Fall Protection Awareness

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Introduction


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.
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?

- General Industry: 4’
- Construction: 6’
- Scaffolds: 10’
- Steel Erection: 15’
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.
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.
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
1. Eliminate the risk

2. Guard the hazard

3. 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

- **Top Rail**: 42” +/- 3”
- **Mid-Rail**: 21” or ½
- **Toe Board**: 3.5”
- **Posts**: Max 8’
- **Top Rail**: 200 lbs.
- **Mid-Rail**: 150 lbs.
- **Toe Board**: 50 lbs.
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
<table>
<thead>
<tr>
<th>Fall Restraint</th>
<th>Fall Arrest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does NOT allow you to fall.</td>
<td>Allows max. 6’ free fall and absorbs fall forces.</td>
</tr>
<tr>
<td>1,000 lb.</td>
<td>5,000 lb. non-certified anchor 3,600 lb. certified/engineered anchor</td>
</tr>
<tr>
<td>N/A</td>
<td>Max. arresting force 1,800 ANSI 900 lb.</td>
</tr>
<tr>
<td>Body Belts (not best practice)</td>
<td>Full Body Harness required.</td>
</tr>
<tr>
<td>Non-Shock Absorbing</td>
<td>Shock Absorbing Lanyard/SRL</td>
</tr>
</tbody>
</table>
Fall Restraint

Fixed length lanyard

Fall hazard

Anchor point
Fall Arrest

Arresting Forces

220 lb (100 kg)
6 ft (1.8 m)
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

Anchorage

Body Harness

Connecting Device
Video – ABC’s of PFAS
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

6’ Lanyard Shock Absorbing

SRL (Twin Leg)
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
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

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

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

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

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

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

LOOK FOR:
1. HARDWARE
   - Rust/corrosion
   - Deformed/bent
   - Bars/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
   - Inlegible
   - Dates
   - Other

PASS ☑ FAIL ☒
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 manufacturer's 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
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.