANSI/ASSE Z359 standards.
- 16.5.2.2 Use.** Rig personal fall arrest systems to prevent an employee from falling more than 4 feet in general industry or more than 6 feet in construction industry or from contacting any lower level. Employees must wear a personal fall arrest system with the attachment point of the body harness in the upper center of the back, between the shoulder blades. When employees are connected to a horizontal lifeline that could become vertical, the lifeline connectors must be able to lock in either direction on the lifeline.
- 16.5.2.3 Maintenance.** Maintenance is a critical element in personal fall arrest systems. Follow manufacturer's recommendations. At least one competent employee must be available to inspect and maintain personal fall arrest systems.
- 16.5.2.4 Annual Inspection.** At least once a year, a competent person will inspect and document all fall arrest systems and components for wear, damage, or deterioration in accordance with the manufacturer's instructions. Per OSHA standard 29 CFR 1910.28 (b)(9), no new ladder cages may be installed. By November 18, 2036, all fixed ladders above 24 feet must have a fall arrest system.
- 16.5.2.5 Impact Loading.** When a personal fall arrest system has been subjected to shock loading, immediately remove it from service until a competent person inspects it and determines that it is suitable for reuse.
- 16.5.3 Positioning Device System**
Positioning device systems include equipment or hardware that, when used with a body harness, supports an employee on an elevated vertical surface (such as a wall or a rebar mat) and allows both hands freedom of movement. Positioning device systems also include devices attached between the employee and an anchorage to prevent an accidental fall from an elevated surface.
- 16.5.3.1 Performance Criteria.** Positioning device systems must withstand, without failure, a 4-foot drop of a 250-pound weight.
- 16.5.3.2 Performance Test.** Positioning device systems comply with performance requirements if they meet the test contained in OSHA standard 29 CFR 1926 Subpart M, Appendix D. Restraint line systems must be designed to meet the same test requirements as other positioning device systems.

16.5.4 Personal Fall Protection Systems for Ladder Climbing

Employees will wear, or must be attached to, personal fall protection systems to prevent injuries and falls when climbing a fixed ladder over 24 feet without a cage.

16.5.4.1 Design Criteria for System Components. The system must permit an employee to ascend or descend the ladder with both hands free for climbing, without having to hold, push, or pull any part of the system. The connection between the carrier or lifeline and the point of attachment to the harness must be no more than 9 inches long. The system must activate within 2 feet after a fall.

16.5.4.2 Performance Criteria. Ladder safety devices and their support systems must withstand, without failure, an 18-inch drop of a 500-pound weight. All other personal fall protection systems for climbing activities must withstand, without failure, a 4-foot drop of a 250-pound weight.

16.5.4.3 Installation. Attach mountings for both rigid and flexible carriers at each end of the carrier. Attach intermediate mounting as necessary along the entire length of the carrier to provide the strength necessary to stop employee falls. When the system is exposed to wind, install cable guides used with a flexible carrier every 25 to 40 feet along the entire length of the carrier to prevent wind damage to the system. The design and installation of mountings and cable guides must not reduce the design strength of the ladder.

16.5.5 Requirements for Linemen's Harnesses and Lifelines

16.5.5.1 Linemen's Equipment (Arc Rated Harnesses). The full body harness used around high voltage equipment or structures will be an industry-designed linemen's arc rated harness with either straps or plastic coated D-rings and position side D-rings in lieu of exposed metal D-rings and exposed metal positioning side D-rings. All other exposed metal parts (e.g., buckles and adjusters) of the linemen's harness will also be plastic coated.

16.5.5.2 Nonconductive Rope Lifelines. Nonconductive rope lifelines must have a minimum breaking strength of 5,000 pounds and be able to withstand an alternating current dielectric test of at least 25,000 volts per foot "dry" for 3 minutes without visible deterioration.

16.6 Pre-job Briefing and Planning Requirements

Before starting a job that involves fall hazards, submit a Job Hazard Analysis (JHA) that is compliant with RSHS Section 4, subsection 4.5 to the Contracting Officer's Representative or the appropriate office lead. The JHA must address, at minimum, the following additional items:

- Emergency procedures, including medical assistance.
- PPE required, including hand, eye, and head protection (for individuals exposed to fall hazards, adequate head protection is required whenever a fall arrest system is employed).
- A description of the equipment to be used for duty.
- A description of the hardware inspection process to be completed before using the equipment.
- Methods for ensuring safe entrance and exit from the worksite.
- Procedures for protecting employees and the public from falling materials.
- Provisions for rescue, including both rescue by onsite personnel and/or arrangements for rescue services by offsite personnel.

16.7 PPE

Appropriate control measures will be implemented through the hierarchy of controls (i.e., elimination, substitution, engineering controls, warnings, administrative controls, and personal protective equipment) to reduce the hazard of falls to an acceptable level of risk. The use of fall protection PPE described in this subsection will be considered only if the other controls in the hierarchy are unavailable or infeasible.

16.7.1 Head Protection

Head protection must provide lateral impact protection, as a side impact could result from a fall, and must provide protection throughout a fall. Hard hats conforming to ANSI Z89.1 requirements, for Type II hard hats with an integrated chinstrap, must be used.

16.7.2 Full Body Harness

Only full body harnesses that have a label specifying that they meet the requirements of ANSI/ASSE Z359 are acceptable. Full body harnesses labeled to meet the requirements of ANSI A10.14 will not be used. Load-bearing straps will have a minimum width of 1-5/8 inches and develop a breaking strength of not less than 5,000 pounds.

16.7.2.1 Hardware. Connectors must be drop forged, pressed, formed steel, or equivalent materials. Connectors must have a corrosion-resistant finish, and all surfaces and edges must be smooth to prevent damage to interfacing parts of the system. D-rings, O-rings, snap hooks, and carabiners must be able to sustain a minimum tensile load of 5,000 pounds. D-rings, snap hooks, and carabiners must be proof tested to a

minimum tensile load of 3,600 pounds without cracking, breaking, or incurring permanent deformation. Snap hooks and carabiners must be self-closing, self-locking, and capable of being opened only by two or more consecutive, deliberate actions. Only snap hooks and carabiners meeting a gate strength of 3,600 pounds in all directions, per ANSI/ASSE Z359, *Fall Protection and Fall Restraint*, will be used.

16.7.2.2 Personal Fall Arrest Systems. Personal fall arrest systems require the use of a full body harness. The use of body belts is not acceptable.

16.7.2.3 Attachment Point. The fall arrest attachment point on the full body harness will be integrally attached and located at the wearer's upper back, between the shoulder blades (dorsal D-ring). A frontal D-ring attachment point integrally attached to the full body harness and located at the wearer's sternum can be used for fall arrest if the free fall distance does not exceed 2 feet and the maximum arresting force does not exceed 900 pounds (i.e., used with a ladder climbing device).

16.7.2.4 Suspension Trauma Prevention. All full body harnesses will be equipped with suspension trauma preventers, such as stirrups, relief steps, or similar components, to provide short-term relief from the effects of orthostatic intolerance. All full body harnesses must have suspension trauma straps.

16.7.3 Lanyards and Lifelines

Lanyards and vertical lifelines that tie off one employee must have a minimum breaking strength of 5,000 pounds. Self-retracting lifelines and lanyards that automatically limit free fall distance to 2 feet or less must have components that can sustain a minimum static load (tensile load) of 3,000 pounds applied to the device with the lifeline or lanyard fully extended. Self-retracting lifelines and lanyards that do not limit free fall distance to 2 feet or less, rip stitch lanyards, and tearing and deforming lanyards must be able to sustain a minimum tensile load of 5,000 pounds applied to the device with the lifeline or lanyard fully extended. A competent or qualified person must inspect each knot in a lanyard or vertical lifeline to ensure the breaking strength and tensile load requirements of this paragraph are met.

A qualified person must design, install, and supervise the use of horizontal lifelines as part of a complete personal fall arrest system that maintains a safety factor of at least 2.

Restraint lines must be able to sustain a tensile load of at least 3,000 pounds. Lifelines and carriers must not be made of natural fiber rope. Synthetic rope such as nylon, polyester, or polypropylene must contain an ultraviolet light inhibitor.

16.8 Other Safety Equipment

16.8.1 Anchorages

For fall arrest, anchorages must be able to support at least 5,000 pounds per attached employee or must be designed, installed, and used under the supervision of a qualified person as part of a complete fall protection system that maintains a safety factor of at least 2. For rescue and work positioning, anchorages must be able to support 3,000 pounds and travel restraint support of 1,000 pounds. De-energized conductors, insulators, and nonstructural components in switchyards or on transformers, circuit breakers, or other components will not be used as anchorage points.

16.8.1.1 Rebar. Anchorages will not be made from drill steel or reinforcing bar.

16.8.1.2 Mobile Anchorages. Anchorages must not be made to mobile equipment or other items that can move while the anchorage is in use.

16.8.2 Rope Access Safety Requirements

The requirements in this section do not apply when an employee performs rope-access work on high-angle slope or vertical environments where the rope is the primary means of support and where the employee must manipulate the rope and its attachments while using industrial rope-access techniques to obtain access to the work area. These situations include such work as high scaling, geologic mapping, rock bolting, structural inspections, construction, operations, and maintenance activities. The Reclamation Rope Access Board ensures all rope-access operations are conducted in a safe and consistent manner. Consult the latest version of Reclamation's *Guidelines for Rope Access Work*. Permit rope-access work only when other means of access are not feasible or when methods other than rope-access work expose employees to greater danger.

16.9 Definitions

Anchorage	A secure point of attachment for equipment such as lifelines, lanyards, or deceleration devices.
Body belt	A strap with means both for securing about the waist and for attaching to other components, such as a lanyard, and used with positioning systems, travel restraint systems, or ladder safety systems.
Body harness	Straps that support the employee in a manner that distributes fall arrest forces over at least the thighs, pelvis, waist, chest, and shoulders, and that include a means for attaching the harness to other components of a personal fall protection system.

Carabiner	A connector generally comprising a trapezoidal- or oval-shaped body with a closed gate or similar arrangement that may be opened to attach to another object and that, when released, automatically closes to retain the object.
Competent person	A person who can identify existing and predictable hazards in any personal fall protection system or any component of it as well as in its application and use with related equipment, and who has authorization to take prompt corrective action to eliminate the identified hazards.
Connector	A device used to couple (connect) parts of the fall protection system together.
D-ring	A connector used <ul style="list-style-type: none">• in a harness as an integral attachment element or fall arrest attachment;• in a lanyard, energy absorber, lifeline, or anchorage connector as an integral connector; or• in a positioning or travel restraint system as an attachment element.
Deceleration device	Any mechanism that serves to dissipate energy during a fall.
Deceleration distance	The vertical distance a falling employee travels from the point at which the deceleration device begins to operate, excluding lifeline elongation and free fall distance, until stopping. It is measured as the distance between the location of an employee's body harness attachment point at the moment the deceleration device activates during a fall (i.e., at the onset of fall arrest forces) and the location of that attachment point after the employee comes to a full stop.
Equivalent	Alternative designs, equipment, materials, or methods that the employer can demonstrate will provide an equal or greater degree of safety for employees compared to the designs, equipment, materials, or methods specified in the standard.
Free fall	The act of falling before the personal fall arrest system begins to apply force to arrest the fall.
Free fall distance	The vertical displacement of the fall arrest attachment points on the employee's body belt or body harness between onset of the fall and just before the system begins to apply force to arrest the fall. This distance excludes deceleration distance and lifeline and lanyard elongation but includes any deceleration device slide distance or self-retracting lifeline/lanyard extension before the devices operate and fall arrest forces occur.
Lanyard	A strap or flexible line of rope or wire rope that generally has a connector at each end for connecting the body belt or body harness to a deceleration device, lifeline, or anchorage.

Lifeline	A component of a personal fall protection system consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline) or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline) and that serves as a means for connecting other components of the system to the anchorage.
O-ring	A gasket in the form of a ring with a circular cross section, typically made of pliable material, used to seal connection in pipes and tubes.
Personal fall arrest system	A system used to stop an employee in a fall from a walking-working surface. It consists of a body harness, anchorage, and connector. The means of connection may include a lanyard, deceleration device, lifeline, or a suitable combination of these.
Personal fall protection system	A system (including all components) an employer uses to provide protection from falling or to safely arrest an employee's fall if one occurs. Examples of personal fall protection systems include personal fall arrest systems, positioning systems, and travel restraint systems.
Positioning system (work-positioning system)	A system of equipment and connectors that, when used with a body harness or body belt, allows an employee to be supported on an elevated vertical surface, such as a wall or windowsill, and work with both hands free. Positioning systems are also called positioning system devices and work-positioning equipment.
Qualified person	A person who, by possession of a recognized degree, certificate, or professional standing, or by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter, the work, or the project.
Safety factor	The ratio of the ultimate breaking strength of a member or piece of material or equipment to the actual working stress or safe load when in use.
Self-retracting lifeline/lanyard	A deceleration device containing a drum-wound line that can be slowly extracted from, or retracted onto, the drum under slight tension during normal movement by the employee. At the onset of a fall, the device automatically locks the drum and arrests the fall.
Snap hook	A connector comprising a hook-shaped body with a normally closed gate or similar arrangement that may be manually opened to permit the hook to receive an object. When released, the snap hook automatically closes to retain the object. Opening a snap hook requires two separate actions. Snap hooks are generally one of two types: <ul style="list-style-type: none">• Automatic-locking type (permitted), with a self-closing and self-locking gate that remains closed and locked until intentionally unlocked and opened for connection or disconnection, and in a lanyard, energy absorber, lifeline, or anchorage connector as an integral connector.• Non-locking type (prohibited), with a self-closing gate that remains closed, but not locked, until intentionally opened for connection or disconnection.

Travel restraint (tether) line	A rope or wire rope used to transfer forces from a body support to an anchorage or anchorage connector in a travel restraint system.
Travel restraint system	A combination of an anchorage, anchorage connector, lanyard (or other means of connection), and body support that an employer uses to eliminate the possibility of an employee going over the edge of a walking-working surface.

16.10 References

- American National Standards Institute. ANSI A10.14, *Construction and Demolition Operations - Requirements for Safety Belts, Harnesses, Lanyards and Lifelines for Construction and Demolition Use*.
- American National Standards Institute. ANSI/ASSE Z359.2, *Minimum Requirements for a Comprehensive Managed Fall Protection Program*.
- American National Standards Institute. ANSI/ASSE Z490.1, *Safety, Health, and Environmental Training*.
- Infrastructure Health and Safety Association. *Hoisting and Rigging Safety Manual* (2009). www.ihsa.ca/PDFs/Products/ld/M035.pdf.
- Occupational Safety and Health Administration. 29 CFR 1910.29, *Fall Protection and Falling Object Protection and Practice Criteria*. www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.29.
- Occupational Safety and Health Administration. 29 CFR 1926.502, *Fall Protection System Criteria and Practices*. www.osha.gov/laws-regs/regulations/standardnumber/1926/1926.502.
- Occupational Safety and Health Administration. *Walking-Working Surfaces and Personal Fall Protection Systems Final Rule Frequently Asked Questions*. www.osha.gov/walking-working-surfaces/faq.html.
- United States Geological Survey. *Occupational Safety and Health Program Requirements Handbook (445-2-H)*, Chapter 44, "Fall Protection Program." www.usgs.gov/about/organization/science-support/survey-manual/445-2-h-occupational-safety-and-health-program#Chapter%2044.

RECLAMATION MANUAL TRANSMITTAL SHEET

Effective Date: _____

Release No. _____

Ensure all employees needing this information are provided a copy of this release.

Reclamation Manual Release Number and Subject

Summary of Changes

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