

# **CENTRAL ARIZONA PROJECT**



## **FALL PROTECTION PROGRAM**

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- 1.0 PURPOSE:** The purpose of this program is to prevent or minimize worker injuries due to falls. This is to be accomplished as far as possible by engineering and administrative controls (i.e. eliminating the hazard where possible). When exposure to elevated fall hazards cannot be prevented through engineering and administrative controls, the appropriate fall protection system and equipment will be used to control the fall hazard.
- 2.0 SCOPE:** Potential fall hazards exist throughout CAP facilities. While many of these hazards have been eliminated via installation of guardrails and other protective devices, many cannot be eliminated, and appropriate fall protection is therefore required.

This program covers all CAP employees, vendors and contractors who are exposed to fall hazards of four feet or more (six feet during the performance of construction work). The program covers roles and responsibilities, fall hazard assessment, training, and record-keeping requirements.

This program applies to maintenance and operation activities, permanent installations and construction work.

- 3.0 DEFINITIONS:** Most terms used in this program are defined the same as within OSHA's fall protection standards at 29 CFR 1910.21 and 29 CFR 1926.500. Where not defined below, employees should refer to those standards for appropriate definitions of terms.

3.1 Infrequent and temporary: OSHA provides the following guidance on these terms:

- *Infrequent* means that the task or job is performed only on an occasional basis, when needed (e.g., equipment breakdown), or at sporadic or irregular intervals. Infrequent tasks include work activities such as annual maintenance or servicing of equipment, monthly or quarterly replacement of batteries or HVAC filters, and responding to equipment outage or breakdown.
- *Temporary* means that the duration of the task the worker performs is brief or short. Such tasks generally include those that a worker is able to perform in less time than it takes to install or set up conventional fall protection. They also include those that workers are able to complete at one time rather than repeatedly returning to the roof or requiring more than one work shift to complete. They generally are those that take less than 1-2 hours to complete. Examples of temporary tasks include changing a filter in a roof-top HVAC system, replacing a part on a satellite dish, or caulking or resealing the flashing around a skylight.

3.2 Travel restraint system: A combination of an anchorage, anchorage connector, lanyard (or other means of connection), and body support that an employee uses to eliminate the possibility of going over the edge of a walking-working surface. This system will allow the employee to approach and work up to the edge, but unlike a fall arrest system, it will not allow the employee to fall off the edge.

- 3.3 **Warning line:** A barrier erected 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 other means of fall protection. A warning line barrier must meet very specific requirements as found in the OSHA standards. (See Appendix A)

## 4.0 ROLES AND RESPONSIBILITIES

4.1 **Environmental, Health & Safety Manager:** The EH&S Manager is the Fall Protection Program Administrator and has overall responsibility for ensuring CAP's fall protection policies are appropriate for the work performed. The EH&S Manager will also ensure that the Fall Protection Program is reviewed at least every two years and that any changes to regulatory requirements are incorporated into the program and company policies are updated and communicated to affected employees.

4.2 **Qualified Person:** The Engineering, Maintenance, and EH&S Departments will supply as many trained fall protection-Qualified Persons as necessary to provide coverage project wide. These individuals must have a recognized degree, professional certificate, or extensive training and experience so as to be fully qualified to:

- Assist in the review and design of fall protection systems.
- Analyze work tasks that require access to elevated work areas and develop control measures for fall protection work plans.
- Establish processes for integrating fall protection into new or modified building structures or equipment installations.
- Ensure that people under their direction are properly trained and informed.
- Approve elements of fall protection systems developed for specific tasks.

### 4.3 Managers and Supervisors

- All CAP supervisors & managers are responsible for ensuring that only properly trained personnel are assigned tasks that require the use of fall protection.
- Supervisors may train their employees on the use of specific fall protection equipment only after the employee has received training explaining CAWCD's general fall protection program and the hazards and consequences of falls (typically provided at the time of new employee orientation). Supervisors can also contact the EH&S Department to provide training for their employees.

4.4 **Competent Persons:** A CAP competent person must have extensive training and/or experience in fall protection. The competent person is responsible for assisting employees with the identification of fall hazards, the mitigation of those hazards and the proper selection and use of fall protection equipment. A competent person must have the authority to correct any observed fall hazard. Finally, he/she must be familiar with the requirements of this program.

- 4.5 Employees:** Employees who are exposed to fall hazards during the course of their work must:
- Ensure that fall protection equipment is inspected before each use, kept in good repair, and properly stored as per the manufacturer's instructions.
  - Be trained to recognize fall hazards and successfully demonstrate the proper use of fall protection equipment before working at heights.
  - Read, understand, and comply with the requirements of this program.
  - Initiate CAWCD's Incident Investigation Process in the event of a fall or near miss so that measures can be taken to eliminate the fall hazard.
  - Immediately remove from service any fall protection equipment involved in a fall. Such equipment must be tagged "Do Not Reuse" and sent to the EH&S department for disposal.

- 4.6 CAP representative for specific contractors/vendors:** The CAP representative who brings a contractor or vendor on-site is responsible for ensuring only qualified contractors and vendors perform job tasks associated with fall hazards. The CAP representative will:
- Ensure that contractors and vendors have a Fall Protection Policy prepared prior to actual work activities beginning. (Note: The EH&S department can assist with review of any such policy.)
  - Periodically monitor contractor and vendor work practices and ensure safe work practices are maintained.

- 4.7 Contractors and Vendors**
- Will ensure their workers have the knowledge and competency to work safely, recognize fall hazards, and properly wear fall protection equipment prior to performing job duties on CAP property.
  - Notify the CAP representative as soon as possible in the event of a fall or near miss so that measures can be taken to eliminate the fall hazard or safety concerns.
  - Are responsible for supplying their own fall protection equipment and to ensure that it is inspected before each use, kept in good repair, and properly stored as recommended by the manufacturer's instructions.

**5.0 FALL PROTECTION REQUIREMENTS:** Fall protection is required whenever employees are exposed to a fall of six feet or more when performing construction activities, four feet or more when performing maintenance activities, or at any height when working over hazards that increase the likelihood of harm to the worker should a fall occur, such as a fall onto projections, sharp or rough obstructions, moving equipment, etc.

Where possible, fall hazards should be engineered out or otherwise eliminated. When exposure to fall hazards cannot be eliminated, the appropriate personal fall protection system and equipment will be used to minimize risk.

It is not possible to list every fall exposure that may be present in CAP workplaces. However, the following sections list common exposures and the general requirements for protecting employees that work around those exposures. When in doubt as to the appropriate protective measures that should be used, employees should consult with their supervisors and/or with the EH&S department for guidance.

**5.1 General requirements:** The following requirements apply whenever an employee is exposed to a fall hazard:

- 5.1.1 All employees who work at heights must be trained on the proper use of the equipment used to protect them from falls. Training must occur prior to using that equipment.
- 5.1.2 Only CAP-provided and approved fall protection equipment will be used by employees. **No** employee owned equipment will be used unless prior approval is given by the EH&S Manager.
- 5.1.3 At no time will an approved fall protection anchor point be used for any purpose other than fall protection. Any fall protection anchor point used for another purpose is no longer available for use in fall protection until evaluated by a qualified person.

Note: "Anchor point" as used in the above paragraph generally refers to field-installed anchors. The use of a building's structural steel for both an anchor point and another purpose (i.e., hoisting materials) would not normally be prohibited.

- 5.1.4 Fall protection anchor points must be capable of supporting 5000 pounds per employee attached; or if designed and used under the supervision of a qualified person, must maintain a safety factor of at least two. Appendix B provides guidance on fall protection anchor points.
- 5.1.5 Job specific fall protection requirements and/or associated JSA's must be reviewed in a pre-job briefing prior to beginning work involving fall hazards.
- 5.1.6 All surfaces on which employees walk or work shall be in good repair and capable of supporting the intended loads.
- 5.1.7 When used, personal fall arrest systems must be installed and used in a manner that will prevent a free fall greater than six feet and prevent contact with a lower level or swinging into walls or other obstructions.

**5.2 Low sloped roofs – non construction work:** Most *non-construction* work (i.e., HVAC maintenance, microwave tower maintenance, simple roofing membrane patch, etc.) that occurs on our facility rooftops will, 1) take place 15' or more from an *unprotected* edge of the roof, and 2) meet the definition of "infrequent and temporary." (See section 3.1.) Accordingly, such work on facility rooftops shall conform to the following fall protection requirements: (For *construction* work on low sloped roofs, see section 5.3 below.)

5.2.1 Work within 15' of the roof edge: When work occurs less than 15 feet from the edge of the roof, employees **must** be protected from falls by one of the following systems:

- Guardrails; or
- Safety nets; or
- Personal fall arrest system; or
- Travel (fall) restraint system.

Note: Where guardrails are used, they must span a wide enough section that the employee will always be at least 15' from the fall hazard (the end of the guardrail).

5.2.2 Work 15 feet or more from the roof edge: *Infrequent and temporary* work that is 15' or more from the edge requires no fall protection. If it becomes necessary to be within 15' of the edge, one of the fall protection methods listed in 5.2.1 above must first be implemented.

On many facility rooftops, a black line has been painted 15' from the edge of the roof, or from the end of a guardrail system to assist employees in identifying the area where *infrequent and temporary, non-construction* work may be performed without fall protection. Where no line is present or where the line is not 15' from a fall exposure, employees must still maintain that 15' distance from the exposure to be in compliance with this policy.

When in doubt about the fall protection requirements for work on rooftops or around similar unprotected sides and edges, one of the fall protection measures listed in paragraph 5.2.1 should be the default position.

Work that is 15' or more from the edge but which is not considered *infrequent and temporary* must use one of the systems listed in 5.2.1 above.

**5.3 Low sloped roofs – construction work**: Construction work that occurs on a low sloped roof (most all CAP facility rooftops) shall conform to the following fall protection requirements.

Note: Typically, the only construction work that would occur on a CAP facility rooftop would be the replacement of the roofing membrane, or a large-scale repair of holes or other damage to the membrane. Most all other work on rooftops will be maintenance, such as on an HVAC system, and will therefore be covered by section 5.2 above. When in doubt, consult with the EH&S department.

5.3.1 Roofing work on low sloped roofs: Roofing work is the replacement or repair of the roofing membrane. (Exception: minor patch work on the membrane is considered maintenance and is covered under section 5.2 above.) During

the performance of roofing work, employees must be protected from falls by one of the following systems:

- Guardrail system; or
- Safety net system; or
- Personal fall arrest system; or
- Travel restraint system; or
- A warning line system (see Appendix A) used in combination with one of the above systems; or
- A warning line system (Appendix A) used in combination with a safety monitoring system.

**Note:** While the OSHA standards allow the use of a safety monitoring system alone (during roofing work) on roofs 50' or less in width, **CAP does not allow this**. In no circumstance is the use of a safety monitoring system, by itself, an acceptable form of fall protection.

5.3.2 All other construction work: For all other construction work on low slope roofs, employees must be protected from falls using one of the following:

- Guardrail system; or
- Safety net system; or
- Personal fall arrest system; or
- Travel restraint system.

**Exception:** Where the construction work takes place 15' or more from the unprotected side or edge of the floor, roof or other opening, a warning line system can be used. The warning line must be set at least 15' from the edge and must meet all requirements listed in Appendix A. Employees are prohibited from crossing the warning line unless additional fall protection measures are implemented.

**5.4 Unprotected sides and edges (i.e., plant deck openings):** In most all cases, employees exposed to an unprotected floor edge such as a plant deck opening must utilize one of the fall protection methods specified for low sloped roofs in section 5.2.1 above.

Guardrails are the typical form of fall protection used around plant deck and other floor openings. When necessary, personal fall arrest systems are available and must be used where employees are exposed to a fall between the time deck plates or other covers are removed, and guardrails are installed.

**5.5 Discharge lines:** Although rolling or sliding down a discharge line is not considered a fall, such a slide does present the potential for serious injury. It is appropriate, therefore, to outline measures to mitigate that hazard.



When the slope of the discharge line is 3:1 (H:V) or greater, employees walking or working in the line shall wear a harness with lanyard and the lanyard shall be attached to a static line via rope grab. This will allow the employee to move freely within the discharge line but will prevent the employee from sliding down the line should he/she slip and fall. Training is required for individuals setting up and using this type of a 'slide restraint' system.

- 5.6 Work over and around water:** Working over and around water presents a unique set of fall protection challenges for several reasons. A lack of suitable anchorage points, swift moving water, and other hazards – in addition to a potential fall – all increase the potential danger and require special considerations. Protective measures for work over and around water shall follow those outlined in the [Safety Resource Manual](#), Section 2 (Safety Rules), Subsection 15 (Safety Near, Over and On the Water).

In all cases, the basic rule of fall protection applies: where an employee is exposed to a fall of four or more feet (six in construction), including a fall into water, fall protection must be provided. (Note: Rolling down the canal slope is not considered a fall for fall protection purposes. True fall protection is therefore not required when working on the canal slope, but other safety measures must still be implemented. See the above section/subsection in [Safety Resource Manual](#).)

- 5.7 Fixed ladders:** Fixed ladders greater than 24' in length must be equipped with a ladder safety system. Alternatively, a davit arm or similar device can be used as part of a personal fall arrest system. Note: A cage or well is an acceptable form of fall protection on existing fixed ladders greater than 24' until November 18, 2036.
- 5.8 Portable ladders:** Typically, no fall protection is required if the ladder is placed at the proper angle (one foot back for every four feet of rise), extends three feet above the upper landing, and is secured at the top. However, due to the height of the climb, CAP's practice is to use fall protection (i.e., davit arm and retractable lifeline) when portable ladders are used in the following situations:

- 5.8.1 As access into and egress from vaults, checks and turnouts.
- 5.8.2 As access into and egress from siphons (i.e., through manholes).

## 6.0 EQUIPMENT INSPECTIONS

- 6.1** Employees who have been assigned or otherwise use personal fall protection equipment are required to inspect that equipment prior to each day's use. Any deficient equipment must be immediately removed from service. This inspection does not need to be documented. Appendix C can be used as a guide for equipment inspections.

6.2 During routine facility inspections, members of EH&S staff will perform random inspections of personal fall arrest systems, anchorage points, guardrails, and other fall protection equipment. Any deficient equipment will be immediately removed from service.

**7.0 EMERGENCY RESCUE PLAN:** An important yet often overlooked component to a fall protection program is the rescue plan. Prior to the start of any work involving a potential fall, employees and supervisors should plan their response to a fall. This can be accomplished as part of a pre-job briefing. The plan does not need to be in writing, but the following points should be considered:

- Are there aerial lifts, ladders or other methods of rescuing an employee who is suspended?
- Will there be obstructions to accessing the employee?
- Where is the closest first aid kit, AED unit and similar equipment?
- Who will perform the rescue?
- Who will be responsible for calling the Control Center (2530) and summoning rescue services?

**8.0 TRAINING:** All employees with potential exposure to fall hazards and those who use fall protection equipment will be trained in the following:

- The nature of fall hazards in their work areas.
- The correct procedures for erecting, maintaining, disassembling, and inspecting the fall protection systems to be used.
- The use and operation of guardrail systems, personal fall arrest systems, warning line systems, and other protection to be used, as applicable to their work.
- The role of employees in CAP's fall protection program.
- The applicable OSHA standards on fall protection.
- The importance of planning for a rescue in the event of a fall.
- The requirements of the CAP Fall Protection Program.

Refresher training will be provided as required by changes in work process, changes in equipment, and/or audit or incident investigation recommendations.

## **9.0 RECORDKEEPING**

All formal fall protection training must be documented in the CAP learning management system. Records of training must be provided to the EH&S or CLD Departments in writing as soon as is practical so the training can be documented. Information provided must include:

- The name of the employee(s) trained
- The name of the person providing the training
- The date, time, and location of the training
- A summary of the topics covered, including the type of equipment on which training was provided.

## APPENDIX A

### Requirements for Warning Line Systems

During some *construction* work, a warning line is an acceptable form of fall protection (often in conjunction with other requirements). Where one is used, it must conform to the requirements of 29 CFR 1926.502(f) as follows:

- The warning line shall be erected around all sides of the roof work area.
- When mechanical equipment is not being used, the warning line shall be erected not less than 6 feet (1.8 m) from the roof edge.
- When mechanical equipment is being used, the warning line shall be erected not less than 6 feet (1.8 m) from the roof edge which is parallel to the direction of mechanical equipment operation, and not less than 10 feet (3.1 m) from the roof edge which is perpendicular to the direction of mechanical equipment operation.
- Points of access, materials handling areas, storage areas, and hoisting areas shall be connected to the work area by an access path formed by two warning lines.
- When the path to a point of access is not in use, a rope, wire, chain, or other barricade, equivalent in strength and height to the warning line, shall be placed across the path at the point where the path intersects the warning line erected around the work area, or the path shall be offset such that a person cannot walk directly into the work area.
- Warning lines shall consist of ropes, wires, or chains, and supporting stanchions erected as follows:
  - The rope, wire, or chain shall be flagged at not more than 6-foot (1.8 m) intervals with high-visibility material;
  - The rope, wire, or chain shall be rigged and supported in such a way that its lowest point (including sag) is no less than 34 inches (.9 m) from the walking/working surface and its highest point is no more than 39 inches (1.0 m) from the walking/working surface;
  - After being erected, with the rope, wire, or chain attached, stanchions shall be capable of resisting, without tipping over, a force of at least 16 pounds (71 N) applied horizontally against the stanchion, 30 inches (.8 m) above the walking/working surface, perpendicular to the warning line, and in the direction of the floor, roof, or platform edge;
  - The rope, wire, or chain shall have a minimum tensile strength of 500 pounds (2.22 kN), and after being attached to the stanchions, shall be capable of supporting, without breaking, the loads applied to the stanchions as prescribed in paragraph (f)(2)(iii) of this section; and
  - The line shall be attached at each stanchion in such a way that pulling on one section of the line between stanchions will not result in slack being taken up in adjacent sections before the stanchion tips over.
- No employee shall be allowed in the area between a roof edge and a warning line unless the employee is performing roofing work in that area. A personal fall arrest system is required.
- Mechanical equipment on roofs shall be used or stored only in areas where employees are protected by a warning line system, guardrail system, or personal fall arrest system.

**APPENDIX B**  
**Guidelines for Fall Arrest System Tie-Off Anchor Points**

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**Items normally ACCEPTABLE for Tie-Off**

- Engineered anchor Points
- Minimum 6" x 6" wide flange beam, maximum span of 5 feet, with light load (e.g. catwalk support, small bore pipe support)
- Minimum 8" x 8" wide flange beam, maximum span of 10 feet, with light loads (e.g. platform support, cable tray support)
- Minimum 6" square tube steel beam, maximum span 7 feet, with light load
- Minimum 12" x 6" timber beam, maximum 6 foot spans, with light load
- Beams specifically designed for this purpose
- Vehicle bumper (for fall restraint/tethering purposes when working on canal slope)

**Items UNACCEPTABLE for Tie-Off**  
(Unless approved by a Qualified Person)

- Handrail/Guardrail
- Toe plate
- Grating
- Process pipe less than 8 inches in diameter
- Any pipe with greater than 10 feet between vertical and lateral supports
- Any pipe with insulation
- Any pipe with thermal warnings
- Any hazardous piping
- Cable tray
- Conduit
- HVAC Duct
- Equipment support or restraint for piping, electrical, or ductwork
- Channel type strut (i.e. unistrut)
- Bar joists
- Wall studs, metal or wood
- Fence or fence posts
- Metal deck (roof or floor)
- Door/window frames
- Door/window hardware
- Ladder or ladder cage

## APPENDIX C

### Fall Protection Equipment Inspection

All fall protection equipment must be inspected before each day's use. All inspections must be done as per the manufacturer's instructions. Listed below are some general guidelines.

1. Fall protection equipment should be reasonably clean.
2. Inspect harness hardware (buckles, D-rings, back pad, loop keepers). These items must not be damaged, broken, distorted, and must be free of sharp edges, burrs, cracks, worn parts, or corrosion. PVC coated hardware must be free of cuts, rips, tears, holes, etc. in the coating to insure non-conductivity. Ensure buckles work freely.
3. Inspect harness webbing. Material must be free of frayed, cut, or significant broken fibers. Check for tears, abrasions, mold, burns, or discoloration. Inspect stitching. Check for pulled or cut stitches. Broken stitches may be an indication that the harness has been impact loaded and must be removed from service.
4. Look for chemical damage which is evidenced by discoloration or fiber stiffness.
5. Inspect carabineers and clips for distortion, elongation, cracks, corrosion, and malfunctioning gates.
6. Inspect lanyard for cuts, frayed areas, broken strands, kinks, unusual wear patterns, and signs that it has arrested a fall such as broken stitches or a stretched shock absorbing section.
7. Inspect labels. All labels should be present and fully legible.
8. Do not use permanent marker, ink pen or similar items to write on the webbing of harnesses, lanyards and other equipment. This includes writing one's name, or the date of an equipment inspection. You may write on a label or tag on the equipment if there is room to do so without writing over any manufacturer's information.

**Note: Any fall protection equipment that has been involved in a fall arrest must be immediately removed from service and sent to the EH&S Department.**