

DIOSH Day 2010

Troy M. Sweet
Compliance Officer OSHA
Peoria Area Office

OBJECTIVES

- Background on OSHA
- Identify the fall protection requirements
- Differentiate between fall prevention and fall protection
- Determine compliance of fall protection systems
- Ensure your safety and health efforts address the hazards

The OSHA Mission...

- To assure safe and healthful working conditions for working men and women

OSHA Jurisdiction

- Employer / employee relationship
- OSHA covers employers that have 1 or more employees
- Cover businesses affecting interstate commerce

OSHA is not notified every time and employee is injured.

- OSHA may receive a complaint when an employee is injured, but employers are only obligated to notify OSHA, within 8 hours, of a fatality or catastrophe (3 or more hospitalized).

The OSH Act does not allow inspectors to write “warning tickets”

- OSHA citations are classified based on the hazard identified
- Inspectors are required to address hazards in plain view

OSHA does not have a standard for everything.

- Section 5(a)(1) - general duty clause
- Each employer shall furnish a place of employment free of recognizable hazards that are likely to cause serious physical harm.

Several OSHA standards require a **COMPETENT PERSON**

- Means one who is capable of identifying existing and predictable hazards in the surrounding or working conditions which are unsanitary, hazardous, or dangerous to employees, **AND**
- Who has authorization to take prompt corrective measures to eliminate them

Emphasis Programs

- National Emphasis
 - Excavation/Trenching
 - Amputation hazards
 - Lead exposure
 - Silica exposure
 - **Combustible dust**
- Local Emphasis
 - Fall Hazards
 - Powered Industrial Vehicles

The Steps of Fall Protection?

**Fall
Arrest**



1

**Fall
Prevention**



2

Positioning



3

Retrieval



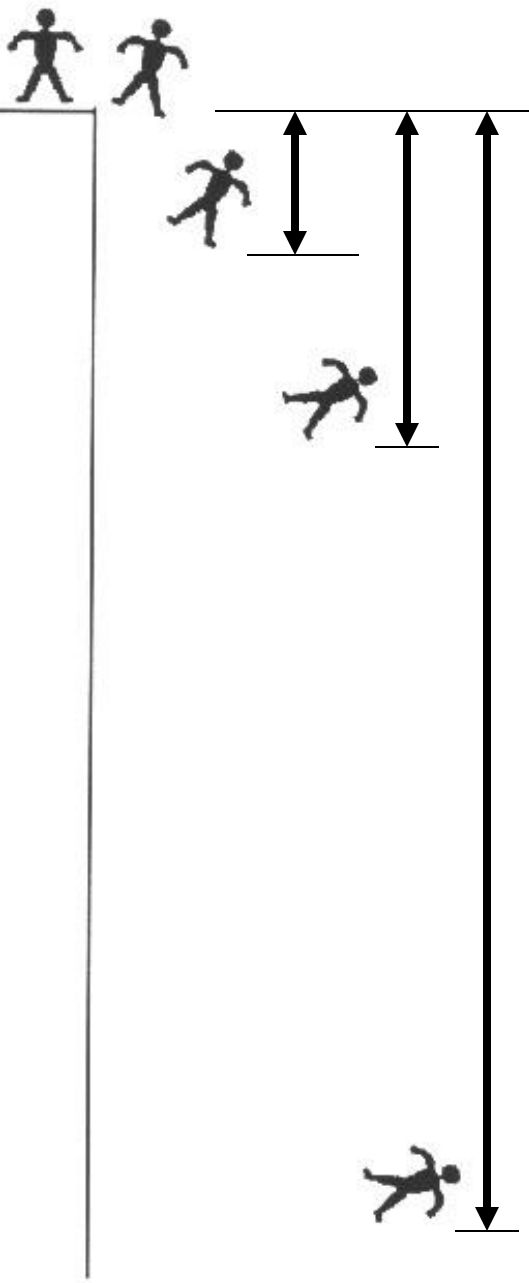
4

- Is this the correct order?

Falls

- **Falls** are the *leading cause of fatalities* in the construction industry.
- An average of *362 fatal falls occurred each year* from 1995 to 2005, with the trend on the increase.

Anatomy of a Fall



.33sec./2 feet

.67 sec./7 feet

1 sec./16 feet

2 sec./64 feet

- It takes most people about 1/3 of a second to become aware.
- It takes another 1/3 of a second for the body to react.
- A body can fall up to 7 feet in 2/3 of a second.

What Is Fall Protection?

- **A series of reasonable steps taken to cause elimination or control of the injurious effects of an unintentional fall while accessing or working at height**

Philosophies of Fall Protection

Stop/Prevent The Fall



Restraint/Positioning

Guardrails

Warning Lines

Controlled Access Zones

Controlled Decking Zones

Safety Monitors



Do these stop/prevent the fall?

Catch The Fall



Fall Arrest

Safety Nets

Catch Platforms

Planning for Fall Protection

- Best practice dictates that fall protection becomes an integral part of the project planning process, from constructability, to systems installation, to use and maintenance
- A project cannot be truly safe unless fall protection is incorporated into every phase of the construction process
- Planning will keep workers safe and minimize liability for all parties involved

Open-sided Work Areas

1910.23

Every open-sided
floor or platform 4
feet or more above
adjacent floor or
ground...

Fall hazards - floor holes & skylight openings

Falls from portable extension ladders

- **Fall protection not required**
-

Scaffold Requirements

1910.28 & 1926.450

- Fall protection at 10 feet
- Safe access (40% of fatalities)
- Daily Inspection
- fully planked - toeboard

Scaffold Fall Protection

- Ends of work platforms must be guarded.

Scaffold Fall Protection

X-braces can
serve as
a top
or mid-rail
BUT NOT BOTH!

Platforms for elevating personnel

- Suitable guardrails
 - 42 inches top rail, midrail and toeboard
- Platform secured
- Platform construction
- *There will be singing & dancing until someone falls*

Aerial Work Platforms

Extendable Boom Aerial Lifts

- Wear fall arrest
- Operators trained on manual instructions

**No fall
arrest
worn**

Ensure the use of fall protection suitable inspections

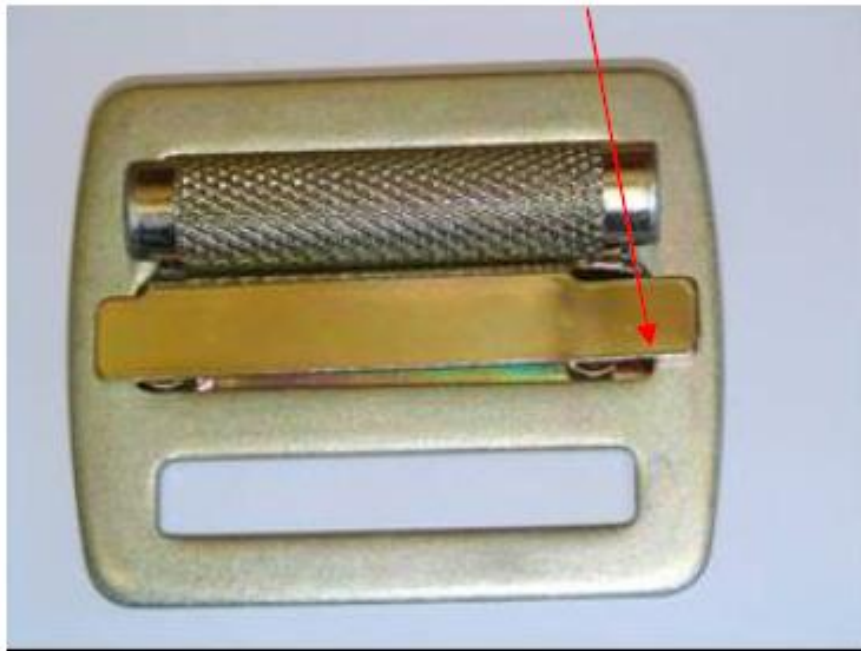
TECHNICAL BULLETIN #C419

INSPECTION AND PROPER OPERATION OF PARACHUTE ADJUSTER BUCKLES

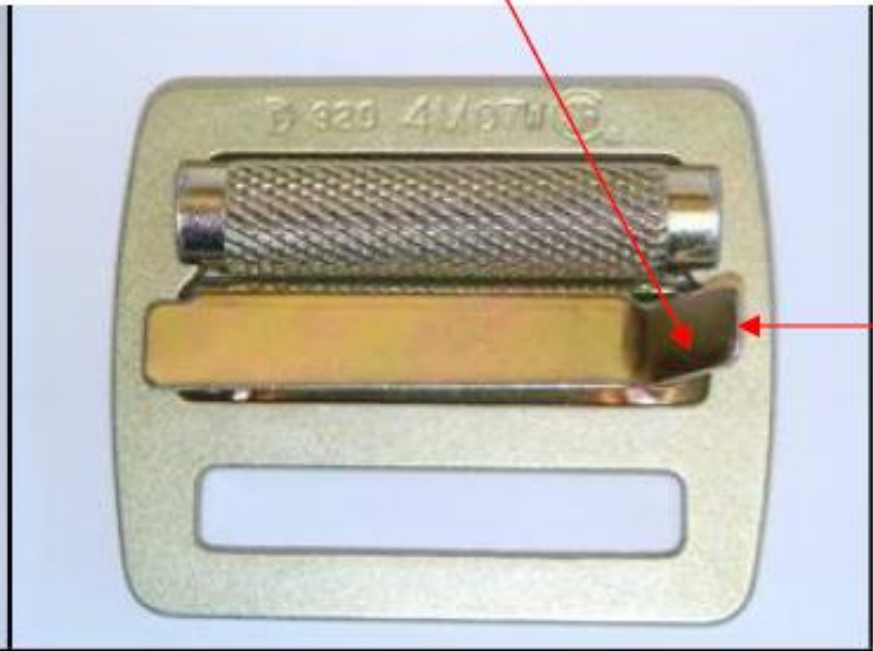
Parachute Adjuster Buckle inspection instructions

1. Inspect the buckle to ensure the slider plate is not bent

✓ Good Slider Plate



✗ Bent Slider Plate

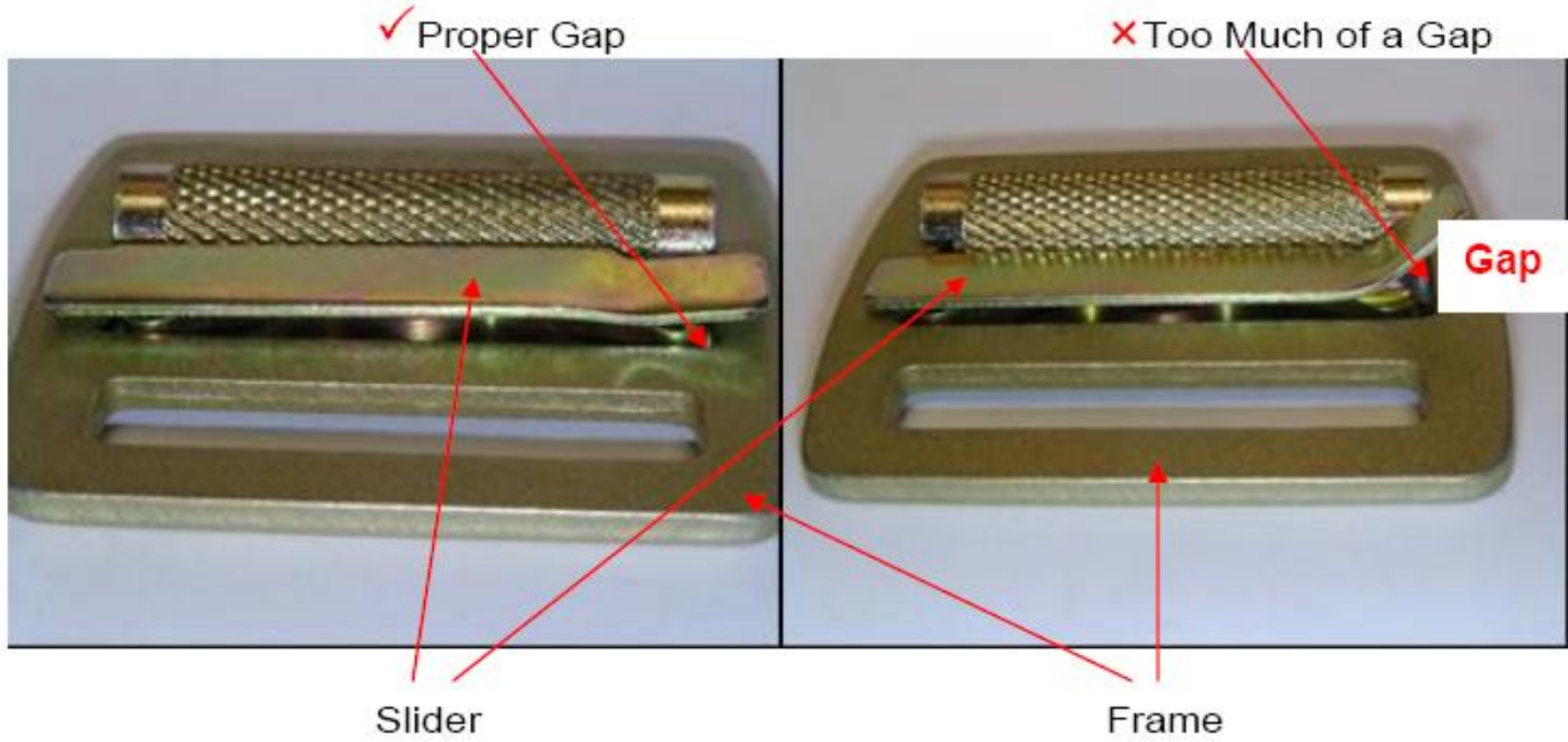


Gap

Strength: Buckle is capable of withstanding a tensile load of 4000 lbs. (17.8Kn) without breaking.

Standards: OSHA 1910.66, OSHA 1926.502, ANSI A10.14-1991, ANSI Z359.1-1992.

- 2. Inspect the slider by turning the buckle and inspecting the gap between the frame and slider



Fall Protection Standard

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

- (a)(1) This subpart sets forth requirements and criteria for fall protection in construction workplaces covered under 29 CFR part 1926.
- Exception: The provisions of this subpart do not apply when employees are 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.

1926.500 (b) Definitions

- "**Hole**" means a gap or void 2 inches (5.1 cm) or more in its least dimension, in a floor, roof, or other walking/working surface.
- "**Infeasible**" means that it is impossible to perform the construction 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

1926.500 (b) Definitions (continued)

- **"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.**
- **"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.

Competent Person

- **1926.32(f): Means one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them.**

Qualified Person

- **1926.32(m): Qualified means one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, the work, or the project.**

1926.501(b) Duty to have fall protection

Duty to have fall protection

- (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."

Duty to have fall protection

- (9) "Overhand bricklaying and related work."
- (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."

Unprotected sides and edges

1926.501(b)(1) Each employee on a walking/working 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.

1926.501(b)(2) "Leading edges."

- Each employee who is constructing a leading edge 6 feet or more above lower levels shall be protected by a **guardrail systems, safety net system, or personal fall arrest systems.**

1926.501(b)(2) "Leading edges."

- **Exception:** When the employer can demonstrate that it is **infeasible or creates a greater hazard** to use these systems, the employer shall develop and implement a fall protection plan which meets the requirements of paragraph (k) of 1926.502.
- **Note:** 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.

1926.501(b)(4) Protection from falling through holes (including skylights)

- Employee fell 16 ft. to his death through skylight
- Fatality accident occurred after an employee cracked a skylight

- Warning lines were erected after the fatality accident and prior to OSHA's arrival at the site

1926.501(b)(4)
falling through holes

1926.501 (b)(5) Formwork and reinforcing steel

1926.501 (b)(6) Ramps, runways, and other walkways

501(b)(7) "Excavations."
Each employee at the edge of an excavation 6 feet (1.8 m) or more in depth shall be protected from falling by guardrail systems, fences, or barricades when the excavations are not readily seen because of plants or other visual barrier

501(b)(9) Overhand bricklaying and related work

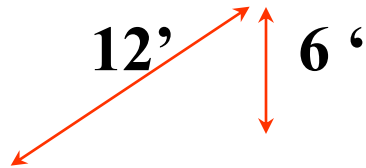
1926.501(b)(10) "Roofing work on Low-slope roofs."

- Each employee engaged in roofing activities on low-slope roofs, with unprotected sides and edges 6 feet (1.8 m) or more above lower levels shall be protected from falling by guardrail systems, safety net systems, personal fall arrest systems, or a combination of warning line system and guardrail system, warning line system and safety net system, or warning line system and personal fall arrest system, or warning line system and safety monitoring system. ***Or, on roofs 50-feet (15.25 m) or less in width (see Appendix A to subpart M of this part), the use of a safety monitoring system alone [i.e. without the warning line system] is permitted.***

Low slope = 4 and 12 pitch

Steep slope = Greater than 4 and 12

Steep slope roof



1926.501(b)(13)
Residential construction
6 feet (1.8 m)

Exception: When the employer can demonstrate that it is infeasible or creates a greater hazard to use these systems, the employer shall develop and implement a fall protection plan which meets the requirements of paragraph (k) of 1926.502.

501(b)(14) "Wall openings."

Each employee working on, at, above, or near wall openings where the outside bottom edge of the wall opening is 6 feet or more above lower levels and the inside bottom edge of the wall opening is less than 39 inches (1.0 m) above the walking/working surface, shall be protected from falling by the use of a guardrail system, a safety net system, or a personal fall arrest system.

(b)(15) "Walking/working surfaces
not otherwise addressed."

1926.502 Fall protection systems criteria and practices.

(a) "General."

(a)(2) Employers shall provide and install all fall protection systems required by this subpart for an employee... before that employee begins the work that necessitates the fall protection.



1926.502 Fall protection systems criteria and practices.

- "Guardrail systems."
- Top edge height of top rails shall be 42 inches (1.1 m) plus or minus 3 inches walking/working level.
- capable of withstanding, without failure, a force of at least 200 pounds

1926.502 Fall protection systems criteria and practices.

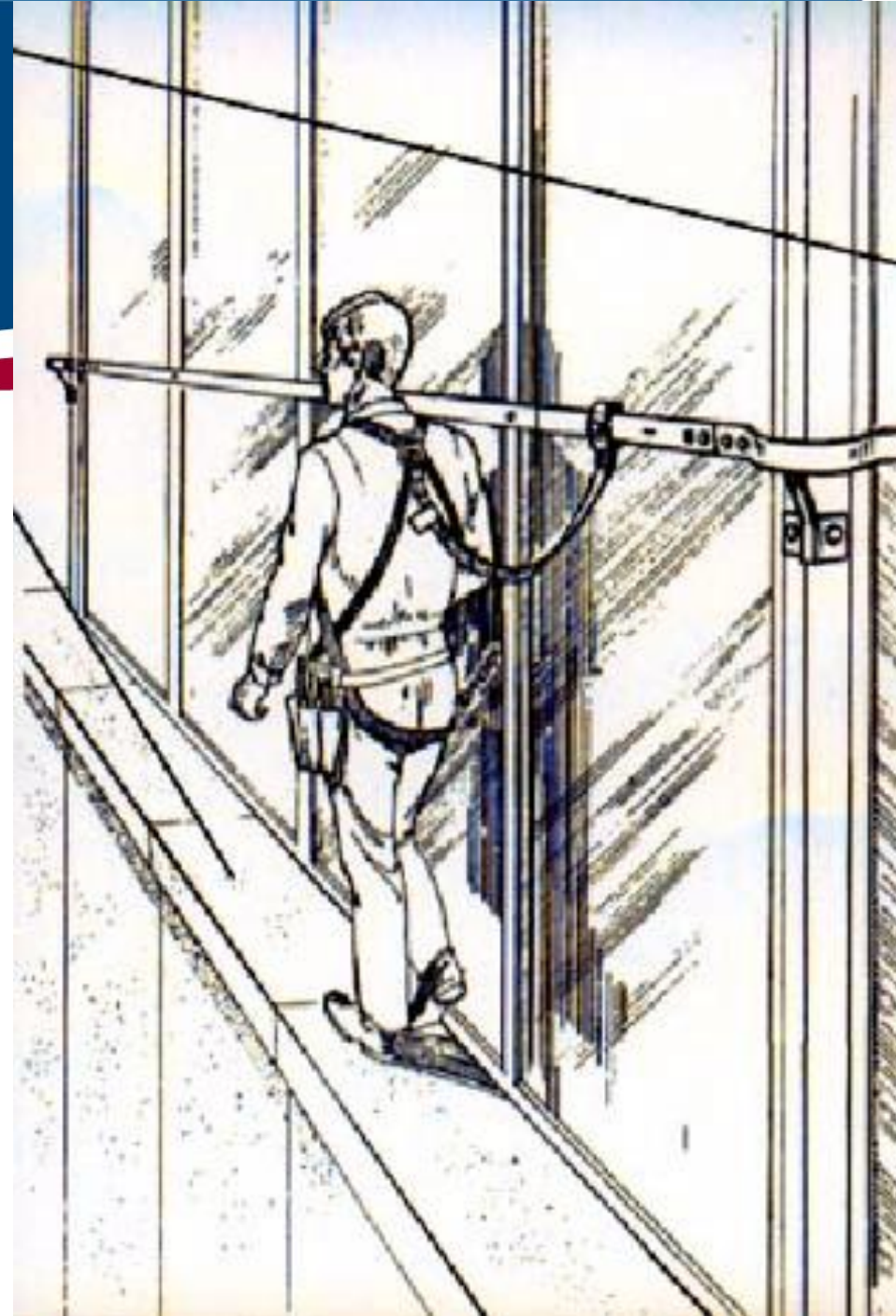
- (c) "Safety net systems."
 - installed as close as practicable under the walking/working surface on which employees are working, but in no case more than 30 feet (9.1 m) below such level. ."

1926.502(d)(8) Horizontal lifelines shall be designed and used under the supervision of a qualified person and maintain a safety factor of 2

1926.502(d)

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.

Lanyards and vertical lifelines shall have a minimum breaking strength of 5,000 pounds (22.2 kN).

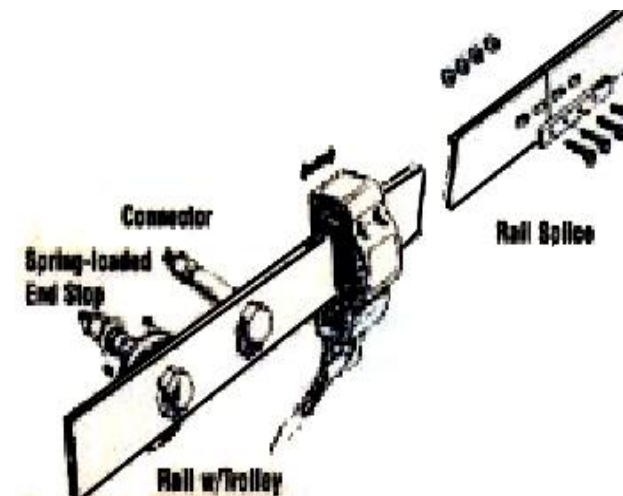
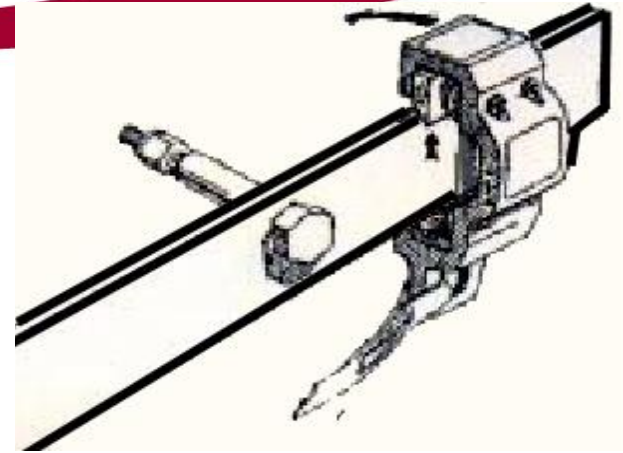


- (d)(5) Snaphooks shall be sized to be compatible with the member to which they are connected to prevent unintentional disengagement.

1926.502 (d) Personal fall arrest systems

- (d)(15) Anchorage's 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, or shall be designed, installed, and used as follows:

- (i) as part of a complete personal fall arrest system which maintains a safety factor of at least two; and
- (ii) under the supervision of a qualified person.



Suitable anchorage point?

(d)(16) Personal fall arrest systems, when stopping a fall, shall:

- (i) limit maximum arresting force on an employee to 900 pounds (4 kN) when used with a body belt;
- (ii) limit maximum arresting force on an employee to 1,800 pounds (8 kN) when used with a body harness;
- (iii) be rigged such that an employee can neither free fall more than 6 feet (1.8 m), nor contact any lower level;
- iv) bring an employee to a complete stop and limit maximum deceleration distance an employee travels to 3.5 feet (1.07
- (v) have sufficient strength to withstand twice the potential impact energy of an employee free falling a distance of 6 feet (1.8 m), or the free fall distance permitted by the system, whichever is less.

1926.502 (d) *Personal fall arrest systems*

- (d)(17) The attachment point of the body harness shall be located in the center of the wearer's back near shoulder level, or above the wearer's head.
- (d)(20) The employer shall provide for prompt rescue of employees in the event of a fall or shall assure that employees are able to rescue themselves.
- (d)(21) Personal fall arrest systems shall be inspected prior to each use for wear, damage and other deterioration, and defective components shall be removed from service.

Fall protection systems criteria and practices.

- (g) Controlled access zones
- (h) Safety monitoring systems
- (i) Covers
- (j) Protection from falling objects
- (k) "Fall protection plan."

1926.502(k) "Fall protection plan."

- This option is available only to employees engaged in **leading edge work, precast concrete erection work, or residential construction work** (See 1926.501(b)(2), (b)(12), and (b)(13)) who can demonstrate that it is infeasible or it creates a greater hazard to use conventional fall protection equipment. The fall protection plan must conform to the following provisions.
- **(k)(1)** The fall protection plan shall be prepared by a qualified person and developed specifically for the site where the leading edge work, precast concrete work, or residential construction work is being performed and the plan must be maintained up to date.

1926.502(k) "Fall protection plan."

- **(k)(2)** Any changes to the fall protection plan shall be approved by a qualified person.
- **(k)(3)** A copy of the fall protection plan with all approved changes shall be maintained at the job site.
- **(k)(4)** The implementation of the fall protection plan shall be under the supervision of a competent person.
- **(k)(5)** The fall protection plan shall document the reasons why the use of conventional fall protection systems (guardrail systems, personal fall arrest systems, or safety nets systems) are infeasible or why their use would create a greater hazard.

1926.502(k) "Fall protection plan."

- **(k)(6)** The fall protection plan shall include a written discussion of other measures that will be taken to reduce or eliminate the fall hazard for workers who cannot be provided with protection from the conventional fall protection systems. For example, the employer shall discuss the extent to which scaffolds, ladders, or vehicle mounted work platforms can be used to provide a safer working surface and thereby reduce the hazard of falling.
- **(k)(7)** The fall protection plan shall identify each location where conventional fall protection methods cannot be used. These locations shall then be classified as controlled access zones and the employer must comply with the criteria in paragraph (g) of this section.
- **(k)(8)** Where no other alternative measure has been implemented, the employer shall implement a safety monitoring system in conformance with 1926.502(h).

1926.502(k) "Fall protection plan."

- **(k)(9)** The fall protection plan must include a statement which provides the name or other method of identification for each employee who is designated to work in controlled access zones. No other employees may enter controlled access zones.
- **(k)(10)** In the event an employee falls, or some other related, serious incident occurs, (e.g., a near miss) the employer shall investigate the circumstances of the fall or other incident to determine if the fall protection plan needs to be changed (e.g. new practices, procedures, or training) and shall implement those changes to prevent similar types of falls or incidents.

1926.503 Training requirements.

- Training
- Certification
- Re-training

1926.503 Training requirements.

- The nature of fall hazards in the work area
- 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, safety net systems, warning line systems, safety monitoring systems, controlled access zones, and other protection to be used
- The role of each employee in the safety monitoring system when this system is used

1926.503 Training requirements.

- The limitations on the use of mechanical equipment during the performance of roofing work on low-sloped roofs
- The correct procedures for the handling and storage of equipment and materials and the erection of overhead protection
- The role of employees in fall protection plans
- The standards contained in this subpart

Controlling Fall Exposures

- Select fall protection/prevention systems appropriate for given situations.
- Proper installation of safety systems.
- Train workers in the proper selection, use, and maintenance of fall protection/prevention systems
- Ensure employees use safe work procedures

Personal Fall Arrest Systems

- Anchorage
- Body
- Connector



Lanyards



Harnesses



Beam Wraps



Caribiners

Rope Grabs

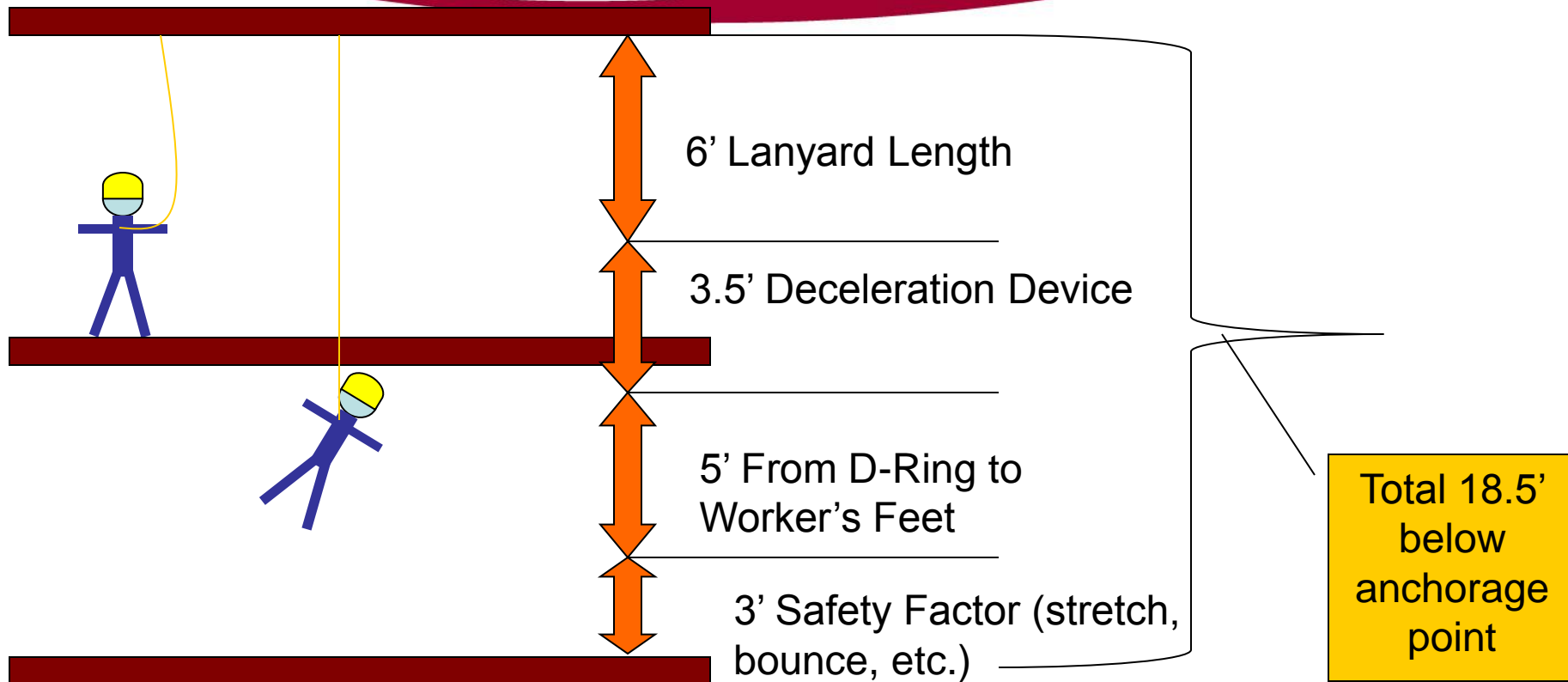


OSHA
Positioning

Primary concerns when setting up fall protection systems

- Impact Force to the Body Less Than 1800# (with a harness)
- Maximum 6' Free Fall Distance
- May Not Hit Structures Below
- Maximum Weight of Individual w/Tools of 310 pounds

Below (Total Fall Distance)



All distances are approximate, and shown for illustration only. This is why it is critical to maintain the safety factor distance.

Anchorage

- Must support 5000# per employee attached,
 - Or as part of a complete personal fall arrest system which maintains a safety factor of at least two
 - Or 3000# when using fall restraint or a Self-Retracting Lifeline (SRL, Retractable, or “yo-yo”) which limits free fall distance to 2 feet
- Should always be at or above D-ring height

Roof & Deck Anchors



**Permanent
Anchors**



**Wood Roof
Anchor**



**Metal Roof
Anchor**

Use of Eye Bolts

- Rated for loading parallel to the bolt axis.
- If wall mounted, the rating perpendicular to the axis must be good for 5,000 lbs. per employee



Rated



Needed

Horizontal Life Lines

- **Provide maneuverability.**
- **Must be designed, installed and used under the guidance of a qualified person**

Body (Harnesses)

- Need to be inspected frequently (daily before use by the worker, at least monthly by a Competent Person)
- Should never be modified
- Should be taken out of service immediately if defective or exposed to an impact

Harness Fitting

Chest strap tightened
at mid chest

Proper snugness
shoulder to hips

Leg straps snug but
not binding



“D” ring between
shoulder blades

Butt strap
supports the load



- Harness must be sized for the worker

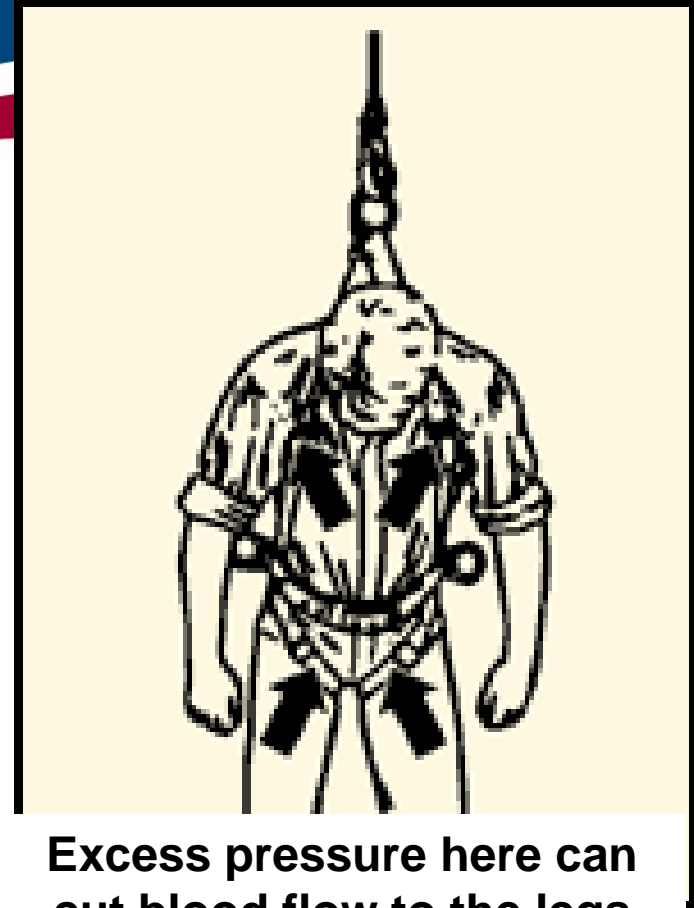
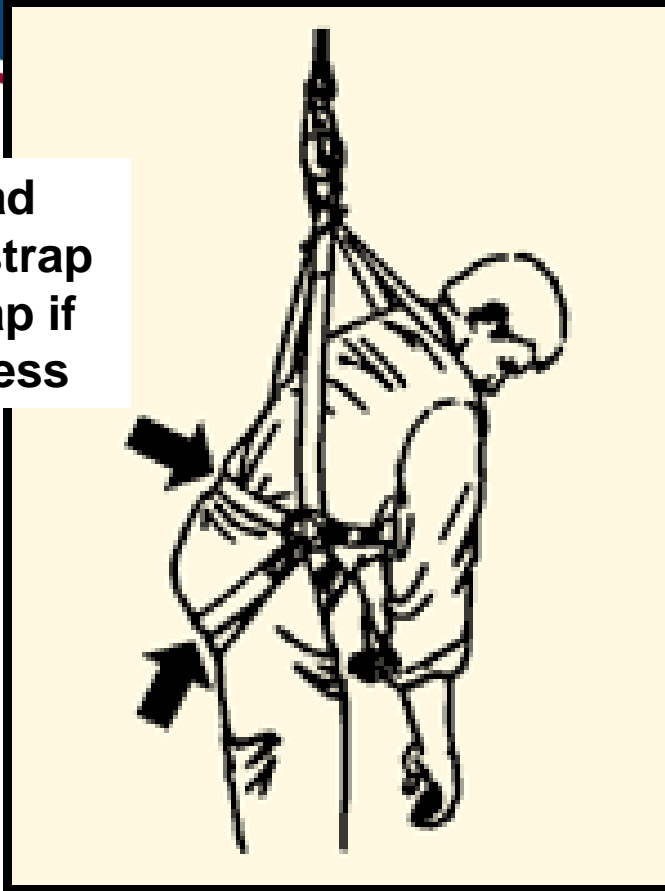
Proper Adjustment Is Key

Be able to reach your D-ring with your thumb

- Maximum Four (flat) Fingers of Slack at the legs, straps as high as comfortably possible
- Ensure chest strap is across the chest/breastbone
- Have a buddy double check for twists, etc...

Harness Pressure Points

**Spread load
across butt strap
and belt strap if
on the harness**



**Excess pressure here can
cut blood flow to the legs**

Some studies have indicated permanent damage to the lower extremities when the worker hangs for more than 20 minutes

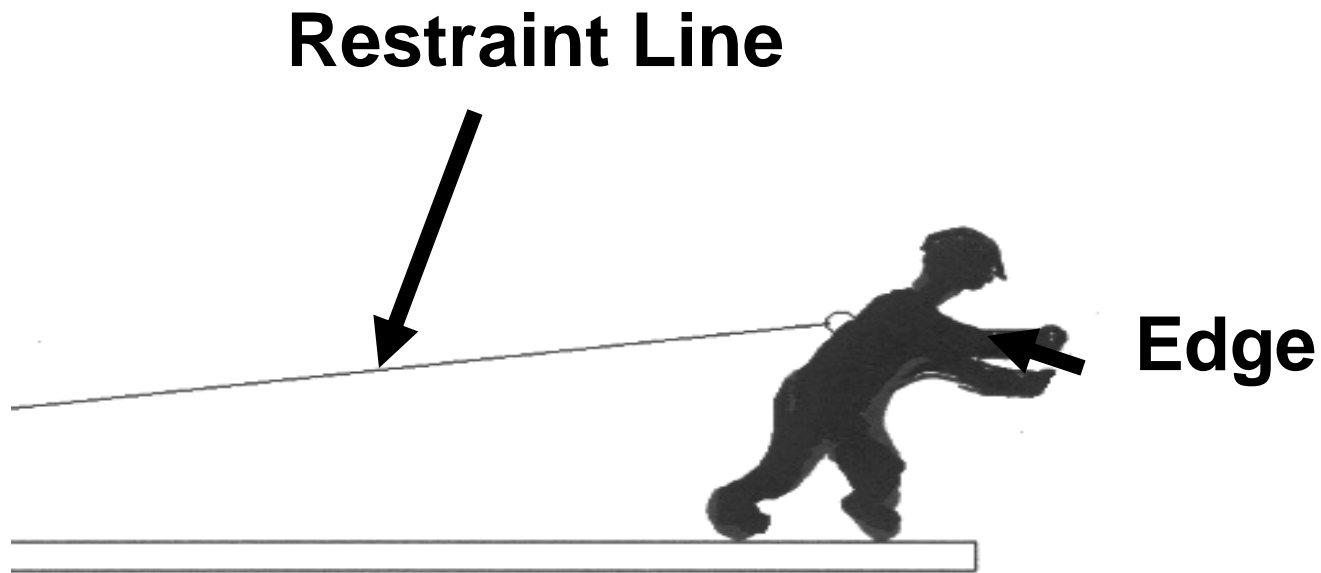
Retractable Lifelines

- Very effective for vertical applications.
- Will normally lock up in 1 –2 feet, minimizing total fall distance and impact forces on the worker's body

Do Not Hook Lanyards to Re-tractable devices

- This worker is hooked to a retractable lifeline with his lanyard.
- The retractable should be attached directly to the “D” ring.

Fall Restraint



- **Fall restraint assures worker cannot reach the edge.**

Restraint Devices

- Provides access but will prevent falls
- Limit anchorage requirement to 3000 pounds
- May be more suitable for loading areas, scaffold erection and dismantling
- Should be installed and used under the supervision of a Competent Person

Use of Restraint Cables

Example of restraint cables used during deck anchoring.



Define “Adequate” training

Training

- By a “qualified” or “competent” person
- The nature of hazards
- Appropriate systems and use
- Understand the limitations
- Evaluation
- Documentation

Planning for Fall Protection

- Best practice dictates that fall protection becomes an integral part of the project planning process, from constructability, to systems installation, to use and maintenance
- A project cannot be truly safe unless fall protection is incorporated into every phase of the construction process
- Planning will keep workers safe and minimize liability for all parties involved

Fall Protection Alternatives to 1926.501(b)(13): Directive STD 3-0.1A

Directives

STD 03-00-001 - STD 3-0.1A - Plain Language Revision of OSHA Instruction STD 3.1, Interim Fall Protection Compliance Guidelines for Residential Construction

← Directives - Table of Contents

| | |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| • Record Type: | Instruction |
| • Directive Number: | STD 03-00-001 |
| • Old Directive Number: | STD 3-0.1A |
| • Title: | Plain Language Revision of OSHA Instruction STD 3.1, Interim Fall Protection Compliance Guidelines for Residential Construction |
| • Information Date: | 06/18/1999 |
| • Standard Number: | 1926 |



U.S. DEPARTMENT OF LABOR

Occupational Safety and Health Administration

Group I

- Floor Joists
- Floor Sheathing
- Roof Sheathing
- Erecting Exterior Walls
- Setting & Bracing Roof Trusses & Rafters



Fall Protection Plan

- Example: Subpart M, Appendix E
 - Safest Procedures for Fall Protection
 - All employees trained
 - Competent Person to implement the Plan
 - Qualified Person to approve changes to the Plan
 - Supervision to correct unsafe practices
- Controlled Access Zone
 - Boundaries
 - Monitor
 - Restricted Access
 - Final Check
- Plan Enforcement
- Accident Investigation
- Plan Review

Truss/Rafter Erection

Up to 8' Walls: Use scaffolding on interior of wall

**Walls over 8': Use Scaffolding or Ladders
OR**

Designated, Trained

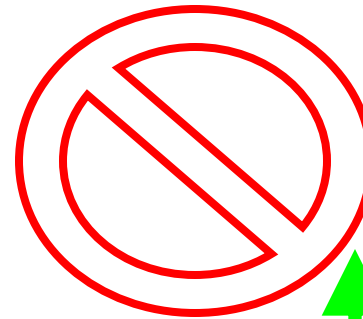
Restricted Access of Others

Trusses braced before used for support

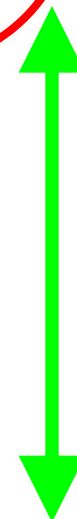
No other duties during process

1ST two trusses set from ladders; After first trusses set, climb ladder to INTERIOR top plate to secure peaks

Remain on INTERIOR top plate use previously stabilized trusses as support



12'



Working at the Peak

1926.501(b)(1) or 1926.501(b)(13)

Detaching trusses from cranes or securing trusses. May be stationed on top of ridge beam IF only feasible way to secure rafters

Stable Work Position

When at the peak, web of trusses, or top of ridge beam work from stable position. Sit on a ridge seat or position previously stabilized trusses and lean into/reach through, the trusses

Fall Hazard Exposure.

Must not remain on or in the peak/ridge any longer than necessary to complete the task safely

Floor Sheathing

1926.501(b)(1) or 1926.501(b)(13)

Installation of Floor Sheathing.

1st row of floor sheathing installed from ground, ladders, or scaffolds.

Following rows of sheathing, work from the established deck.

Residential Roofing Safety

Roof Sheathing Operations

- Slide Guards on the bottom row
 - 2 x 4's 90 Degrees to face of sheathing
- Roof Pitch up to and including 9 in 12 Slide guards are required every 13 feet
- Roof Pitch OVER 9 in 12 slide guards are required every 4 feet



No slide guards being used

Requirements

- Roof Pitch Up to 4:12 – safety monitor or 1 slide guard at the eave
- Roof Pitch Greater than 4:12 up to and including 6:12 - 1 slide guard at the eave
- Roof Pitch Greater than 6:12 up to and including 8:12 - 1 slide guard at the eave and slide guards every 8 feet
 - ***Note: Slide guards for roofing work are 2 x 6's 90 Degrees to the face of the roof***

Requirements

- Roof pitches over 8/12 and/or an eave height over 25 feet –
Some type of fall protection has to be used:
 - Harness and Lanyard
 - Guardrails
 - Safety Netting



• Questions?

Troy M. Sweet
Compliance Officer
Peoria Area Office
T 309.589.7033
tsweet@dol.gov