

P-19

Fall Hazard Prevention and Control

I. Policy

This operating procedure provides the minimum steps required to ensure that the Department of General Services (DGS) Fall Prevention and Control Program is successfully and consistently implemented throughout all DGS owned and operated buildings and worksites.

This procedure is designed to protect DGS employees who perform work on surfaces (either horizontal or vertical) with an unprotected side or edge, which is 4 feet or more above a lower level. It does not cover work on portable ladders, vehicles, man lifts, or trailers.

II. References

The following OSHA standards are provided for informational purposes. The standards provide guidelines for the administration of the DGS fall prevention and control program.

- A. *29 CFR 1910.23, Guarding Floor and Wall Openings and Holes* - Every open-sided floor or platform which is 4 feet or more above the adjacent floor or ground level must be guarded by a standard railing on all open sides except where there is an entrance to a ramp, stairway, or fixed ladder.
- B. *29 CFR 1910.24, Fixed Industrial Stairs* - Fixed industrial stairs must be provided for access from one structure level to another where operations require regular travel between levels and for access to operating platforms on any equipment which requires attention routinely during operations. Fixed industrial stairs includes any interior or exterior fixed stairs around machinery, tanks, and other equipment, and stairs leading to or from floors, platforms, or pits.
- C. *29 CFR 1910.27, Fixed Ladders* - Fixed ladders are required to meet minimum design requirements and maintain specific features such as cages, landing platforms and rung spacing. Ladders that exceed 20 feet in length must have specifically designed cages or wells. Ladder safety devices may be used on tower, water tank, and chimney ladders over 20 feet in unbroken length in lieu of cage protection.
- D. *29 CFR 1910.28, Safety Requirements for Scaffolding* - Scaffolds must be furnished and erected in accordance with this standard for persons engaged in work that cannot be done safely from the ground or from solid construction. Scaffolds must be provided with top rails and mid-rails if the scaffolds are more than four feet off the ground.
- E. *29 CFR 1910.29, Manually Propelled Mobile Ladder Stands and Scaffolds (towers)* - This section prescribes rules and requirements for the design, construction, and use of mobile work platforms (including ladder stands but not including aerial ladders) and rolling (mobile) scaffolds (towers).

- F. *29 CFR 1910.66, Powered Platforms for Building Maintenance* - This section sets requirements for powered platform installations permanently dedicated to interior or exterior building maintenance of a specific structure or group of structures. Building maintenance includes, but is not limited to, such tasks as window cleaning, caulking, metal polishing and re-glazing.
- G. *29 CFR 1910.67, Vehicle-Mounted Elevating and Rotating Work Platforms* - This section prescribes design and use requirements for all aerial devices. Aerial devices include the following types of vehicle-mounted aerial devices used to elevate personnel to jobsites above ground: (i) extensible boom platforms, (ii) aerial ladders, (iii) articulating boom platforms, (iv) vertical towers, and (v) a combination of any of the above.

III. Responsibilities

- A. Supervisors should evaluate their work areas to determine if work is performed on surfaces (either horizontal or vertical) with an unprotected side or edge, which is 4 feet or more above a lower level. If such fall hazards are identified they should be eliminated or controlled to ensure that all DGS employees are provided a workplace free of uncontrolled fall hazards.
- B. Supervisors should ensure their personnel are familiar with these procedures, adhere to its guidelines, and are provided necessary personal protective equipment. Supervisors are responsible for the implementation of this program and for the annual inspection of all equipment.
- C. Supervisors shall be responsible for initiating disciplinary action against employees who do not follow the procedures within this section.
- D. The Safety Coordinator, Bureau Directors, or Safety Consultants are available to provide guidance and are responsible for evaluating the administration of this procedure throughout DGS.

IV. Fall Hazard Evaluations

Competent Persons shall determine if DGS employees perform unprotected elevated work tasks. The Competent Person or the Supervisor should conduct fall hazard evaluations of each operation that may require work on elevated work platforms. An appraisal of each exposure should be made to determine the most effective prevention and control strategies. The following exposures are considered **Unprotected Elevated Work**.

These situations must be protected with an effective fall protection system of either engineering controls such as guardrails, administrative controls such as a Controlled Access Zone, or personal fall arrest systems.

Fixed Ladders - Ascending or descending fixed ladders which exceed 20 feet in height and are not equipped with a protective cage or ladder safety device.

Building or Tree Maintenance - Tasks that require climbing to a height of at least 4 feet to conduct maintenance or pruning of trees.

Leading Edges - Working within 6 feet of a leading edge that is 4 feet or more above a lower level.

Hoist Areas - Working near unprotected hoist areas, which may be a shaft or open edge of a floor.

Holes - Walking/working surfaces with holes more than 4 feet above lower levels. (A hole is defined as a gap or void 2 inches or more in its least dimension, in a floor, roof, or other walking/working surface.)

Excavations - Excavations 4 feet or more in depth not protected by the use of a guardrail system, fence, barricade or cover.

Roofing Work - Working on sloped roofs with unprotected sides or edges 4 feet or more above lower levels.

Wall Openings - Working on, at, above, or near a wall opening where the outside bottom edge of the wall opening is 4 feet or more above lower levels, and the inside bottom edge of the wall opening is less than 39 inches above the walking/working surface.

Unusual Applications - There may be unusual applications where other configurations not addressed in this procedure may be present.

V. Fall Hazard Prevention and Control

Fall hazard prevention and control programs should provide protection from all foreseeable fall hazards. Control strategies should be selected based on the following priority system:

- Eliminate fall hazard
- Prevent fall hazard
- Arrest falls
- Administratively protect employees

The following minimal controls should be implemented when fall hazards cannot be eliminated at DGS facilities.

A. Fall Prevention

1. Covers

Holes and excavations should be covered. Covers for holes in floors, roofs, and other walking/working surfaces must meet the following requirements:

- Covers located in roadways and vehicular aisles must be capable of supporting, without failure, at least twice the maximum axle load of the largest vehicle expected to cross over the cover.
- All other covers must be capable of supporting, without failure, at least twice the weight of personnel, equipment, and materials that may be imposed on the cover at any one time. Floor covers on walking surfaces where no equipment is operated should be at least $\frac{3}{4}$ inch plywood, or 2 inch planking. The cover should be spray painted with the word 'HOLE' to identify it as covering an opening.
- All covers must be secured when installed so as to prevent accidental displacement by the wind, equipment, or personnel.

2. Guardrail Systems

Guardrail systems used at an unprotected surface, hole, or elevated work platform must meet the following requirements:

- Be erected on all unprotected sides of the scaffold, work surface, or edge of a hole.
- Have not more than two sides provided with removable guardrail system sections to allow the passage of materials.
- Be provided with a gate (at access points such as ladder ways), or be so offset that a person cannot walk directly into the hole or off the edge of a work surface.
- Guardrail systems must be so surfaced as to prevent injury to personnel from punctures or lacerations. Guardrail systems and their use must comply with the following requirements:
 - a. Top rails must be 42 inches \pm 3 inches above the walking/-working surface. The top rail must be capable of withstanding, without failure, a force of at least 200 pounds in any outward or downward direction, at any point along the top rail. If wire rope is used for top rails, it must be flagged at not more than 6-foot intervals with high-visibility material. Wire, manila, plastic or synthetic rope being used for top rails must be inspected frequently to ensure it continues to meet strength requirements.

- b. Mid-rails must be installed midway between the top rail and the walking/working surface. The mid-rail must be capable of withstanding, without failure, a force of at least 150 pounds applied in any outward or downward direction, at any point along the mid-rail. Wire, manila, plastic or synthetic rope being used for mid-rails must be inspected frequently to ensure it continues to meet strength requirements.
- c. Screens and mesh, when used, must extend from the rail to the walking/working surface and along the entire opening between top rail supports. The screen or mesh must be capable of withstanding, without failure, a force of at least 150 pounds applied in any outward or downward direction at any point along the mid-rail.

3. **Falling Objects**

When the potential exist for falling objects to create a hazard, each person at risk from falling objects must wear a hard hat **and one of the following measures must also be implemented.**

- Erect toe boards, screens, or a guardrail system to prevent objects from falling from higher levels.
- Erect a canopy structure and keep potential fall objects far enough from the edge of the higher level so that those objects would not go over the edge if they were accidentally displaced.
- Barricade the area to which objects could fall, prohibit personnel from entering the barricaded area, and keep objects that may fall far enough away from the edge of a higher level so that those objects would not go over the edge if they were accidentally displaced.

B. Personal Fall Arrest Systems

1. General Requirements

Fall arrest systems must be used whenever there is a fall hazard and employees are not protected with guardrails, hole covers, or some administrative control. Personal fall arrest systems and their use must comply with the minimum provisions below. Supervisors must ensure all aspects are completed, as applicable.

Inspection - The user must inspect personal fall arrest systems each day of use for wear, damage and other deterioration. The user is responsible for the safety equipment in his/her possession and all manufacturers' instructions must be followed. In addition, the Supervisor must inspect all fall arrest equipment at least annually, and document the inspection. Defective components must be tagged and removed from service.

System Requirements - *Personal fall arrest systems*, when stopping a fall must meet the following requirements:

- Limit maximum arresting force on personnel to 1,800 pounds when used with a body harness.
- Be rigged such that personnel can neither free-fall more than 6 feet or contact any lower level.
- Bring personnel to a complete stop and limit maximum deceleration distance a person travels to 3.5 feet.

Hoisting Areas - When a personal fall arrest system is used at hoist areas, it must be rigged to allow the movement of the personnel only as far as the edge of the walking/working Surface.

Equipment Used During Falls - Personal fall arrest systems and components subjected to impact loading must be immediately removed from service and must not be used again.

2. Body Harnesses

Body harnesses must be used only for personal protection (as part of a Personal Fall Arrest System restraint or positioning system) and not to hoist material.

Body harnesses must be worn properly, affording a snug, yet comfortable fit. (Body Belts may not be worn as a replacement for body harnesses.)

3. Connectors: D-Rings and Snap hooks (Carabineers)

D-rings and snap hooks (carabineers) must be of a locking type and must have a minimum tensile strength of 5,000 pounds and be proof-tested to a minimum tensile load of 3,600 pounds. All connectors must be drop-forged, pressed or formed steel, or made of equivalent materials. They must have a corrosion-resistant finish and all surfaces must be smooth to prevent damage to interfacing parts of the system.

4. Lanyards and Lifelines

Lanyards and vertical lifelines must have a minimum breaking strength of 5,000 pounds and must be protected against cuts or abrasions. Ropes and straps (webbing) used in lanyards must be made from synthetic fibers.

Each person must be attached to a separate lanyard or lifeline.

Lanyards must be secured properly to a body harness at the center of the wearer's back. Lanyards secured to a body harness (for fall protection) must be secured in the center of the wearer's back near shoulder level, or above the wearer's head.

Lanyards must be secured in such a manner to afford the least free-fall distance possible up to a maximum of 6 feet and must not allow contact with objects below.

Horizontal lifelines must be designed, installed, and used, under the supervision of a qualified person, as part of a complete Personal Fall Arrest System, which maintains a safety factor of at least two to one, as determined by the Supervisor.

Self-retracting lifelines/lanyards (retract locks or safety blocks) that automatically limit free-fall distance to 2 feet or less must be capable of sustaining a minimum tensile load of 3,000 pounds. The use of an additional lanyard should be avoided when using self-retracting lifelines/lanyards. The latching device on the self-retracting lifelines/lanyards must be connected directly to the body harness, using the existing D-ring.

5. Anchorages

Personal fall arrest equipment must be independently attached to an anchorage capable of supporting at least 5,000 pounds per person.

In the absence of other suitable points, a crane hook can be used as an anchorage point for a lanyard or deceleration device provided that the hook can support at least 5,000 pounds, the load is not suspended (rigging can be in place but de-tensioned), and there is no hook movement (hoisting or lowering)

6. Positioning Device System

Positioning device systems must be rigged such that the free-fall distance is limited to a maximum of 2 feet and must be secured to an anchorage capable of supporting at least twice the potential impact load of a person's fall or 3,000 pounds, whichever is greater. A positioning device system, such as a body belt and lanyard, is usually used to prevent a fall, such as for workers in an extensible boom or movable work platform. The positioning system would prevent a person from leaning or climbing out of a basket. A positioning device system may also be used to prevent a person from getting to an unprotected edge.

7. Safety Net Systems

Safety nets must be provided when working more than 25 feet above the lower level and the use of ladders, scaffolds, temporary floors, safety lines or personal fall arrest systems are impractical. Safety nets must be installed as close as practical under the walking/working surface on which personnel are working, but in no case more than 30 feet below such level.

C. Administrative Procedures

1. Safety Monitoring System

A Safety Monitoring System is an alternative fall protection system in which the Supervisor designates a Safety Monitor who is responsible for recognizing and warning personnel of fall hazards. The Safety Monitor System is usually used for roofing operations on low-sloped roofs. The Safety Monitor must have completed fall protection education.

The duties of the Safety Monitor are:

- Be on the same walking/working surface as the monitored personnel, within visual sighting distance and close enough to communicate with the monitored personnel.
- Warn personnel when it appears that they are unaware of fall hazards or act in an unsafe manner, and notify their Supervisor accordingly.
- Not allow other responsibilities to encumber monitoring. If the Safety Monitor becomes encumbered with other responsibilities, the monitor must stop the job and notify the Supervisor.

2. Controlled Access Zone

A Controlled Access Zone is an area designated and clearly marked in which leading edge work steel construction, roofing or block laying may take place without the use of a guardrail system, a safety net system or personal fall arrest system. Control lines must be installed to prevent unauthorized personnel from entering the controlled access zone, and prevent unauthorized personnel from going within 6 feet of an unprotected edge. Control Access Zones must comply with the following provisions:

- a. Control lines must consist of ropes, wires, tapes, or equivalent materials, and supporting stanchions as follows:
 - Each control line must be flagged or otherwise clearly marked at not more than 6-foot intervals with high-visibility material.
 - Each control line must be rigged and supported in such a way that its lowest point (including sag) is not less than 39 inches from the walking/working surface and its highest point is not more than 45 inches from the walking/working surface.
 - Each control line must have a minimum breaking strength of 200 pounds.

- b. When used to control access to areas where leading edge and other operations are taking place, the Controlled Access Zone must be defined by a control line or by any other means that restricts access.
- c. When control lines are used, they must be erected not less than 6 feet nor more than 25 feet from the unprotected or leading edge.
- d. The control line must extend along the entire length of the unprotected or leading edge and must be approximately parallel to the unprotected or leading edge.

VI. Fall Protection Education

- A. Section chiefs/Supervisors must provide education for all personnel who might be exposed to fall hazards. The program must enable personnel to recognize the hazards of falling and must provide guidance in methods to minimize fall hazards.
- B. Circumstances where additional education is required include, but are not limited to:
 1. Changes in the work place cause new hazards to be created
 2. Types of fall protection systems or equipment to be used are changed
 3. Supervisors observe employees are not using fall protection correctly

VII. Procedure Review and Continuous Improvement

Section chiefs/Supervisors will evaluate Fall Prevention and Control Procedures at least annually to ensure the continued effectiveness. The evaluation will be performed to ensure that the procedures are current and provide the required level of protection.

VIII. Record keeping

Records maintained by Section Chiefs/Supervisors should include:

- Records of purchasing fall protection equipment, and records of certifications.
- Records of annual inspections of all fall protection equipment.
- Training records of employees who have received fall protection training.

APPENDIX A

Definitions

Anchorage - A secure point of attachment for lifelines, lanyards or deceleration devices.

Body Harness - 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- A person that has received additional training on fall hazards and is very familiar with the requirements and equipment for fall protection.

Connector - A device, which is used to couple (connect) parts of the personal fall arrest system and positioning device system together. It may be an independent component of the system, such as a carabineer, or it may be an integral component of part of the system (such as a buckle or Dee-ring sewn into a body harness or a snap hook spliced or sewn to a lanyard or self-retracting lifeline/lanyard).

Controlled Access Zone (CAZ) - A controlled access area in which certain work may take place without the use of guardrail systems, personal fall arrest systems, or safety-net systems.

Deceleration Device - Any mechanism, such as a rope-grab, rip-stitch lanyard, specially-woven lanyard, tearing or deforming lanyard, automatic self-retracting lifeline/lanyard, etc., which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limit the energy imposed on an employee during fall arrest.

Deceleration Distance - The additional vertical distance a falling employee travels, excluding lifeline elongation and free fall distance, before stopping, from the point at which the deceleration device begins to operate. It is measured as the distance between the location of an employee's body harness attachment point at the moment of activation (at the onset of fall arrest forces) of the deceleration device during a fall, and the location of that attachment point after the employee comes to a full stop.

Free Fall - The act of falling before a personal fall arrest system begins to apply force to arrest the fall.

Free Fall Distance - The vertical displacement of the fall arrest attachment point on the employee's 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/lanyard elongation, but includes any deceleration device slide distance or self-retracting lifeline/lanyard extension before they operate and fall arrest forces occur.

Guardrail System - A barrier erected to prevent employees from falling to lower levels.

Hole - A gap or void 2 inches or more in its least dimension, in a floor, roof, or other walking/working surface.

Infeasible - Impossibility to perform work using a conventional fall protection system (i.e., guardrail system, safety net system or personal fall arrest system) or that it is technologically impossible to use any one of these systems to provide fall protection.

Lanyard - A flexible line of rope, wire rope, or strap, which generally has a connector at each end for connecting the body, harness to a deceleration device, lifeline, or anchorage.

Leading Edge - The edge of a floor, roof, or formwork for a floor or other walking/working surface (such as the deck), which changes location as additional floor, roof, decking, or formwork sections are placed, formed, or constructed. A leading edge is considered to be an unprotected side and edge during periods when it is not actively and continuously under construction.

Lifeline - A component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorage points at both ends to stretch horizontally (horizontal lifeline), and which serves as a means for connecting other components of a personal fall arrest system to the anchorage.

Lower Levels - Those 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, water, equipment, structures, or portions thereof.

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

Opening - A gap or void greater than or equal to 30 inches high and 18 inches wide, in a wall or partition, through which employees can fall to a lower level.

Personal Fall Arrest System - A system used to arrest an employee in a fall from a walking/working surface. It consists of an anchorage, connectors, and a body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these.

Positioning Device System - A body harness system 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.

Roof - The exterior surface on the top of a building. This does not include floors or formwork, which, because a building has not been completed, temporarily become the top surface of a building.

Roofing Work - The 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.

Rope Grab - A deceleration device that travels on a lifeline and automatically, by friction, engages the lifeline and locks so as to arrest the fall of an employee. A rope grab usually employs the principle of inertial locking, cam-level locking, or both.

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

Safety Net System - Safety nets shall meet performance standards as determined by the regulation and be certified by the manufacturer. Edge ropes shall provide a minimum breaking strength of 5,000 pounds. Forged steel safety hooks or shackles shall be used to fasten the net to its support. Connections between net panels shall develop the full strength of the net.

Self-Retracting Lifeline/Lanyard - A deceleration device containing a drum-wound line which can be slowly extracted from, or retracted onto, the drum under slight tension during normal employee movement, and which, after onset of a fall, automatically locks the drum and arrests the fall.

Snap hook - A connector comprised of a hook-shaped member with a normally closed keeper, or similar arrangement, which may be opened to permit the hook to receive an object and, when released, automatically closes to retain the object.

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

Toe board - A low protective barrier that will prevent the fall of materials and equipment to lower levels.

Unprotected Sides or Edges - Any side or edge (except at entrances to points of access) of a walking/working surface, e.g., floor, roof, ramp, or runway where there is no wall or guardrail system at least 39 inches 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 in order to perform their job duties. Walking/working surfaces on which employees are to work shall have the strength and structural integrity to support employees safely.

Warning Line System - A barrier erected on a roof to warn employees that they are approaching an unprotected side or edge, and which designates an area in which work may take place without the use of a guardrail system, body harness, or safety net system to protect employees