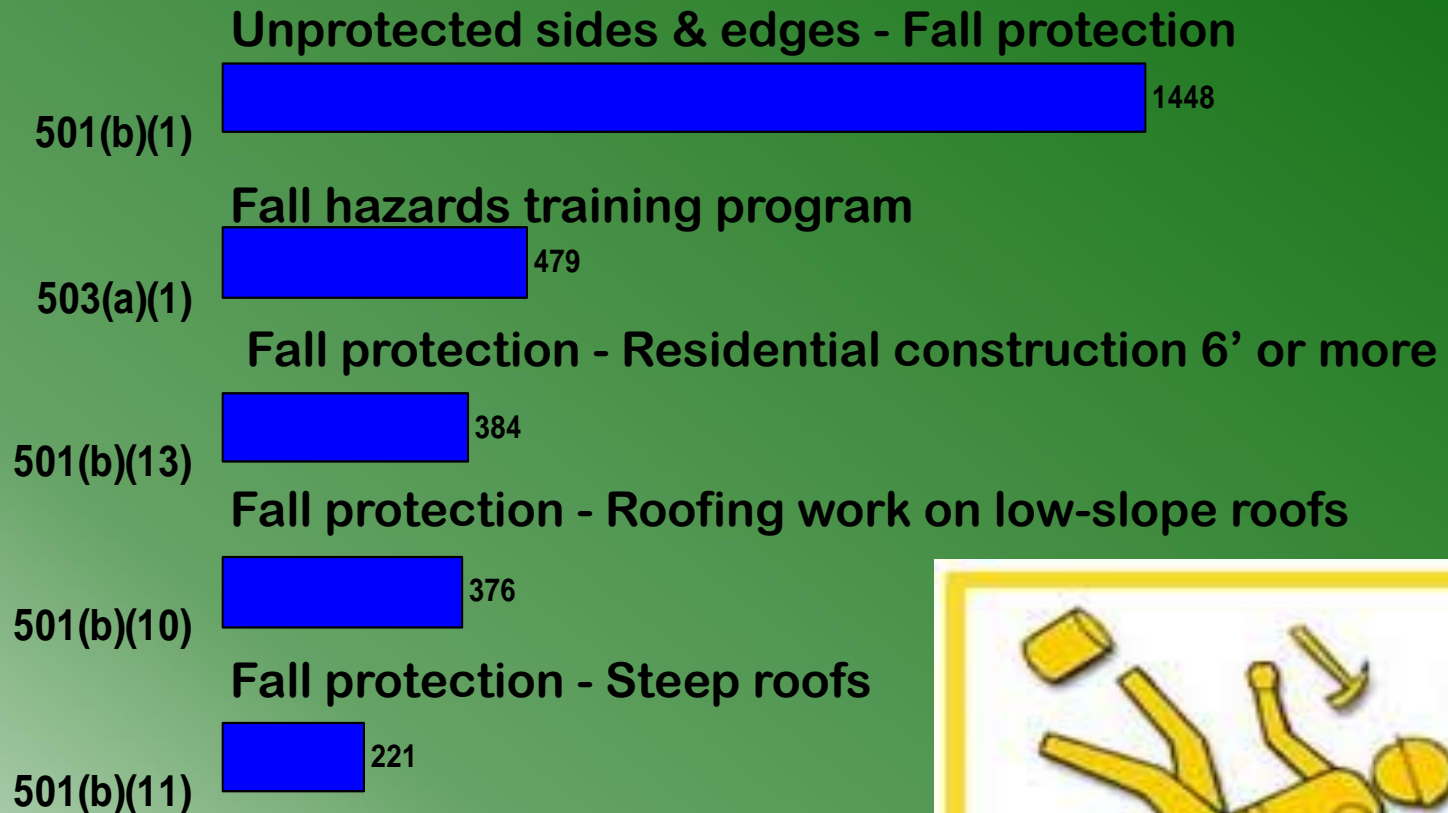


Subpart M



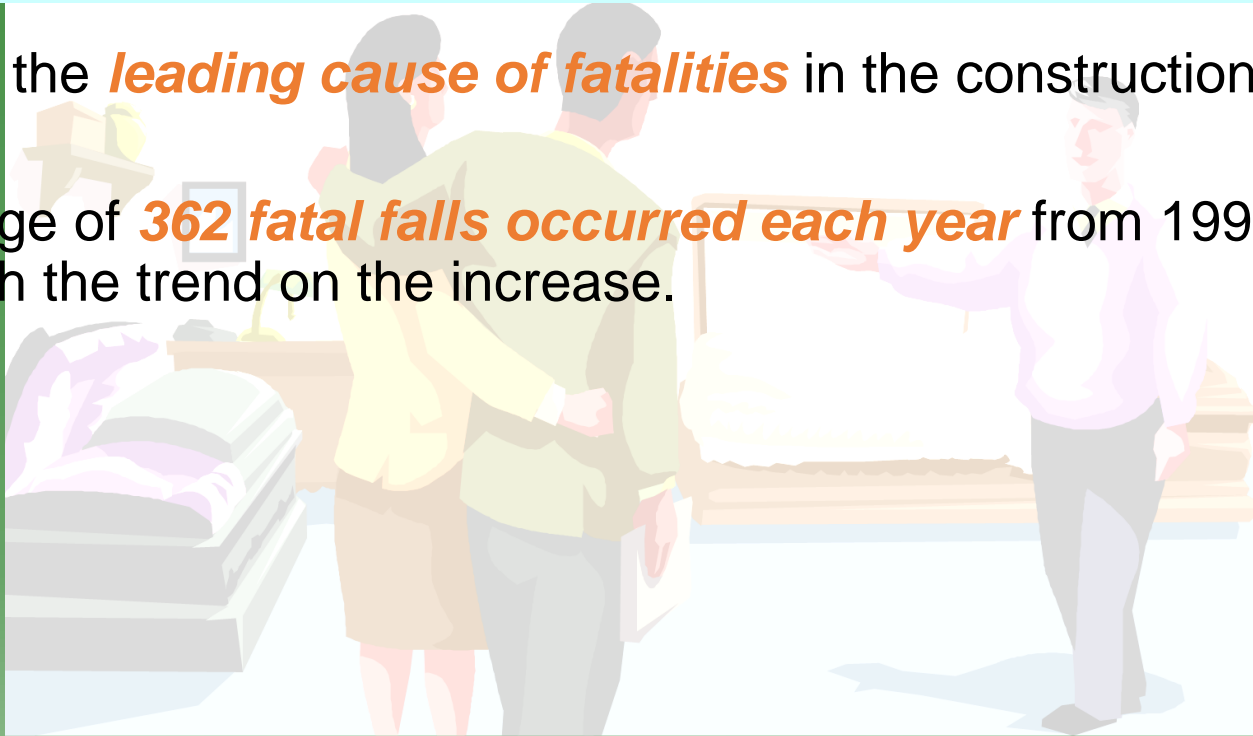
Fall Protection

Subpart M - Fall Protection (1926.500 - 503)



Falls

- **Falls** are the *leading cause of fatalities* in the construction industry.
- An average of *362 fatal falls occurred each year* from 1995 to 1999, with the trend on the increase.



! WARNING: The following slide depicts an actual fall fatality!

Acceleration = 32 ft/sec^2



Prevention

- Select fall protection systems appropriate for given situations.
- Use proper construction and installation of safety systems.
- Supervise employees properly.
- Use safe work procedures.
- Train workers in the proper selection, use, and maintenance of fall protection systems.

Subpart M - Fall Protection

- 1926.500 Scope, application, and definitions
- 1926.501 Duty to have fall protection.
- 1926.502 Fall protection systems criteria and practices.
- 1926.503 Training requirements.

Subpart M - Fall Protection

- **APPENDIX A** TO SUBPART M - DETERMINING ROOF WIDTHS
- **APPENDIX B** TO SUBPART M - GUARDRAIL SYSTEMS
- **APPENDIX C** TO SUBPART M - PERSONAL FALL ARREST SYSTEMS
- **APPENDIX D** TO SUBPART M - POSITIONING DEVICE SYSTEMS
- **APPENDIX E** TO SUBPART M - SAMPLE FALL PROTECTION PLANS



1926.500 Scope

- Requirements and criteria for fall protection in construction workplaces covered under 29 CFR part 1926.
- Exception: does not apply when making an:
 - **Inspection, investigation, or assessment of workplace conditions prior to the actual start of construction work, or**
 - **After all construction work has been completed.**

Definitions

- "Body belt (safety belt)" means a strap with means both for securing it about the waist and for attaching it to a lanyard, lifeline, or deceleration device.



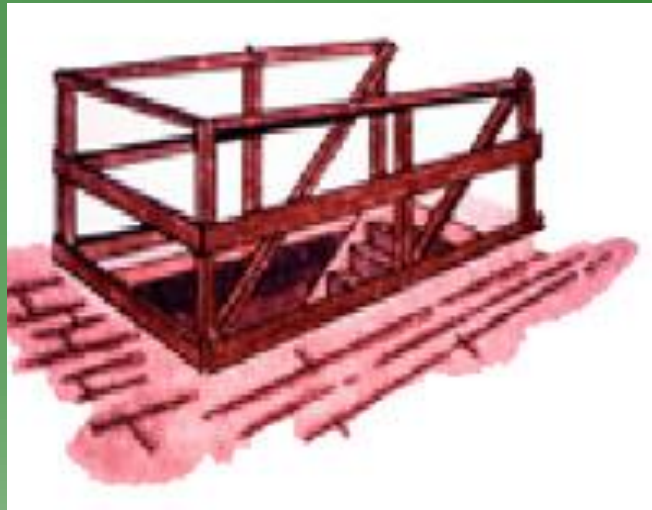
Definitions

- "Body harness" means straps which 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.



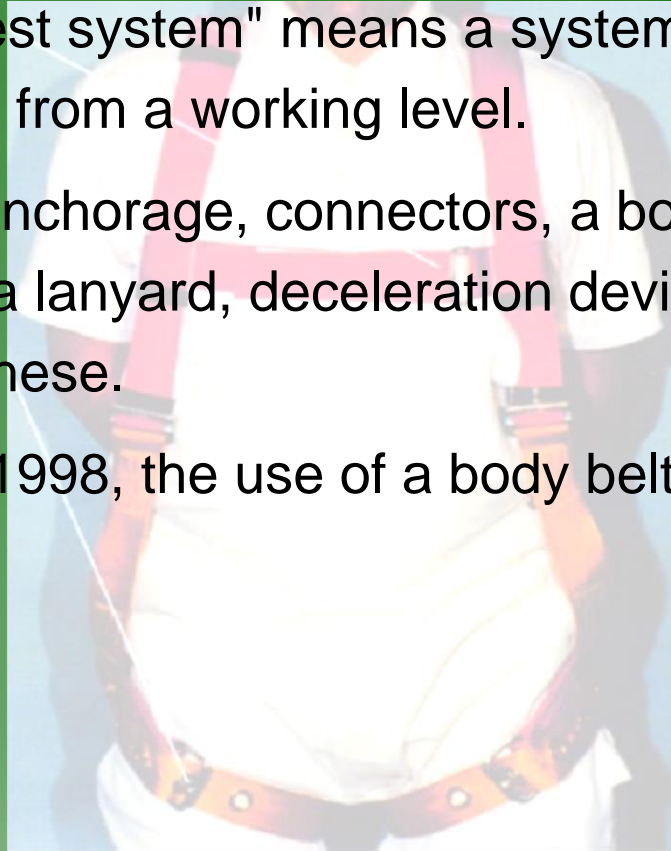
Definitions

- "Guardrail system" means a barrier erected to prevent employees from falling to lower levels.



Definitions

- "Personal fall arrest system" means a system used to arrest an employee in a fall from a working level.
- It consists of an anchorage, connectors, a body belt or body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these.
- As of January 1, 1998, the use of a body belt for fall arrest is prohibited.



Definitions

- "Positioning device system" means a body belt or 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.



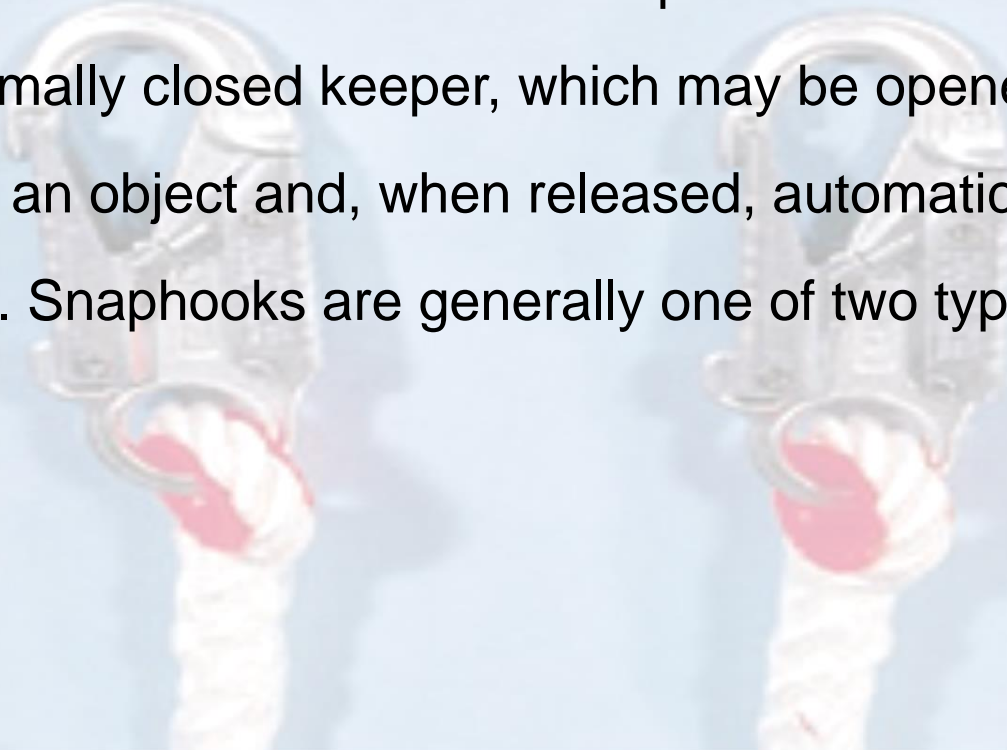
Definitions

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



Definitions

- "Snaphook" means a connector comprised of a hook-shaped member with a normally closed keeper, which may be opened to permit the hook to receive an object and, when released, automatically closes to retain the object. Snaphooks are generally one of two types:



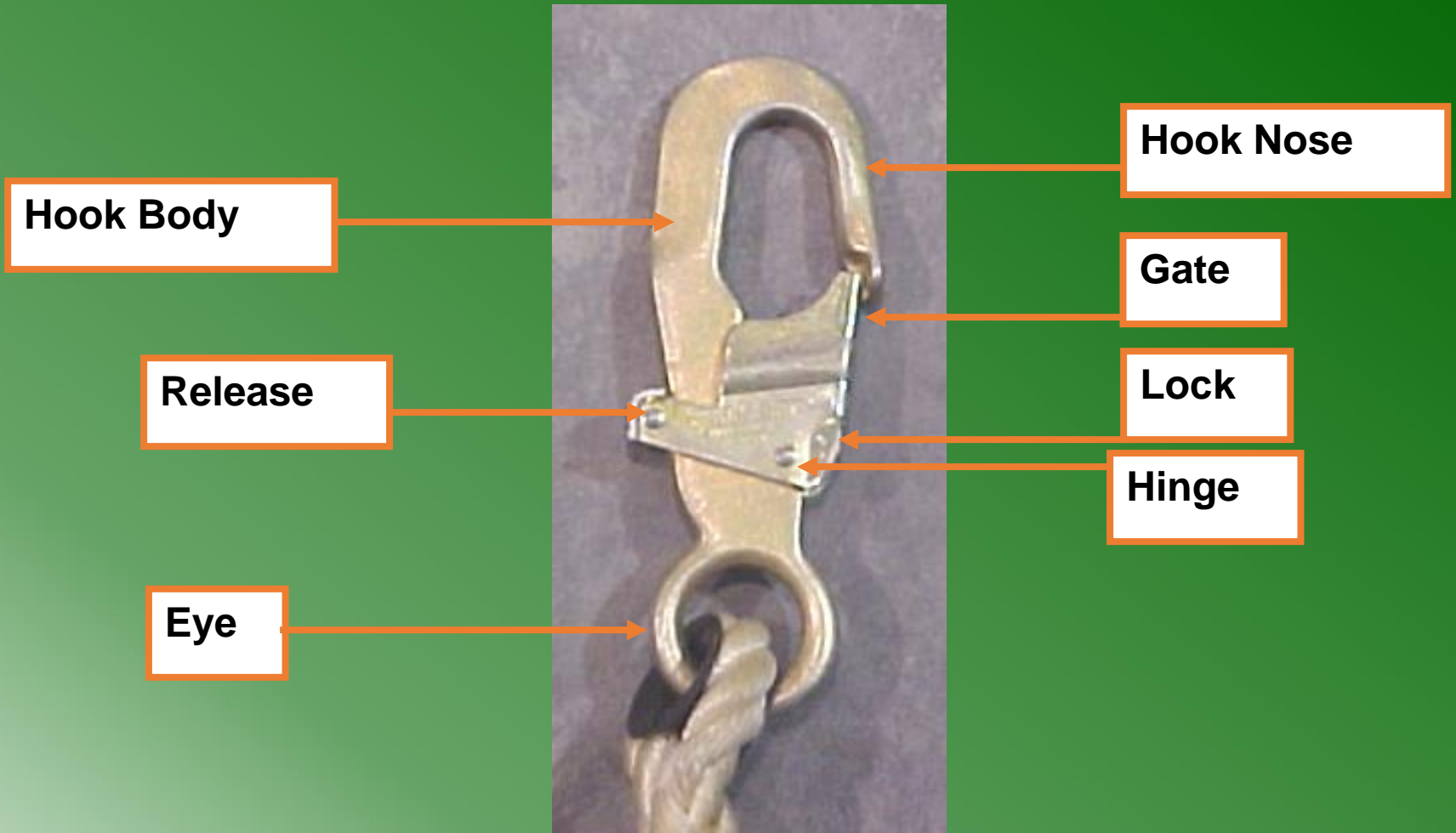
Snaphooks

- The locking type with a self-closing, self-locking keeper which remains closed and locked until unlocked and pressed open for connection or disconnection; or



Snaphooks

- The non-locking type with a self-closing keeper which remains closed until pressed open for connection or disconnection.
- *As of January 1, 1998, the use of a non-locking snaphook as part of personal fall arrest systems and positioning device systems is prohibited.*

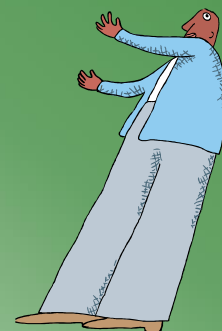


Double – Locking Snap hook

1926.501

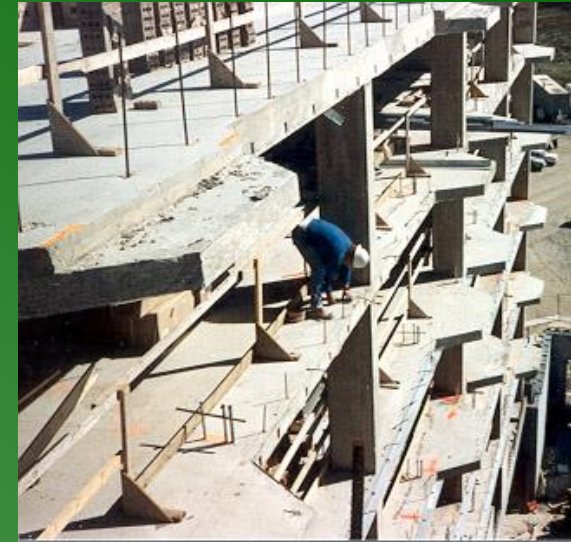
Duty to have

Fall Protection



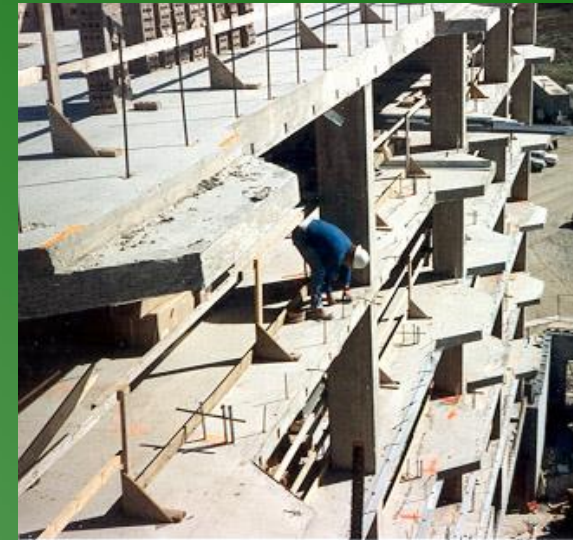
Subpart M applies to:

- (1) "Unprotected sides and edges."
- (2) "Leading edges."
- (3) "Hoist areas."
- (4) "Holes."
- (5) "Formwork and reinforcing steel."
- (6) "Ramps, runways, and other walkways."
- (7) "Excavations."
- (8) "Dangerous equipment."
- (9) "Overhand bricklaying and related work."



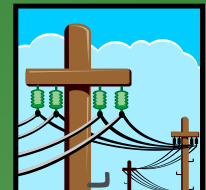
Subpart M applies to:

- (10) "Roofing work on Low-slope roofs."
- (11) "Steep roofs."
- (12) "Precast concrete erection."
- (13) "Residential construction."
- (14) "Wall openings."
- (15) "Walking/working surfaces not otherwise addressed."



Subpart M does not apply to:

- Scaffolds (See Subpart L)
- Certain derricks and cranes (See Subpart N)
- Steel Erection (See Subpart R)
- Certain tunneling operations (See Subpart S)
- Electric distribution lines (Subpart V)
- Ladders and stairs (Subpart X)



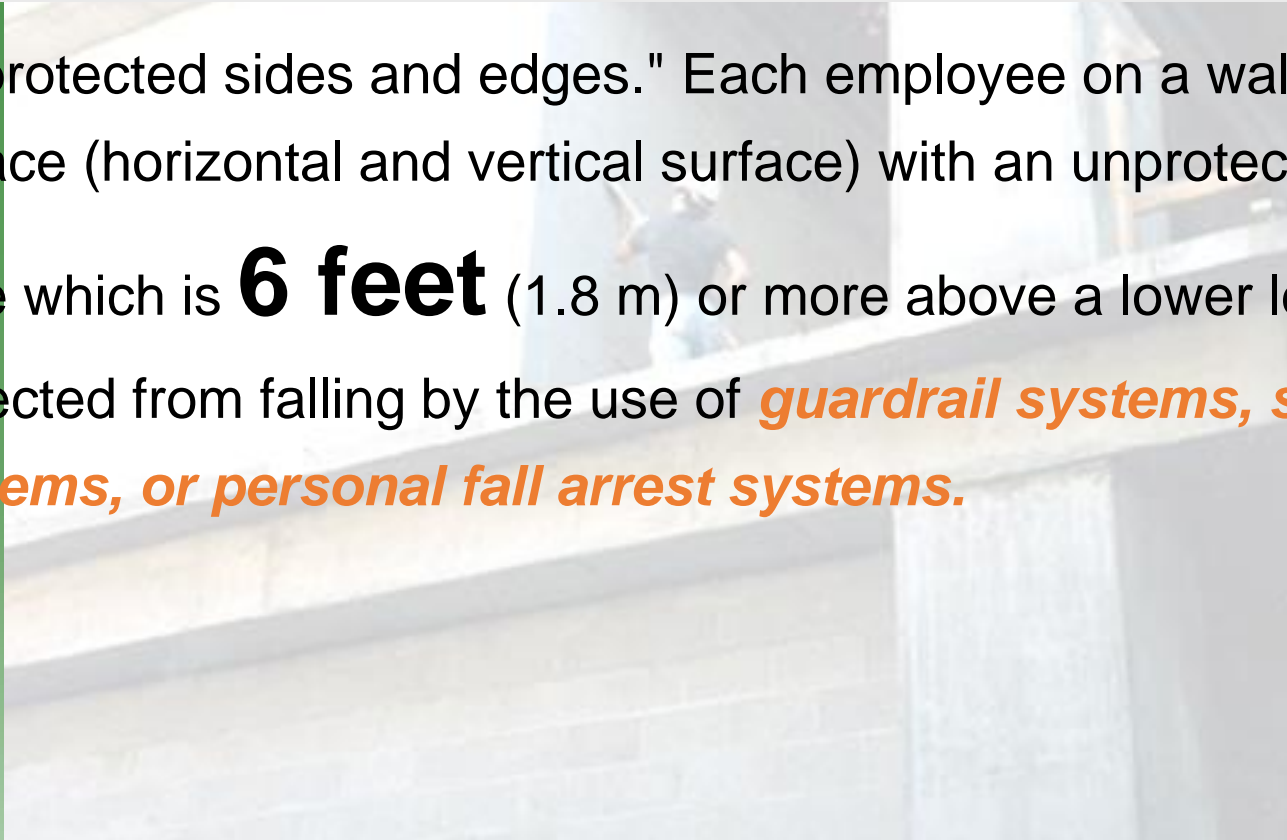
Duty to Have Fall Protection

- Walking/working surfaces on which employees are to work have the strength and structural integrity to support them safely.



Duty to Have Fall Protection

- "Unprotected sides and edges." Each employee on a walking/working surface (horizontal and vertical surface) with an unprotected side or edge which is **6 feet** (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 arrest systems.*



Fall Protection Systems **FPS**



Guardrails



Safety Net

Leading Edge Work

- Employees protected by fall protection system(s)
- If infeasible, or creates a *greater hazard* must implement a **Fall Protection Plan**



Note: There is a presumption that it is feasible and will not create a greater hazard to implement at least one of the fall protection systems.

Accordingly, the employer has the burden of establishing that it is appropriate to implement a fall protection plan which complies with 1926.502(k) for a particular workplace situation, in lieu of implementing any of those systems.

Hoist Areas

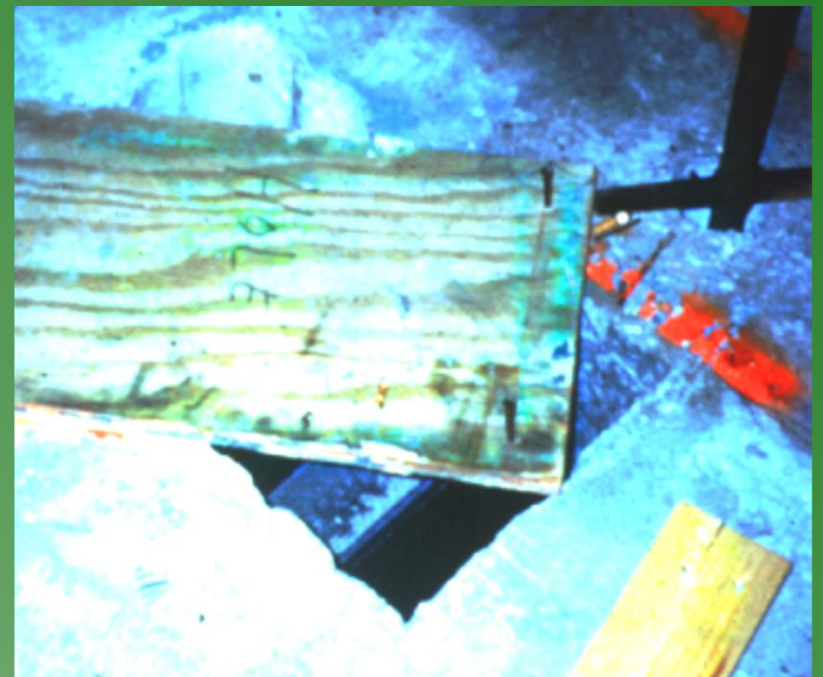
- Hoist areas must be protected by an FPS
- If guardrail section(s) are removed and worker must lean into opening, a PFAS is required.



Holes and Skylights

- Protect from: falling through, tripping or stepping into, and objects falling through





Formwork and Rebar

- Workers must be protected by FPS above 6 feet



Ramps, Runways, Walkways

- Must protect workers with guardrail systems



Excavations

- Use guardrails, fences or barricades if excavation is not readily seen

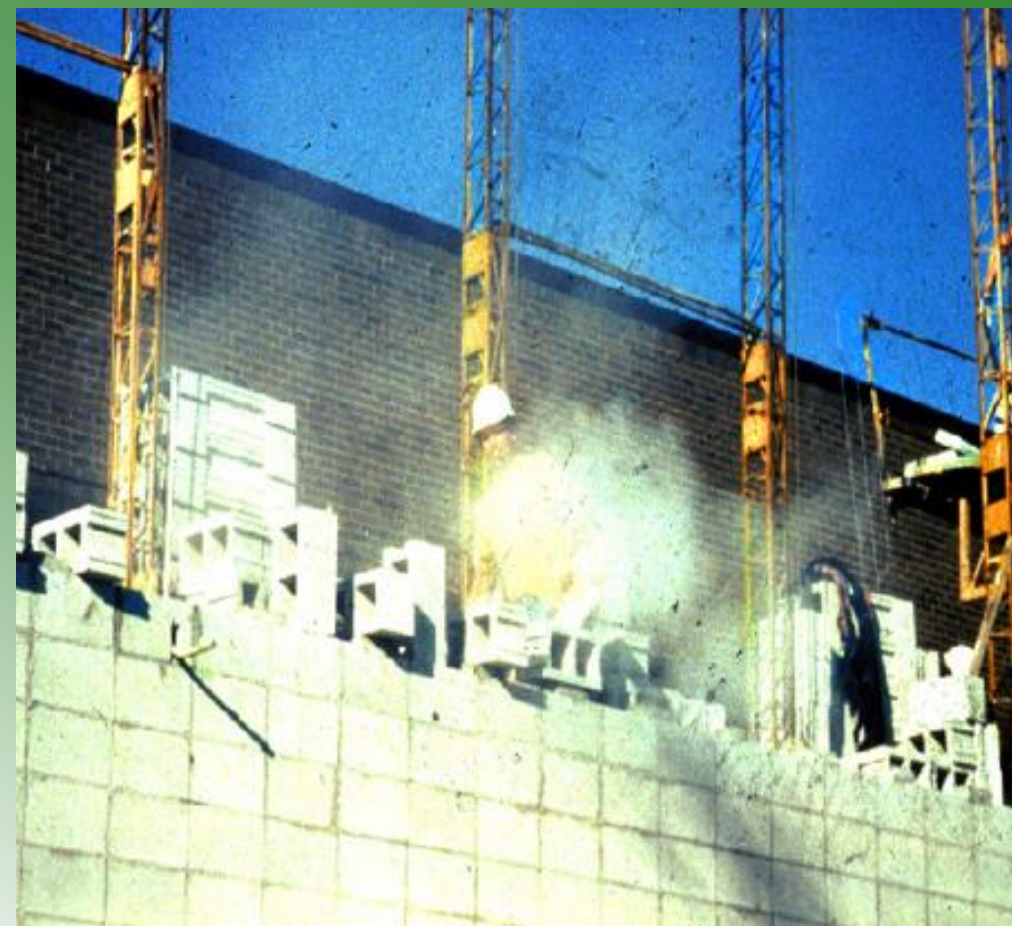


Dangerous Equipment

- *Below six feet* must protect workers with guardrail systems or by equipment guards.



Overhand Bricklaying



- Protect workers with FPS or work in a **Controlled Access Zone** (CAZ)

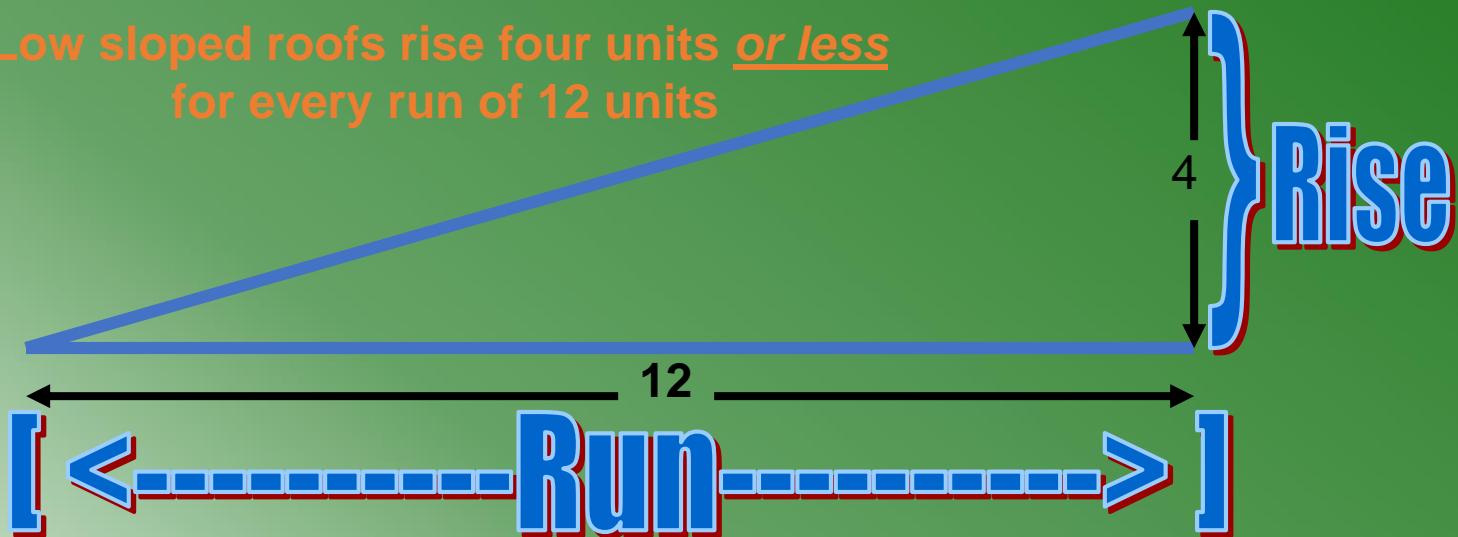
Definition

- "Controlled access zone (CAZ)" means an 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.*

Work on Low-Sloped Roofs

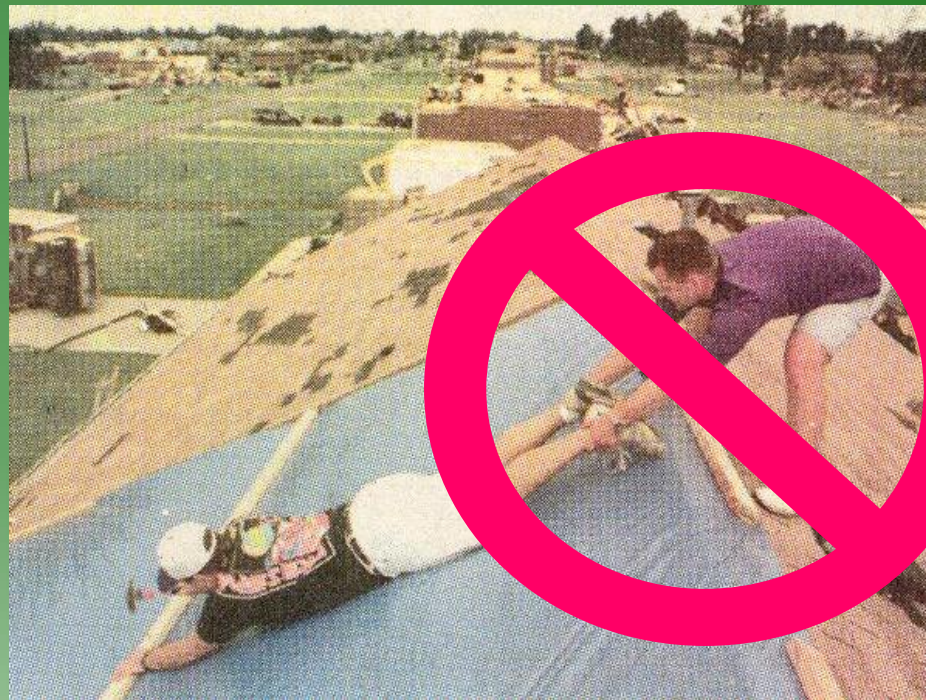
- FPS
- FPS in combination with *warning line*
- Warning line with *safety monitoring*

Low sloped roofs rise four units or less
for every run of 12 units



Safety Monitoring System

- "Safety-monitoring system" means a safety system in which a competent person is responsible for recognizing and warning employees of fall hazards.



Warning Line System

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



Steep Roofs

- "Steep roofs." Each employee on a steep roof with unprotected sides and edges 6 feet (1.8 m) or more above lower levels shall be protected from falling by guardrail systems with toeboards, safety net systems, or personal fall arrest systems.

Steep sloped roofs have a pitch greater than 4 & 12



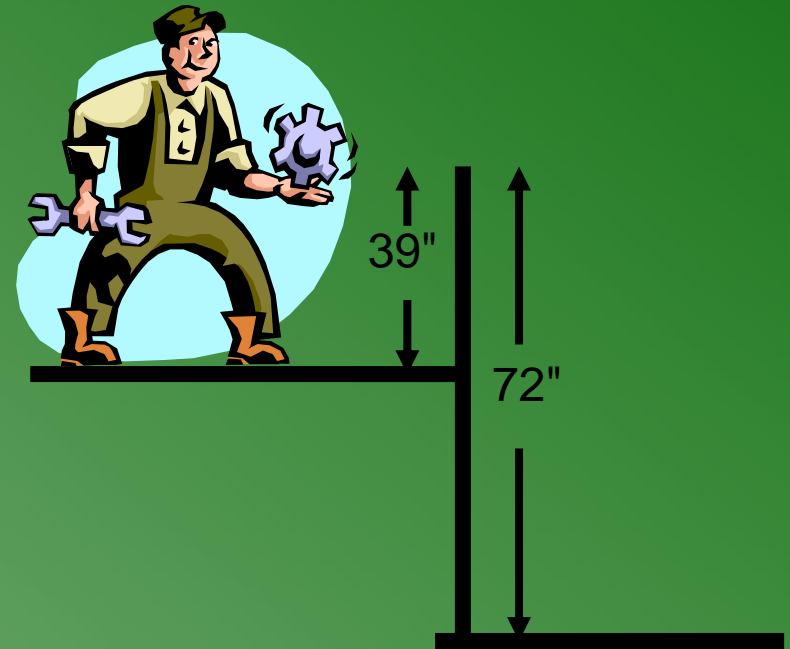
Precast Concrete

- Above six feet must be protected by FPS
- Or by a fall protection plan



Wall openings

- Wall opening is 6 feet (1.8 m) or more above lower levels and the inside bottom edge of the wall opening is less than 39 inches above the walking/working surface protect with FPS



Falling Objects

- Must wear hardhats ***and*** use:
 - Toeboards, screens or guardrails; or
 - Canopy; or
 - Barricades



Fall Protection

systems

1926.502

Guardrail Systems

- Top rail, mid-rail, and toeboard
- Top rail 42" (plus or minus 3 inches)
- Toeboard minimum 3 1/2 inches high



Midrails

- Required if no wall or parapet at least 21" high
- Installed midway between top rail and working level
- Screens & mesh run all along entire opening
- Balusters, when used, not more than 19 " apart

Guardrail Systems

- Must withstand 200 pound force
- Appendix B of the standard provides guidance

200 lb. force, from 2" in downward or outward direction

- Surfaced to prevent injury
- No projection hazard at rail ends
- All rails at least 1/4" thick



Safety Nets

- Installed a maximum of 30' below working level
- 400 pound drop test or *certified* by employer or CP
- Extends sufficiently from outer edge
- Inspected weekly
- Objects removed within shift
- Border rope strength of 5000 pounds



Personal Fall Arrest Systems PFAS

- No body belts for fall arrest!
- Body belts for positioning systems only

PFAS



Snaphooks

- Unless the snaphook is a locking type and designed for the following connections, snaphooks shall not be engaged:
 - Directly to webbing, rope, or wire rope
 - To each other
 - To a dee-ring to which another snaphook or other connector is attached
 - To a horizontal lifeline



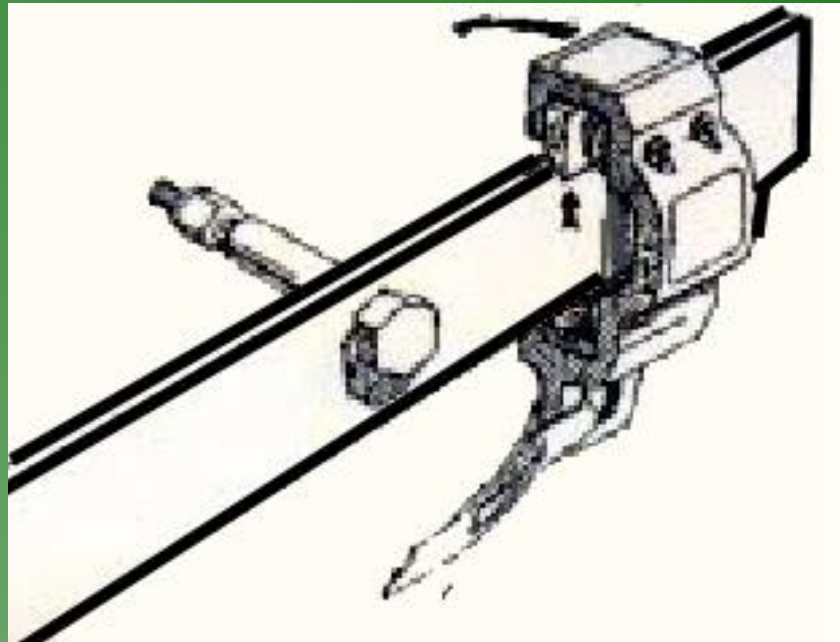
Anchorage

- "Anchorage" means a secure point of attachment for lifelines, lanyards or deceleration devices.



Anchorage

- Anchorages used for attachment of personal fall arrest equipment shall be independent of any anchorage being used to support or suspend platforms and capable of supporting at least 5,000 pounds (22.2 kn.) per employee attached



Anchorage

- As part of a complete personal fall arrest system which maintains a safety factor of at least two; and
- Under the supervision of a qualified person.



Horizontal Lifelines

- Horizontal lifelines shall 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.



Horizontal Lifelines

- Devices used to connect to a horizontal lifeline which could become vertical must be capable of locking in both directions on the lifeline.



Connector

- Used to couple (connect) parts of the personal fall arrest system



Connector

- Buckle or dee-ring sewn into a body belt or body harness



Deceleration Device

- Limits the energy imposed on an employee during fall arrest.



Deceleration Distance

- "Deceleration distance" means 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.

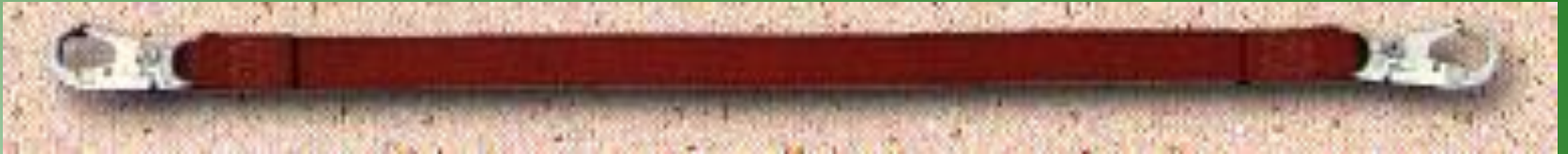
Free fall Distance

- "Free fall distance" means the vertical displacement of the fall arrest attachment point 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.



Lanyard

- Cannot be made of natural fiber rope
- Must be protected against damage by cuts or abrasions
- Each employee must be provided a separate lanyard
- Lanyards must have a minimum breaking strength of 5000 pounds



PFAS

- Personal Fall Arrest Systems must:
 - limit maximum arresting force on an employee to 1,800 pounds when used with a body harness;
 - be rigged such that an employee can neither free fall more than 6 feet (1.8 m), nor contact any lower level;
 - bring an employee to a complete stop and limit maximum deceleration distance an employee travels to 3.5 feet

Calculation of Total Fall Distance

- Freefall = 6 feet maximum
- Deceleration Distance = 3.5 feet maximum
- Lifeline elongation = 2 feet maximum
- Total fall before stopping = 11.5 feet
- Portion of body landing below attachment point approximately 5 feet
- Total clearance below required to avoid contacting lower level may be as great as 16.5 feet or more!



Attachment Point

- Center of wearers back or above head



Additional Requirements PFAS

- PFAS used only for fall protection
- If subject to impact loading, examined by CP
- Prompt rescue provided



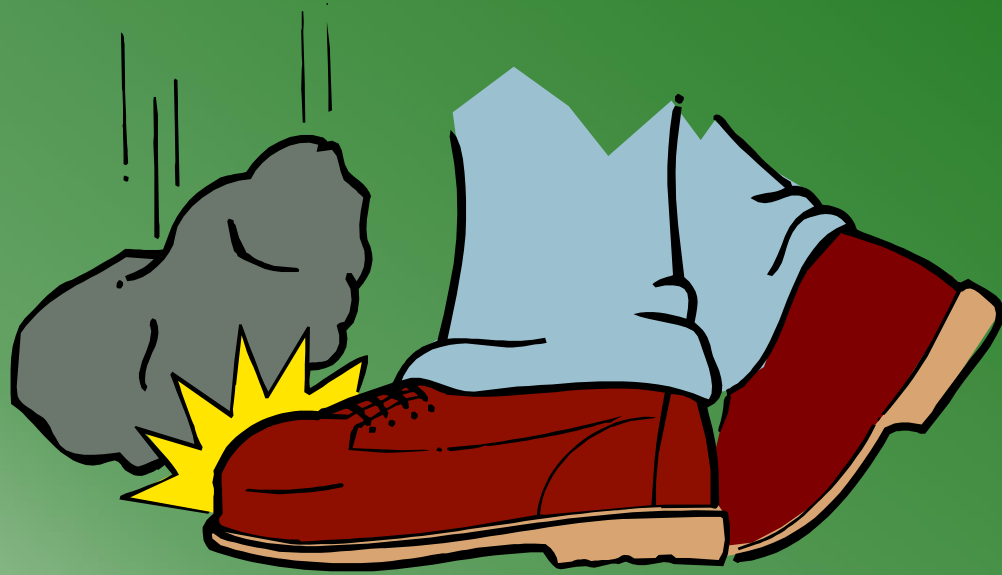
Additional Requirements PFAS

- Inspected prior to each use
- Not attached to guardrail systems
- At hoist areas, allow movement to edge only



Positioning Systems

- Limit free fall to two feet
- Anchorage can handle at least 3000 pounds



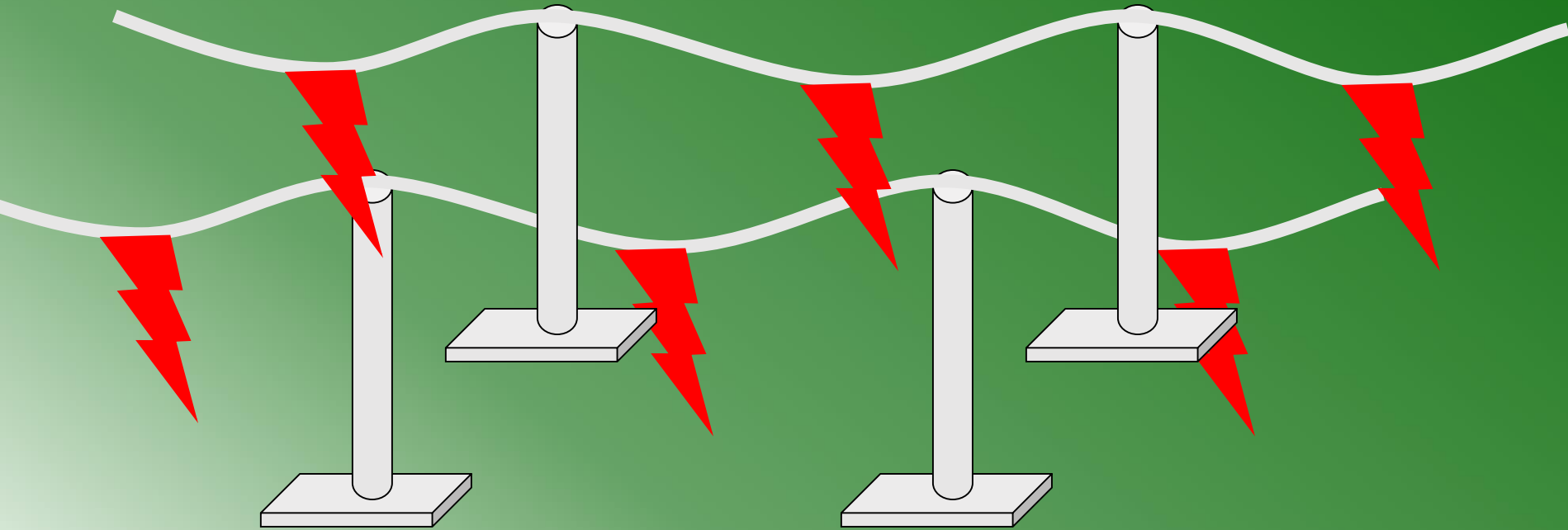
Warning Lines

- Erected around all sides of roof
- Erected at least six feet from edge if no mechanical equipment is used.



Warning Lines

- Points of access formed by two warning lines
- When access not in use, closed off



Warning Lines

- Consist of ropes, wires, or chains, and supporting stanchions
- Flagged at least every six feet



Warning Lines

- Lowest point (including sag) is no less than 34 inches
- Resists 16 outwardly directed pound force at 30 inches



Warning Lines

- Minimum tensile strength of 500 pounds
- Pulling between stanchions will not take up slack in other sections



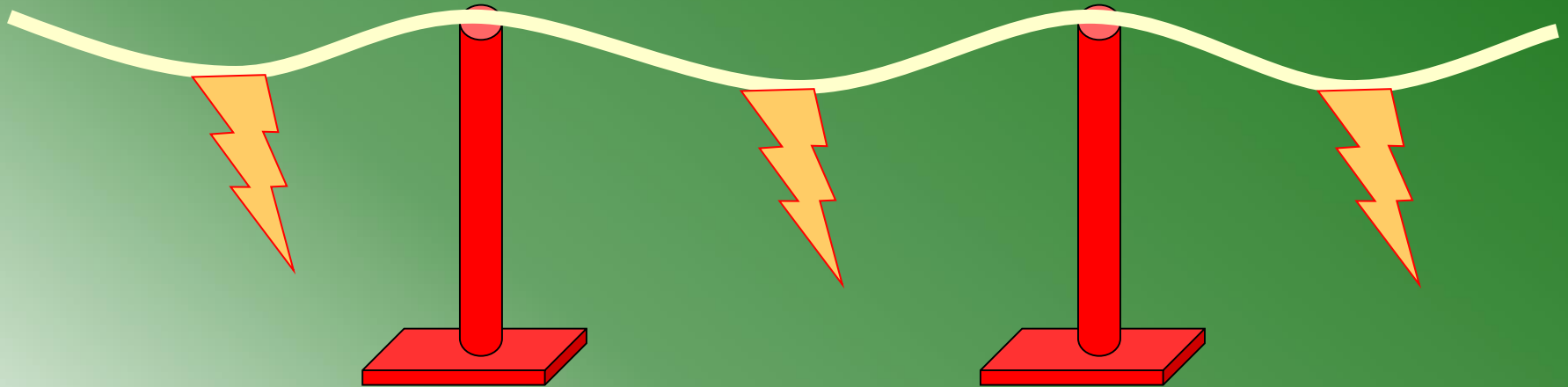
Warning Lines

- Only roofing work employees allowed between roof edge and warning line
- Protect workers from mechanical equipment on roofs



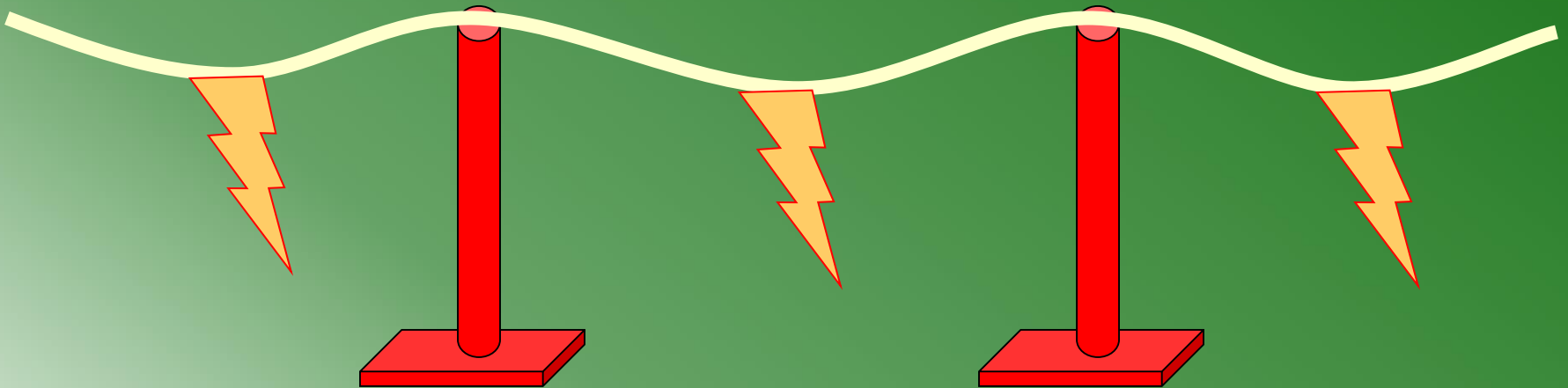
Controlled Access Zones

- Where leading edge and other operations are taking place the controlled access zone shall be defined by a **control line**
- At least six feet from leading edge
- Not more than 25 feet from leading edge



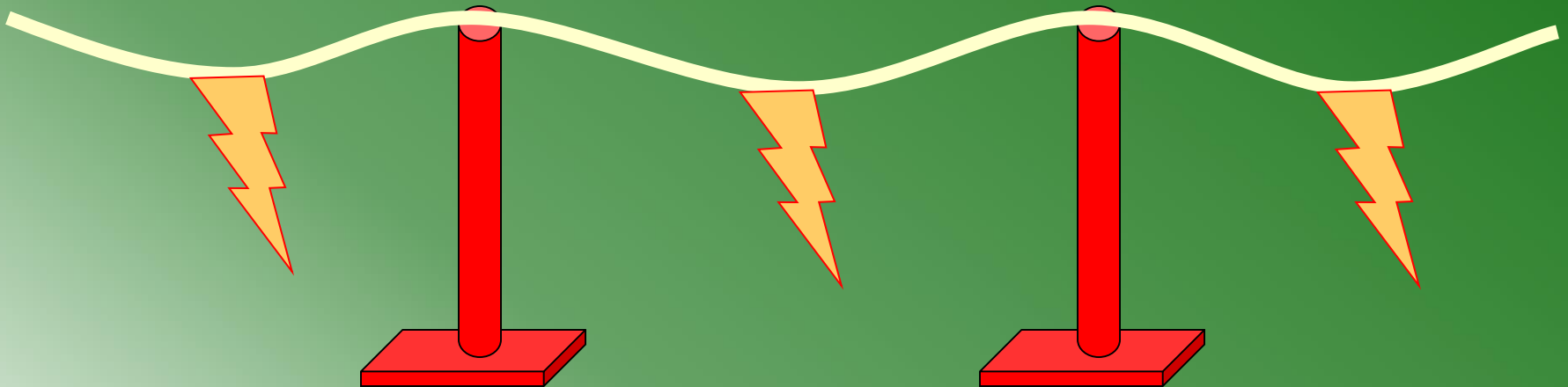
Controlled Access Zones

- For precast concrete operations, CL six to sixty feet from edge
- Extends entire length of leading edge
- Connected at ends to guardrail or wall



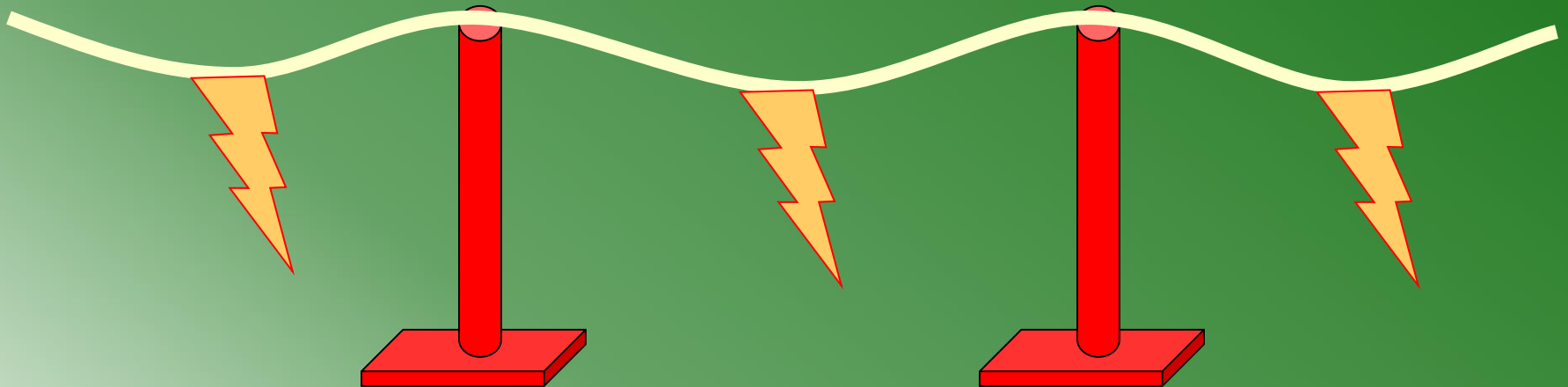
Controlled Access Zones

- Flagged or marked at least every six feet
- 39 to 45 inches high
- 200 pound breaking strength



Controlled Access Zones

- Control line can be used instead of guardrail system along leading edge to protect non-leading edge workers



Safety Monitors

- Must be CP to recognize fall hazards
- Warns employees when:
 - Unaware of hazards
 - Acting in unsafe manner
- Same surface and within sight
- Close enough to be heard
- No other responsibilities



Safety Monitors

- Mechanical equipment not used where safety monitoring system being used.
- Only roofers allowed in area
- Employees must comply with warnings



Covers

- Withstand twice expected load
- Secured
- Marked with '**HOLE**' or '**COVER**'



Falling Objects

- Enough toeboard to protect those below
- 50 pounds strong downward & outward
- At least 3 1/2 inches high

Falling Objects

- Tools & equipment piled higher than toeboard? Use a panel or screen to extend upward to eliminate falling object hazard.

Overhand Bricklaying

- Only bricks and mortar within four feet of edge
- Remove debris at regular intervals



Roofing Work

- No material within six feet of edge unless guardrails
- Materials piled near edge stable and self supporting



Fall

Protection Plans

Fall Protection Plan

- Leading edge work
- Precast concrete
- Residential roofing



Fall Protection Plan

- Prepared by qualified person
- Specific to site
- Changes made by qualified person
- Plan kept at site

Fall Protection Plan

- Implemented by competent person
- Documents why conventional fall protection is infeasible
- Discuss measures used to protect workers



Fall Protection Plan

- Identifies all controlled access zones
- Where no other measures are used a safety monitor must be used
- Identify all CAZ employees
- If an employee falls, review plan to prevent reoccurrence

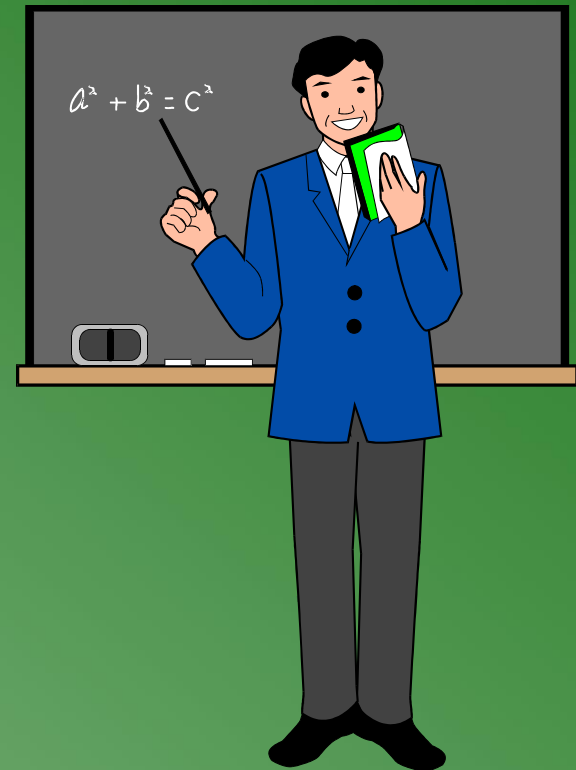
Training

- For each employee who might be exposed to falls
- Trained by competent person
- Covers fall hazards in work area
- Covers procedures for FPS to be used



Training

- The 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 to be used;



Certification

- Training must be certified
- Latest training certification maintained and available!



The End!