NORTH CAROLINA
Department of Transportation









# Fall Protection Awareness

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# Introduction

The Bureau of Labor Statistics indicated slips, trips, and falls accounted for **227,760** nonfatal injuries in 2017.

**818** Fall Fatalities in 2014

**800** Fall Fatalities in 2015

**849** Fall Fatalities in 2016

**887** Fall Fatalities in 2017

# Introduction

381 of the 971 total deaths in Construction in 2017 were due to Falls (39.2%)

OSHA Top 10 Most Frequently Cited 2018

#1 Fall Protection - 29 CFR 1926.501

Area of focus?...


Nearly

**1 in 4**

**FATAL FALLS**

in construction involve

**LADDERS**

**BLS data 2015**

# Fatal Falls on NCDOT Projects

- Manns Harbor – April 2010
  - Sub contractor fell into water
- New Bern – June 2016
  - Sub contractor fell.
  - Rescued using crane.
- Hickory – August 2016
  - Sub contractor fell from bridge into water.
- Asheboro – March 2017
  - Sub contractor fell from bridge.

# Plan to Fall

# Objectives

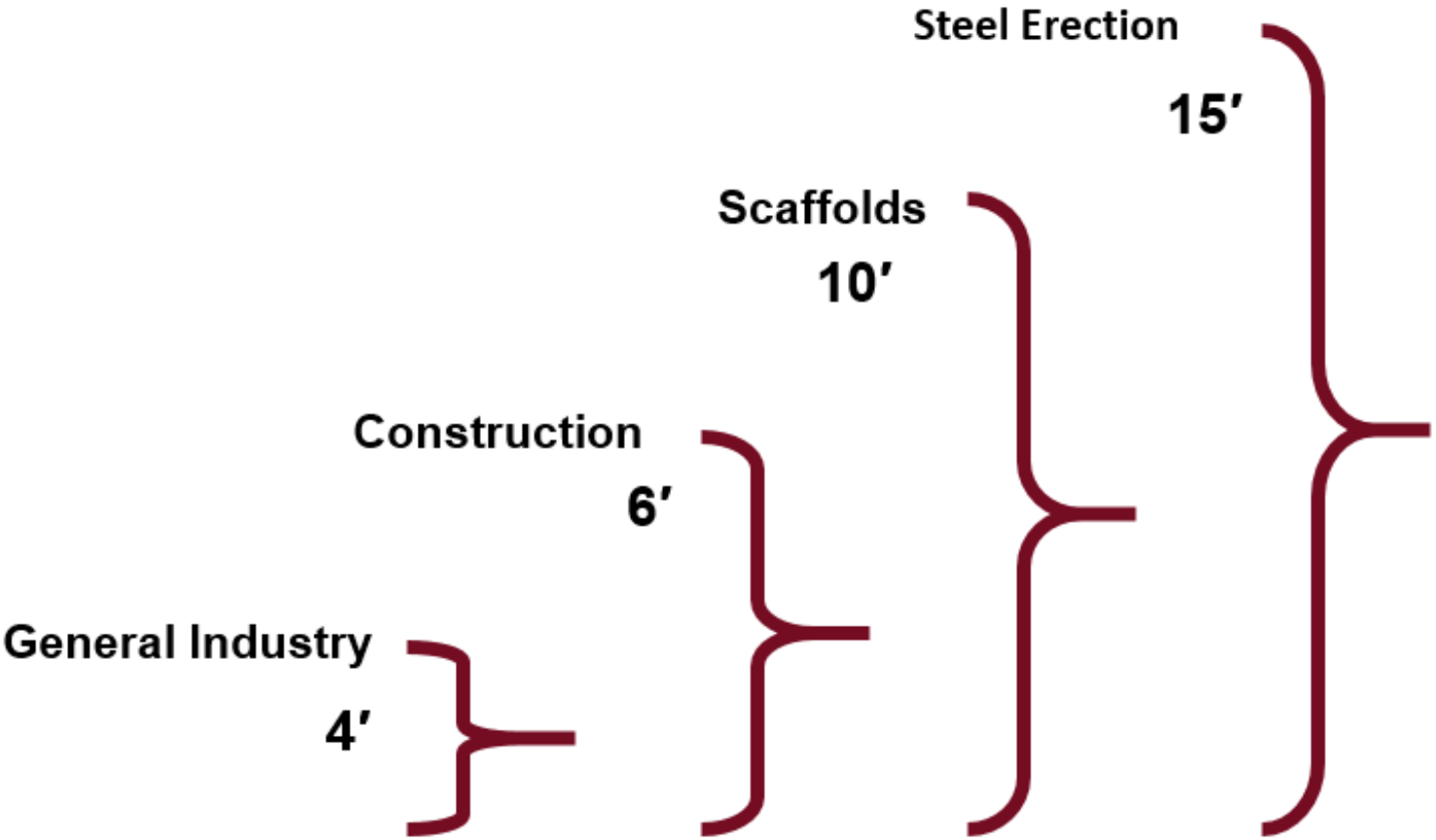
At the completion of this course, the participants will be able to discuss and demonstrate the following topics:

- Fall hazard recognition and assessment
- Hierarchy of Fall Controls
- Selection, application, use, inspection, maintenance, and storage of fall protection equipment
- ABC's of Fall Protection PPE
- Prevention vs. Restraint vs. Arrest

# Fall Protection Standards

- **ANSI Z359 Fall Protection**
- **OSHA Construction 1926 Subpart M - Fall Protection**
  - 1926.500 - Scope, application, and definitions applicable to this subpart.
  - 1926.501 - Duty to have fall protection.
  - 1926.502 - Fall protection systems criteria and practices.
  - 1926.503 - Training requirements.
- **OSHA General Industry**
  - 1910.140 - Personal fall protection systems.
- **Manufacturers Recommendations**
  - PPE, anchors, aerial/scissor lifts, Hydra Platform, etc.

# When Is Fall Protection Required?



# Safety Culture

Each employee has the responsibility for their own safety as well as their co-workers.

Never sacrifice personal safety for production.

Report any concerns or issues to supervision and/or management.

NCD0T

# Authorized User

1. Reasons for fall protection.

2. Fall protection equipment selection and hierarchy of controls.

3. Inspection of fall protection equipment.

4. Proper use, inspect, maintenance, storage, and care of fall protection equipment.

5. ABCD's: Anchor, Body Harness, Connecting Device, & Descent/Rescue.

7. Differences of Fall Prevention, Fall Restraint, & Fall Arrest.

# Competent Person

- Designated by the employer
- Responsible for
  - Immediate supervision
  - Implementation
  - Monitoring of the employer's Fall Protection
- Trained & Knowledgeable in Fall Protection
- Capable of identifying, evaluating, and addressing existing and potential fall hazards
- Has **authority** to take prompt corrective action.

# Qualified Person

- One with a recognized degree or professional certificate, i.e. Engineer, PE, CSP
- Possesses extensive knowledge ***and*** experience in the subject field, Fall Protection.
- Capable of design, analysis, evaluation and specifications in Fall Protection work, project, or product.

# Bridge Damage

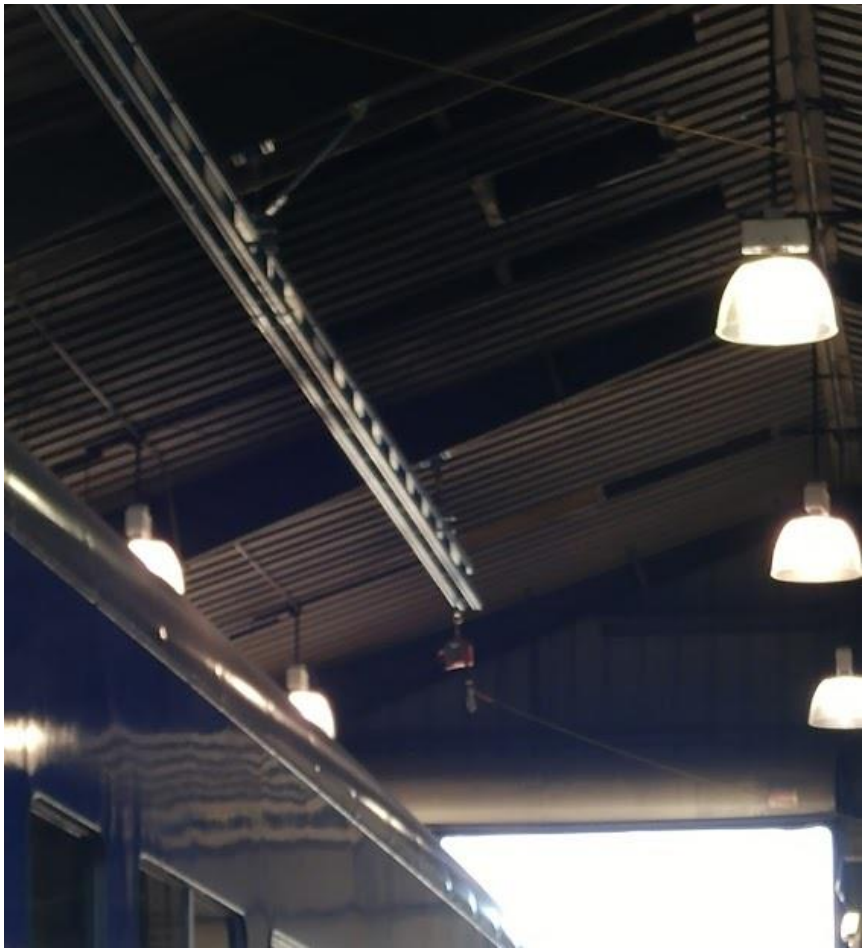
# Bridge Work

# Tank Sounding

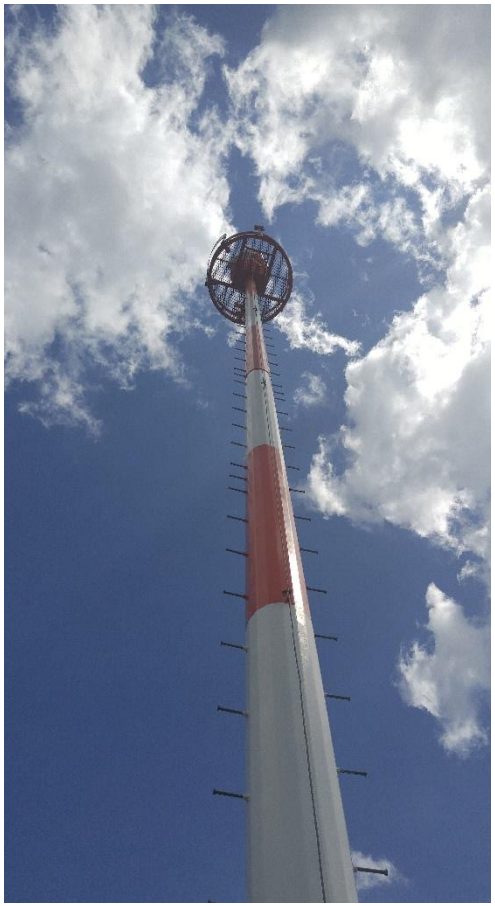
# Truck Wash Station

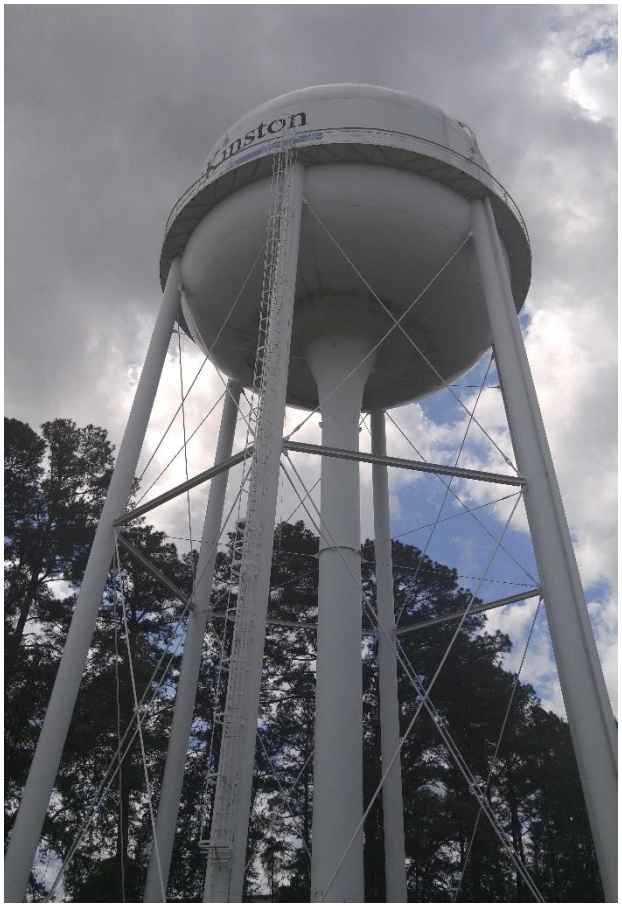
# Railroad Trestle Work

# Rail Maintenance



# Fixed Ladders



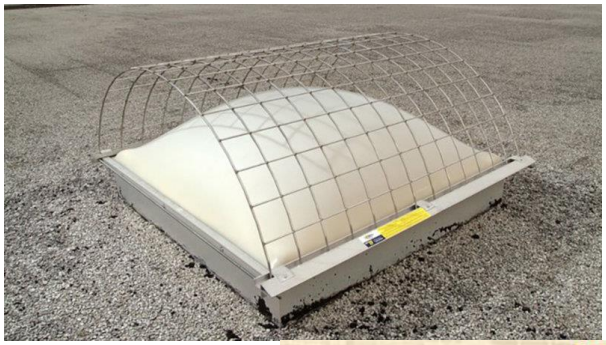


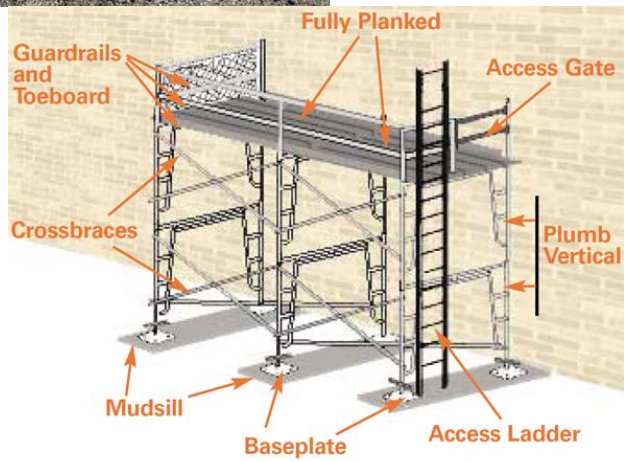
# Fall Hazard Analysis

- Your employer is ultimately responsible for determining the appropriate fall protection method or system.
- Employers now have more fall protection options under the final Walking-Working Surfaces rule.

# Potential Hazards

- Unprotected roof edges and skylights
- Leading edge work
- Mobile Elevating Work Platforms (MEWP)
- Scaffolding
- Ladders
- Steel erection

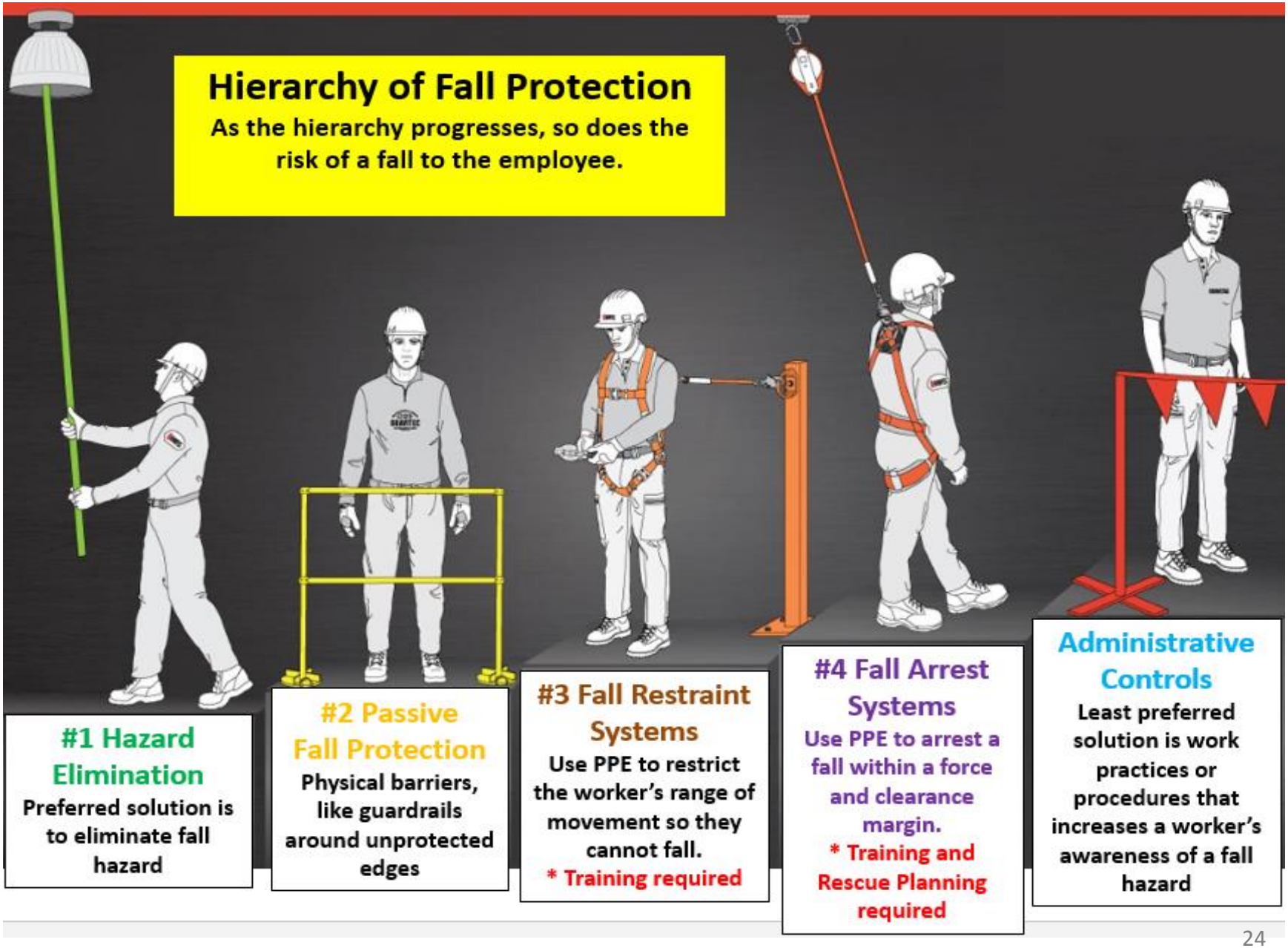





Eliminate the risk


Guard the hazard


Protect the worker


Hierarchy of Fall Protection
As the hierarchy progresses, so does the risk of a fall to the employee.
#1 Hazard Elimination
Preferred solution is to eliminate fall hazard
#2 Passive Fall Protection
Physical barriers, like guardrails around unprotected edges
#3 Fall Restraint Systems
Use PPE to restrict the worker's range of movement so they cannot fall.
* Training required
#4 Fall Arrest Systems
Use PPE to arrest a fall within a force and clearance margin.
* Training and Rescue Planning required
Administrative Controls
Least preferred solution is work practices or procedures that increases a worker's awareness of a fall hazard

# Elimination

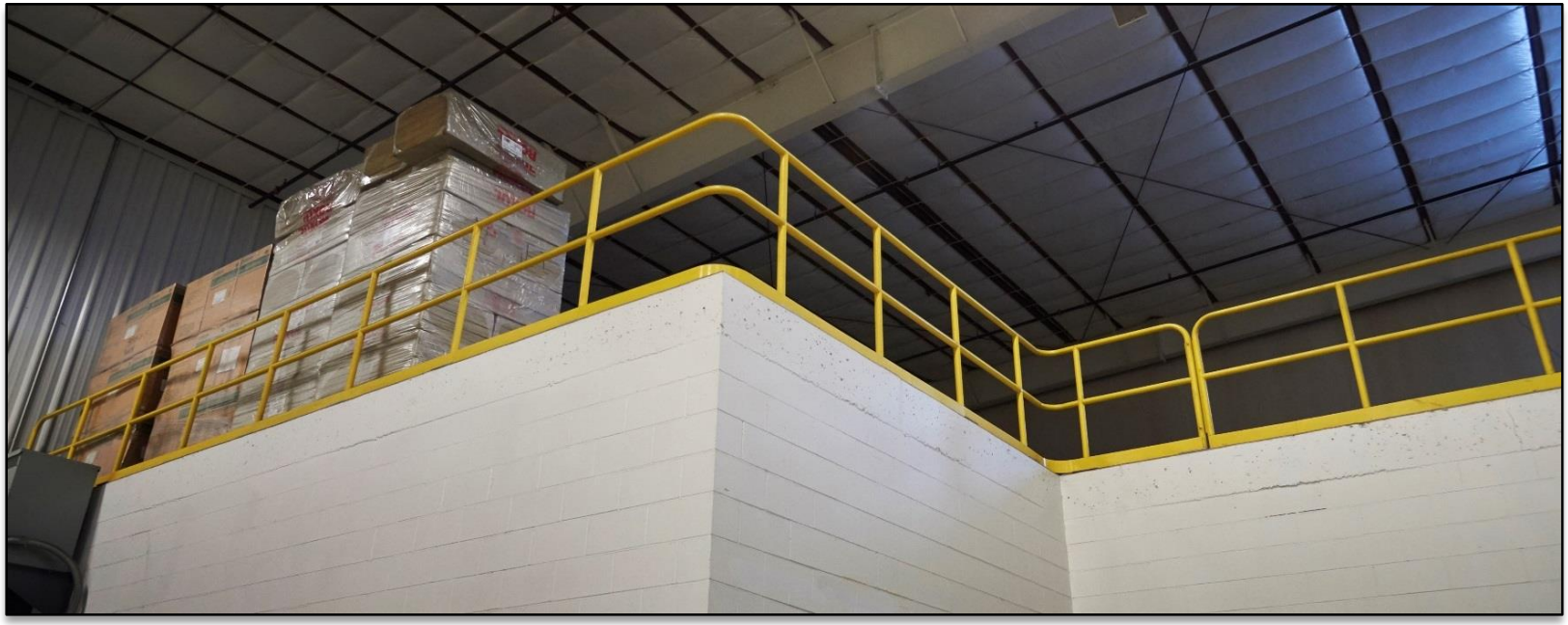
# Reduction

# Engineering

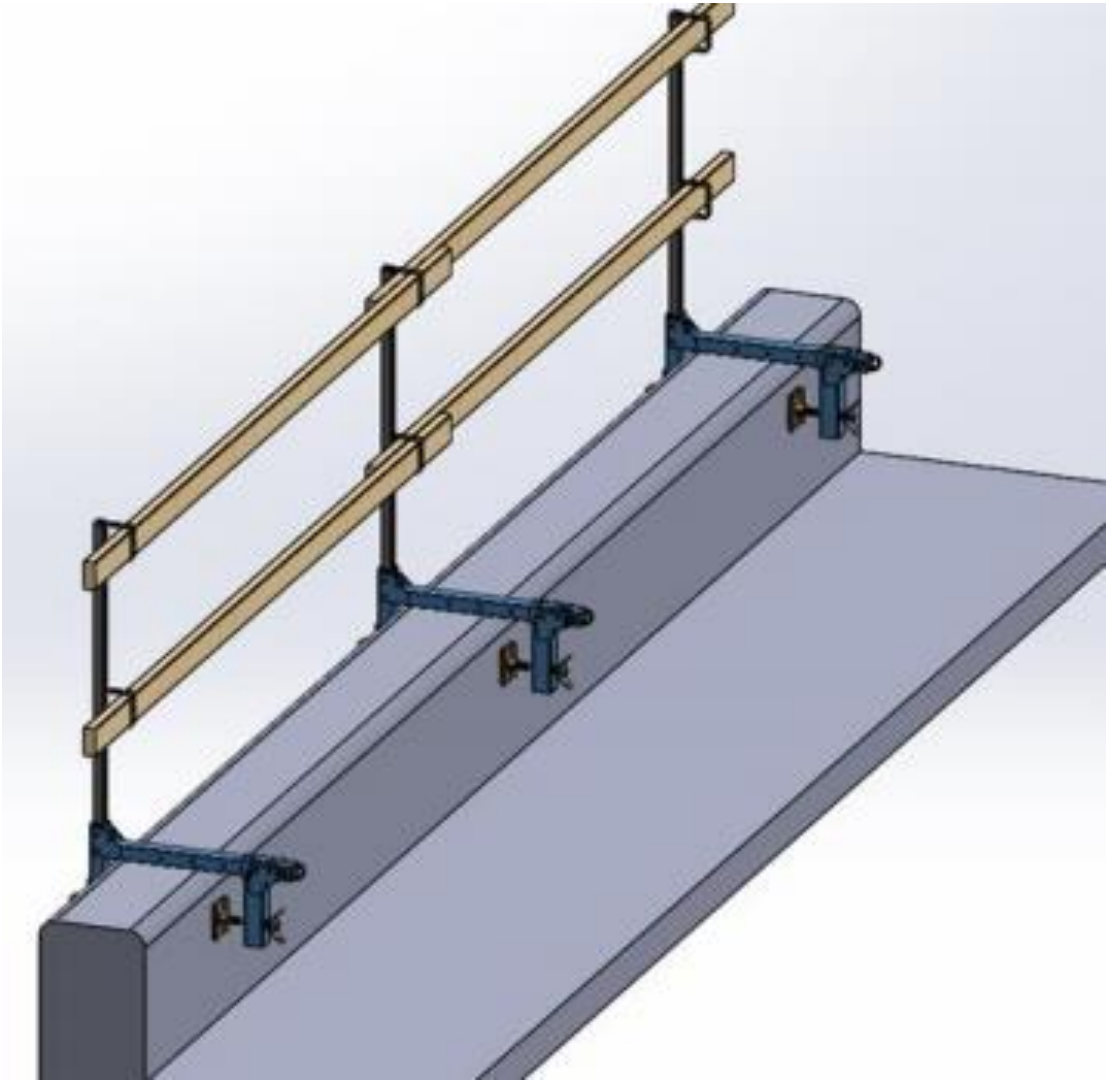
## Guardrail Systems

# Guardrail Systems

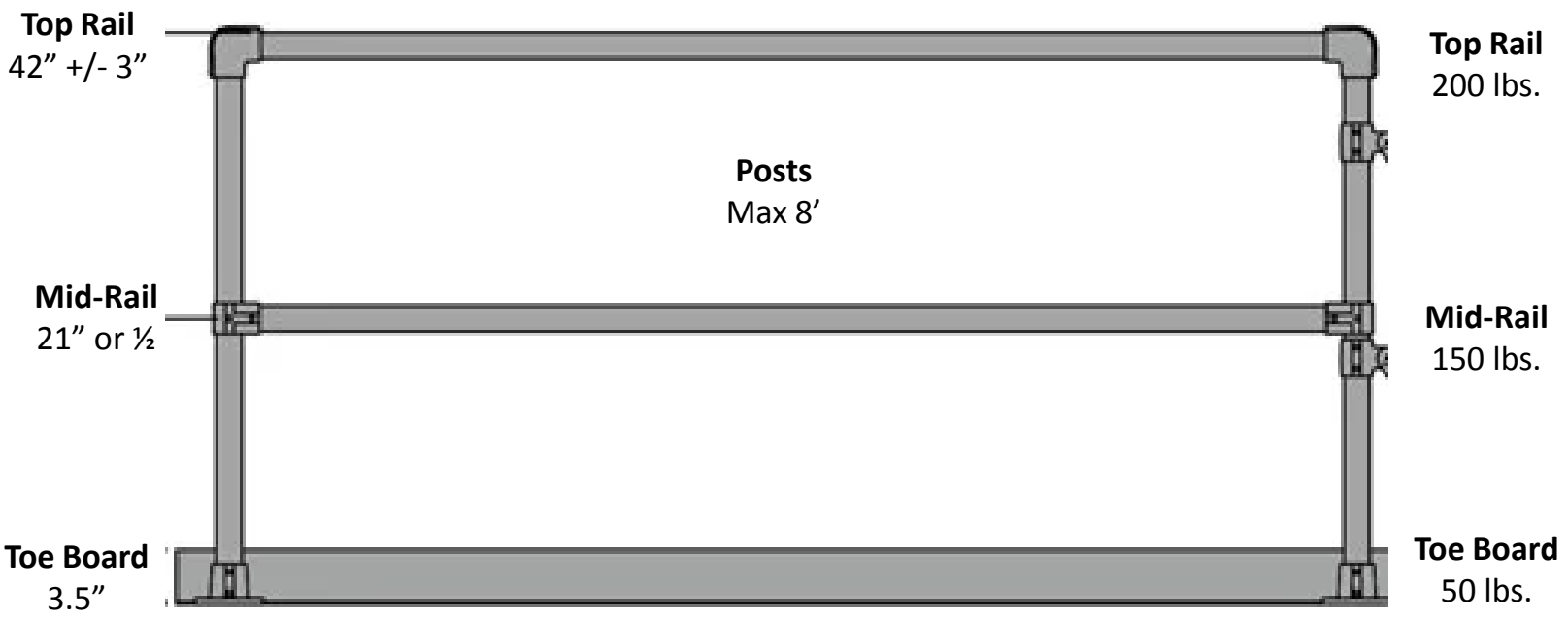
Physical barrier used along an unprotected or exposed side, edge, or other area of a walking-working surface to prevent workers from falling to a lower level.



# Temporary Bridge Guardrail



# Guardrail Requirements

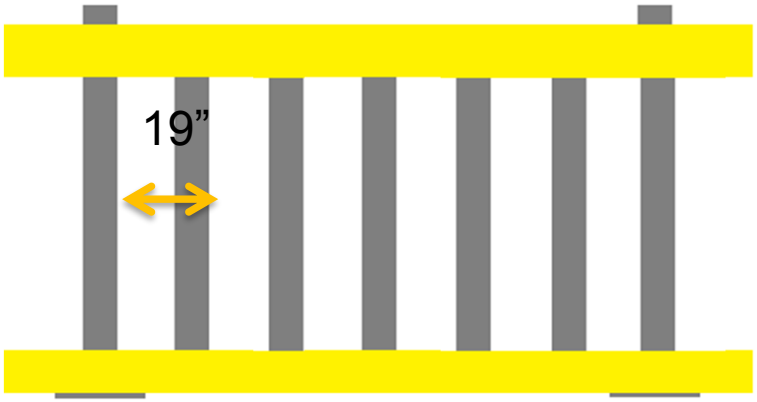


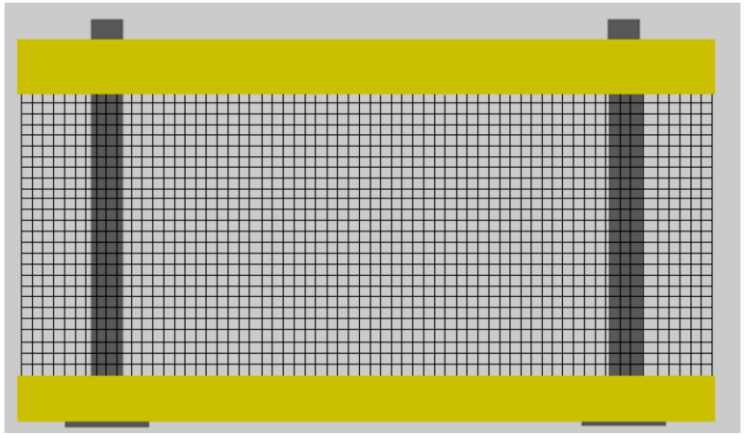
# Guardrail Systems

- Constructed with smooth-surfaced materials to prevent punctures, laceration and snagging of clothing.
- The ends of top rails and midrails do not overhang the terminal posts.
- Rails made be constructed of:
  - Wood, 2” x 4”
  - Steel pipe, diameter of 1.5”
  - Wire Cable, not less than .25”
- Steel or plastic banding is not to be used for rails.

# Mid-Rail

- Installed midway between top rail and working level
- May use screens, mesh or balusters instead of mid rail – must withstand 150 lbs of force
- Screens & mesh run all along entire opening
  - Balusters (vertical rails, not more than 19 ” apart)



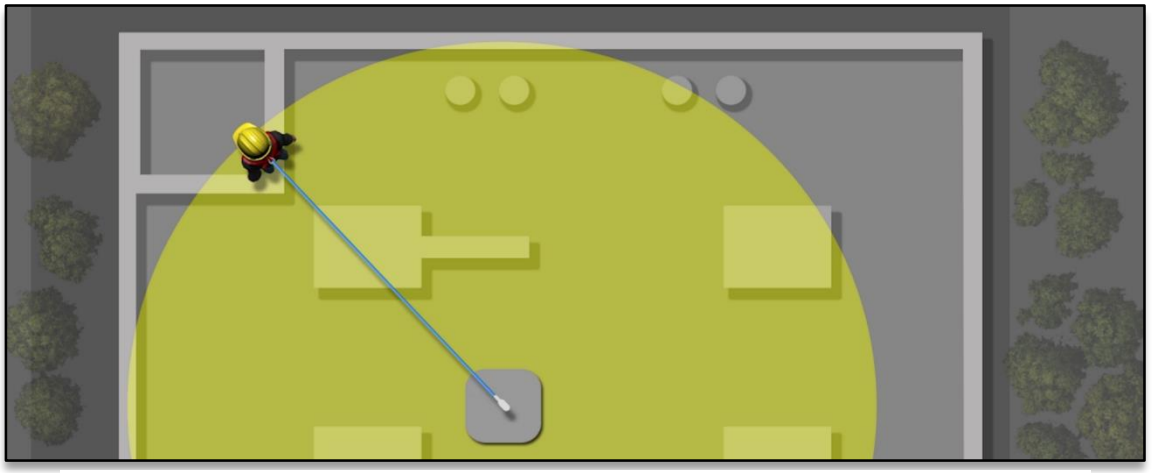



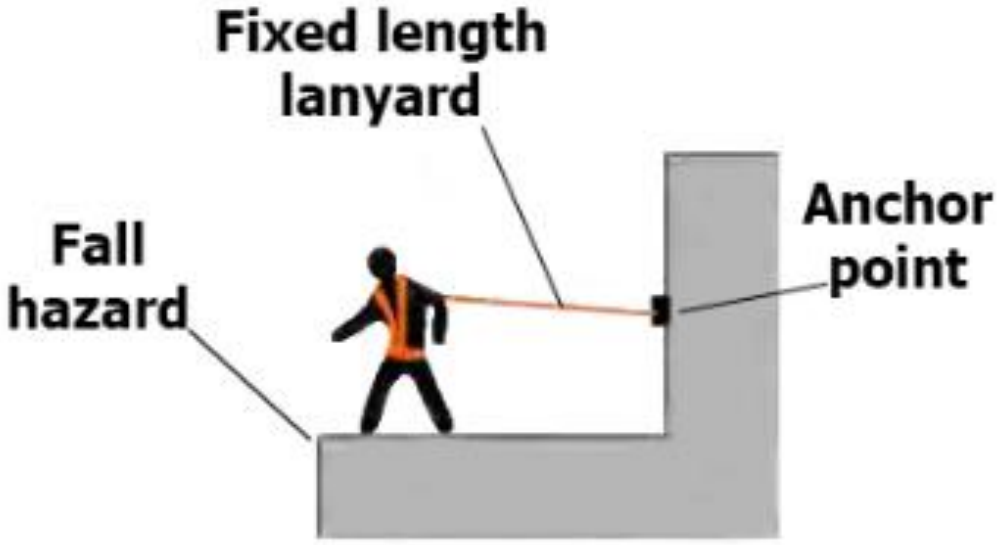
# Fall Protection PPE


KREUTZBERGER

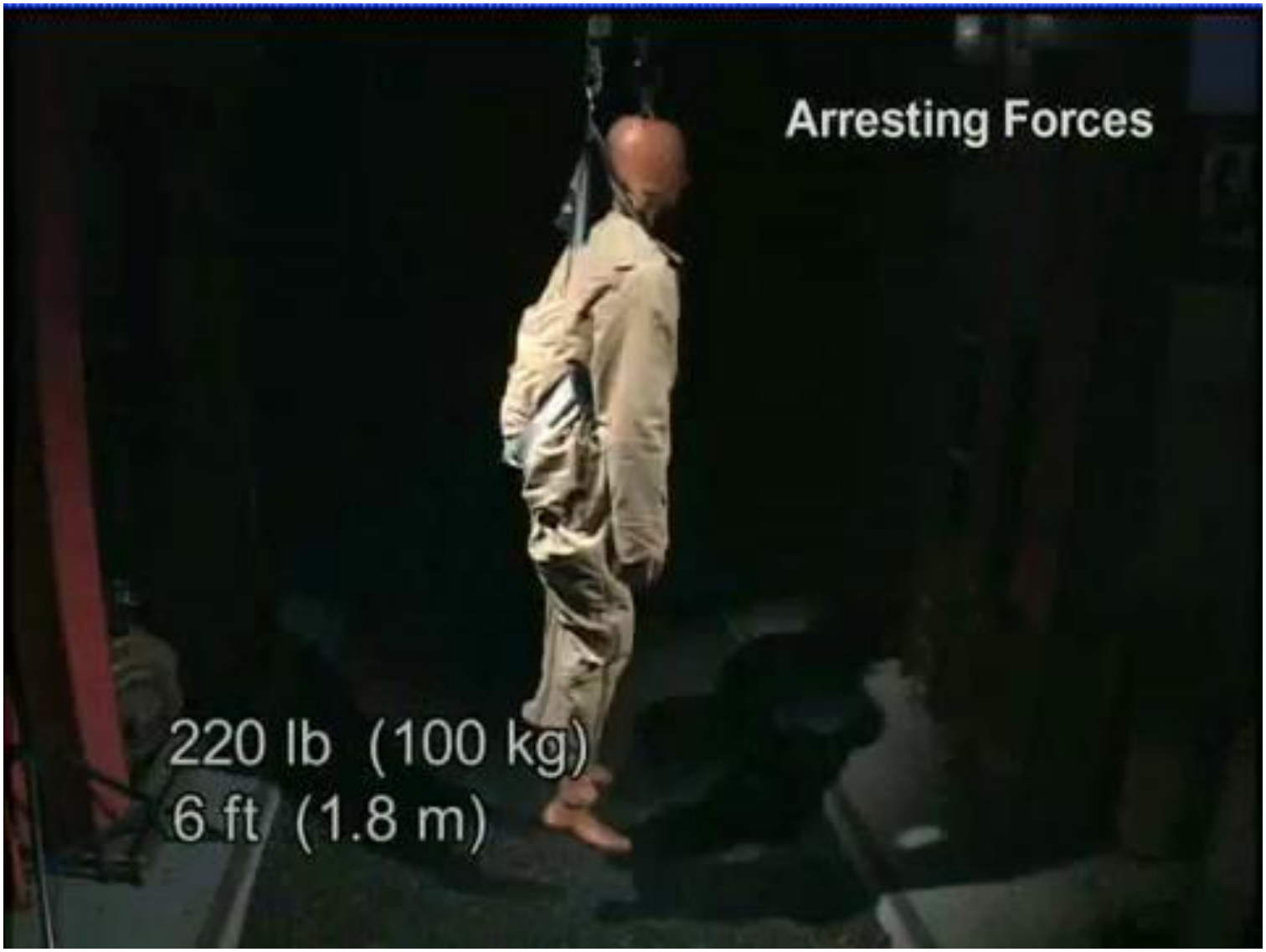
| Fall Restraint | Fall Arrest |
|---|---|
| Does NOT allow you to fall. | Allows max. 6’ free fall and absorbs fall forces. |
| 1,000 lb. | 5,000 lb. non-certified anchor<br>3,600 lb. certified/engineered anchor |
| N/A | Max. arresting force 1,800<br>ANSI 900 lb. |
| Body Belts (not best practice) | Full Body Harness required. |
| Non-Shock Absorbing | Shock Absorbing Lanyard/SRL |

# Fall Restraint





# Fall Arrest



# Personal Protective Equipment

If your employer was unable to eliminate or protect against fall hazards through modifications to the work environment, they are required to determine the most appropriate form of Personal Protective Equipment you'll need to use.

# ABC's of Fall Protection

**A**nchorage

**B**ody Harness

**C**onnecting Device

# Video – ABC's of PFAS

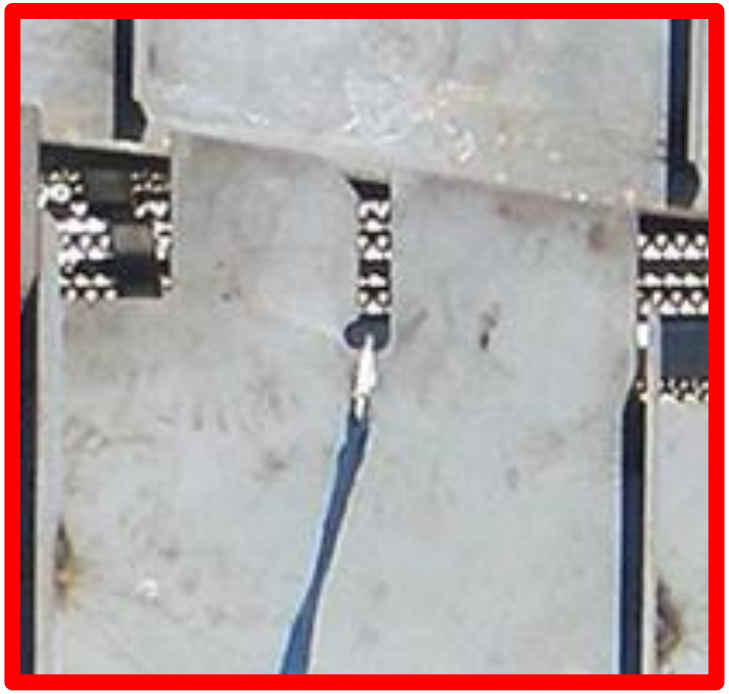


FALLTECH®

# Anchorage

- Anchorage - a secure point of attachment for equipment such as lifelines, lanyards, or deceleration devices.
- Shall be independent of any anchorage being used to support or suspend platforms.

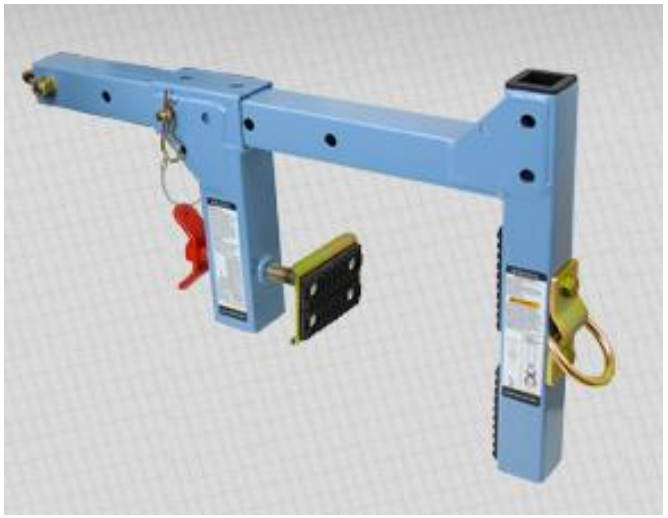
Adequate anchor?



# Certified Anchor Points

Designed, engineered, and approved by a Qualified Person (fall protection company) with a safety factor of 2x the max. arresting force.

# Certified Anchor Points Cont.



# Non-Certified Anchorages

- Non-certified anchor points may be utilized when it is not feasible to use a certified anchor point.
- A fall arrest anchorage that a **competent person** can **judge** to be capable of supporting the predetermined anchorage forces as prescribed in the standard.
- Non-certified anchorages consist of unquestionably strong elements of a structure, such as structural members.
- Non-certified anchor points must be able to support **5,000 lbs.** static strength per employee attached.
  - **"Can I hang a pick-up from it?"**

# Inadequate Anchor Points

- Standard Guardrails or Railings
- Ladders/Rungs
- Scaffolding
- Light fixtures
- Conduit or Plumbing
- Ductwork or Pipe Vents
- Wiring Harnesses
- Vents
- Fans
- Roof Stacks

# Video – Good Anchor Point?

# Body Harness

- A full-body harness designed to distribute fall-arrest forces over thighs, pelvis, waist, chest and shoulders.
  - Body belts outlawed for fall arrest by OSHA in 1998.
- Recent ANSI requirements for harnesses:
  - Pelvic Strap
  - Lanyard hook keepers
  - Impact/Load Indicator

# Body Harness

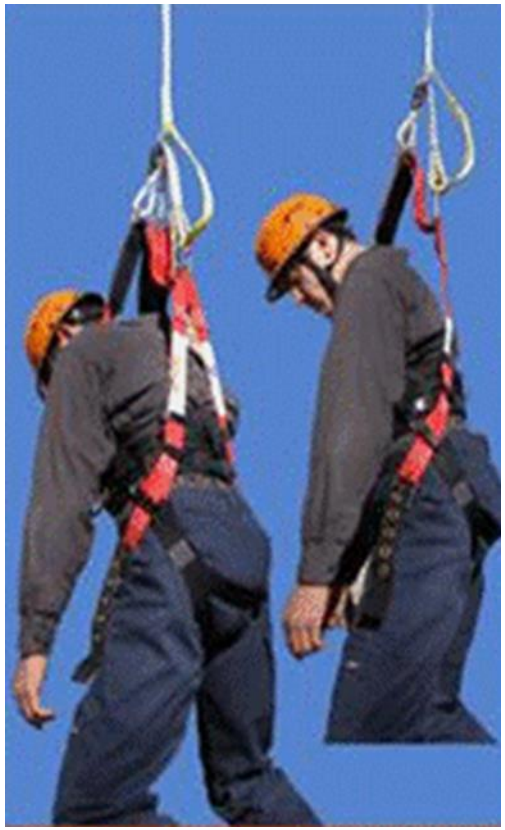
Numerous configurations available.

- Types of Connections


- Amount of D-Rings
- Materials and Ratings

# Body Harness

- Weight Rating
  - ANSI 130 – 310 lbs.
  - OSHA <130 – 425 lbs.
- Proper donning
  - Dorsal D-Ring base of neck
  - Leg straps tightened
  - Straps tucked away
  - Connector snap-hooks on keepers



# Connecting Devices

- Used for securing the worker/body harness to the anchor point.
- In fall arrest scenarios provided shock absorption and deceleration.


Restraint Lanyard

SRL (Twin Leg)


6’ Lanyard
Shock Absorbing

# Connecting Devices

- Snap hooks must be self closing, self locking, and double actuated.
  - ANSI 3,600 lb. gate
- Do not attach more than one snap hook to a single D-ring.

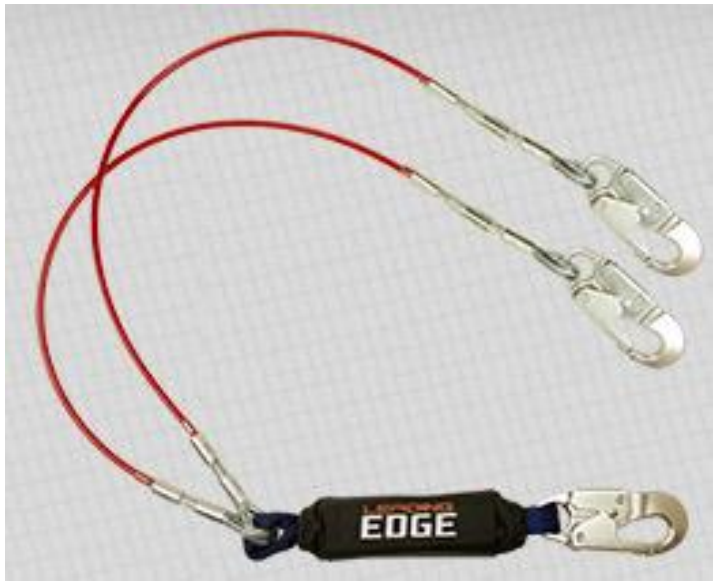
Snap Hook

Rebar/
Pelican Hook

Carabiner

# Connecting Devices


SRL-Leading Edge

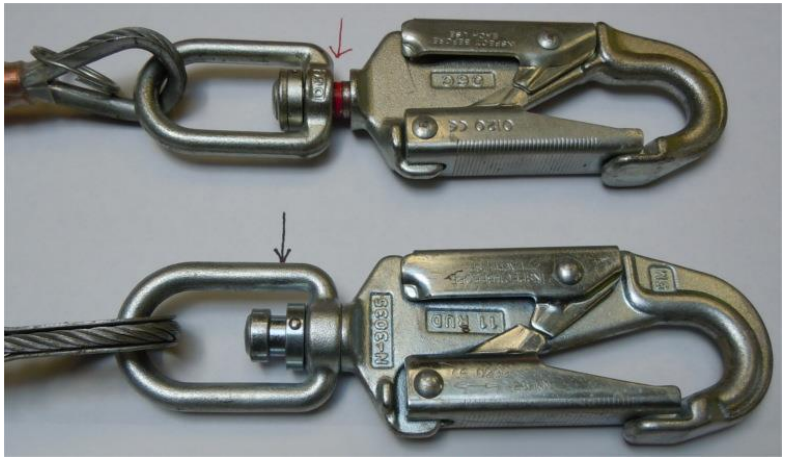



Leading Edge Lanyard

Positioning

# Connecting Devices

- Weight Capacity
  - ANSI 130 – 310 lbs.
  - OSHA <130 – 425 lbs.
  - Must match body harness rating.
- What height can you tie off?
  - D-Ring and up, 5’ below D-ring, etc.
- Load indicators.



# Horizontal Lifeline Systems

1926.502(d)(8) 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.

- Must have shock absorption integrated
- Tension must be set and maintained.


# Horizontal Lifeline Systems

EcoAnchor -
Anchor Point/HLL

Permanent HLL

# Horizontal Lifeline System

Is this HLL designed, installed, and maintained properly?

# Portable Frame HLL

# Mobile Trailer Mounted Anchor

Two User Rated System (310 lb. / User)

Free Standing Design can be detached from vehicle

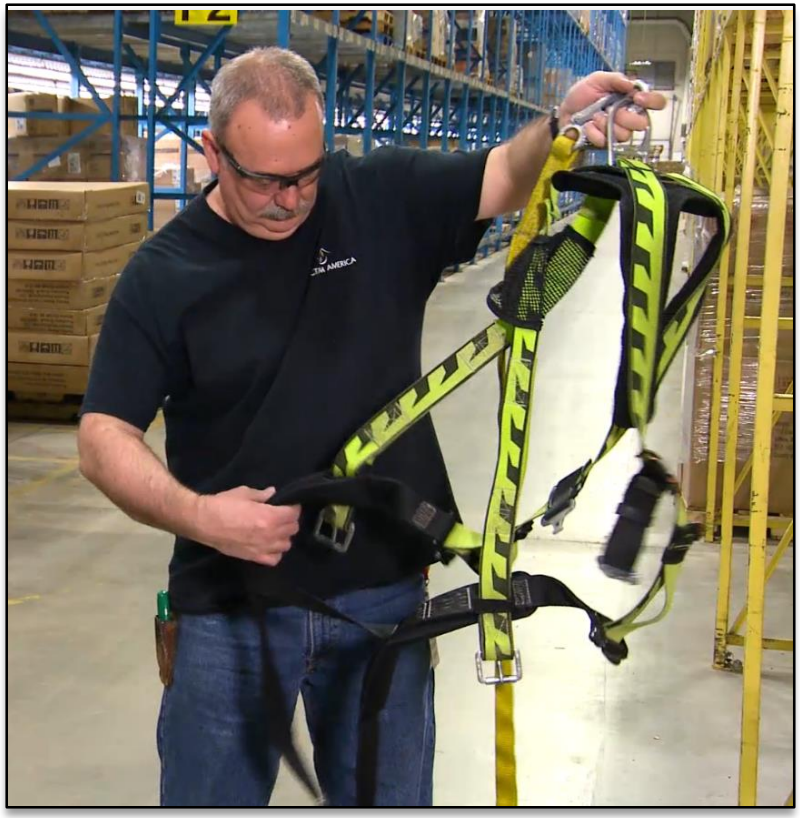
# Mobile Fall Arrest Anchor System

# Fall Protection Anchor System

# Fixed Ladder Safety System


# Using Personal Fall Protection

# Inspecting Fall Protection Equipment



Inspections help identify and correct problems before they cause any harm.

Fall protection equipment is to be inspected:

- Prior to being placed in service
- Prior to each use
- Annually/Semi-Annually by competent person and documented

# Inspecting Fall Protection

General Industry: Annual

Construction: Semi-Annual

1. Hardware
2. Webbing
3. Stitching
4. Labels

# Inspecting Fall Protection

## 1. Hardware

- Rust/Corrosion
- Deformed/Bent
- Burs/Cracks
- Weld Spots/Slag
- Missing Rivets
- Springs
- Functionality
- Other

# Inspecting Fall Protection

## 2. Webbing

- Cuts/Burns/Holes
- Excessive Wear
- Excessive UV Damage
- Chemical Damage
- Writing on Webbing
- Other

# Inspecting Fall Protection

## 3. Stitching

- Missing
- Loose
- Broken
- Other

# Inspecting Fall Protection

## 4. Labels/Tags

- Missing
- Illegible
- Dates
- Other

# Inspecting Fall Protection

## Remove from service when?

1. Damaged
2. Deployed
3. Dated

# Record Inspection

## INSPECTION FORM: Full Body Harness

**OSHA 1926.502(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.

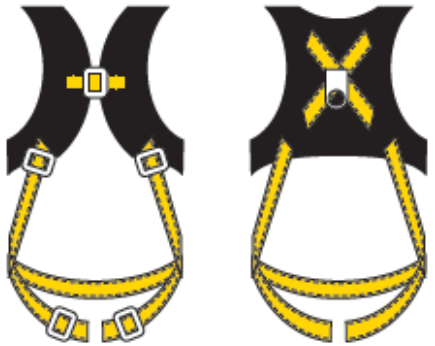
**6.1 Inspection**
6.1.1 Equipment SHALL be inspected by the user before each use and, additionally, by a competent person other than the user at intervals of no more than one year.

FREQUENCY OF INSPECTION IN THE FOLLOWING CATEGORIES:
General Industry: _____ Construction: _____
Your Organization: _____ Manufacturer: _____

MANUFACTURER OF EQUIPMENT:
Name of Manufacturer: _____
Serial #: _____ Model #: _____
Date of Manufacture: ___/___/___

INSPECTION: Date: ___/___/___
REMOVE FROM SERVICE WHEN: Date: ___/___/___

NAME OF COMPETENT PERSON: _____
NAME OF USER (AUTHORIZED PERSON): _____



LOOK AT:
1 Hardware 2 Webbing
3 Stitching 4 Labels/Tags

LOOK FOR:

| 1 HARDWARE | ✓ | ✗ |
|---|---|---|
| Rust/corrosion | | |
| Deformed/bent | | |
| Burs/cracks | | |
| Weld spots/slag | | |
| Missing rivets | | |
| Springs | | |
| Functionality | | |
| Other | | |

| 2 WEBBING | ✓ | ✗ |
|---|---|---|
| Cuts/burns/holes | | |
| Excessive wear | | |
| Excessive UV damage | | |
| Chemical attack | | |
| Writing on the webbing | | |
| Other | | |

| 3 STITCHING | ✓ | ✗ |
|---|---|---|
| Missing | | |
| Loose | | |
| Broken | | |
| Other | | |

| 4 LABELS/TAGS | ✓ | ✗ |
|---|---|---|
| Missing | | |
| Illegible | | |
| Dates | | |
| Other | | |

✓ PASS ✗ FAIL

# Storing Fall Protection

Personal fall protection PPE should be stored in a designated storage area.

**Avoid:**

1. UV/Sunlight
2. Heat
3. Moisture
4. Sharp Edges
5. Chemical
6. Floor/Rodents

# Video – PFAS Donning

# Performing Maintenance

Keeping fall protection PPE clean will prolong the useful life of the equipment.

- Wash with water, mild soap, and soft brush
- Rinse well and air dry

Maintenance work on fall protection equipment should always be performed per manufactures recommendations and must be done or supervised by a qualified person.

# Emergency Procedures

- Prior to working at heights that require fall protection, a rescue plan must be established.
- Fallen workers must be contacted < 6 minutes.
  - This includes the provision for rendering first aid.
- Rescue plan should be briefed prior to working at height.
- If local emergency providers are part of the rescue plan, have they been contacted to determine:
  - Ability for a timely response, location, vehicles, equipment.
  - Volunteer vs. Paid
  - High angle rescue training and equipment?

# Self-rescue

- Victim climbs back to the level from which they fell.  SRLs
- Returns to floor or ground for medical evaluation
- All components of fall arrest system removed from service and tagged out of service until evaluated by a competent person due to impact load.

# Assisted Self-rescue

- Local fire/rescue department may be High Angle Rescue trained and equipped
- Victim is conscious and able to assist in aid
- This may be performed by NCDOT personnel if trained in rescue techniques
- Anchor point for rescue rope must be rated at least 3,000 lbs.
- Haul line may be swung over or lowered to the fallen worker

# Assisted Self-rescue

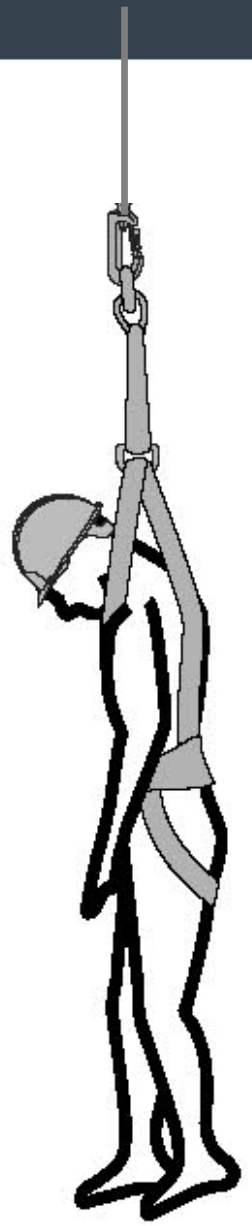
- Victim grasps rescue line with snap hook and attaches to body harness D-ring
- A positive D-ring connection must be verified by rescue team member
- The rescue team raises or lowers fallen employee
- Employee is to be medically evaluated
- Fall arrest equipment is removed from service and tagged due to impact load

# Charlotte Rescue

# Suspension Trauma

After a fall, the weight of the body on the leg straps cuts off blood flow returning to the torso. Blood pools in the legs severely limiting flow to their upper body and head.

- Unconsciousness overcomes the victim followed shortly after by respiratory arrest in as little as 10 -15 minutes after suspension begins.
- Once the victim is lowered to the ground and tension is released, a large volume of poorly oxygenated blood will flow back to the heart, lungs, and brain from the legs.
- This complicates their rescue, compromises resuscitation efforts and ultimately threatens their survival.



# Video – Suspension Straps

# Objectives Review

**You should now be able to:**

- Recognize fall hazards
- Think through the Hierarchy of Fall Controls
- Properly use, inspect, maintain, and store fall protection equipment
- Understand the ABC's of Fall Protection PPE
- Explain Restraint vs. Arrest

Comments, questions, remarks, statements, or debates?

Thank you.