OSHA 10 Hour Construction
Identifying Fall Hazards & Preventative Measures
Understanding the OSHA “Focus Four”
Workplace Hazards
Introduction

Overview

• The purpose of this lesson is ...
  – to provide students with information that will enable them to recognize major fall hazards at construction worksites. The lesson is comprised of following four topics:
    • 1. What is a fall hazard?
    • 2. What are the major types of fall hazards in construction?
    • 3. How can I protect myself from fall hazards?
    • 4. What is my employer required to do to protect workers from falls?
Introduction

Fall Hazards

• One of OSHA’s Construction Focus Four designed for:
  • foremen,
  • crew leaders,
  • construction trades
  • construction support staff
  • anyone wanting general construction safety knowledge

• Engage in all interactive exercises to proceed through the training
Introduction

On-line Resources
• OSHA eTools
• OSHA Publications
• OSHA Quick Cards
• OSHA Safety & Health Topic Page
• NIOSH Safety & Health Topic Page
• NIOSH Fatality Assessment and Control Evaluation (FACE) Program:
• Electronic Library of Construction Occupational Safety & Health materials, developed by CPWR – Center for Construction Research and Training, and more.
Introduction

Overview

• Additionally there are many online resources available to you in your objective of learning more about falls and fall prevention.
  – These include resources from OSHA, the National Institute for Occupational Safety and Health (NIOSH), state OSHA programs and other safety organizations.
  – Many of these online resources are available in Spanish and other languages.
Introduction

Student Handouts

- Guardrail and Safety Net Systems Summary – From the Construction Safety & Health Fall Hazards, Central New York COSH, 2007, OSHA grant product
- Personal Fall Arrest Systems Summary – From the Construction Safety & Health Fall Hazards, Central New York COSH, 2007.
- Preventing Ladder Falls -- From the CDC/NIOSH in partnership with CPWR-The Center for Construction Research and Training, Hollywood, Health and Society, and the Spanish language network Telemundo
- Scaffold Work Can Be Dangerous: Know the Basics of Scaffold Safety From the Construction Safety & Health Fall Hazards, Central New York COSH, 2007
Learning Objectives

– Upon completion of this training session, the student will be able to:

• 1: Identify major fall hazards.
• 2: Describe types of fall hazards.
• 3: Protect him/herself from fall hazards.
• 4: Recognize employer requirements to protect workers from fall hazards.

Disclaimer: This Compliance Assistance product is not a standard or regulation, and it creates no new legal obligations. The Compliance Assistance product is advisory in nature, informational in content, and is intended to assist employers in providing a safe and healthful workplace. Pursuant to the Occupational Safety and Health Act, employers must comply with safety and health standards promulgated by OSHA or by a State with an OSHA-approved State Plan. In addition, pursuant to Section 5(a)(1), the General Duty Clause of the Act, employers must provide their employees with a workplace free from recognized hazards likely to cause death or serious physical harm. Employers can be cited for violating the General Duty Clause if there is a recognized hazard and they do not take reasonable steps to prevent or to abate the hazard. However, failure to implement these recommendations is not, in itself, a violation of the General Duty Clause. Citations can only be based on standards, regulations, and the General Duty Clause.
Introduction

Topic 1 Overview

• What is a fall hazard?
  – Definitions
  – Statistics
  – Examples

• ALL FALLS ARE PREVENTABLE!
Introduction

Topic 2 Overview

• What are the major types of fall hazards in construction?
  • Unprotected roof edges, roof/floor openings, structural steel & leading edges
  • Improper scaffold construction
  • Unsafe portable ladders
Introduction

Topic 3 Overview

• How can I protect myself from fall hazards?
  • Training on Working Safely at Heights
  • Select & Use Proper Fall Protection Equipment
  • Safe Ladder Use
Introduction

Topic 4 Overview

• What is my employer required to do to protect workers from falls?
  • Provide Fall Protection Training and Equipment
  • Proper Scaffold Construction and Use
  • Safe Ladder Inspections and Use
  • Worksite Maintenance
  • Training
Introduction

Additional Resources

– Additional references and sources of information in:

  • Appendix A: Fall Hazards Lesson Test
  • Appendix B: Personal Fall Arrest System Checklist
  • Appendix C: Ladder Safety Exercise
  • Appendix D: Student Handouts
What is a hazard?

- A hazard is a situation or condition that has the potential to cause harm to:
  - Life
  - Health
  - Property
  - Environment.
- Engineered controls protect us from known hazards
- Dormant hazards can become active hazards when conditions change.
- Theoretical hazards are the hardest to recognize.
What is a Fall Hazard?

Definition

• A fall hazard is anything that could cause you to lose your balance or lose bodily support and that has the potential to result in a fall.

• Fall hazards are present at most worksites.
  – Many workers are exposed to these hazards on a daily basis.
  – Any walking or working surface can be a potential fall hazard.
What is a Fall Hazard?

Definition

• Any time you are working at a height ...
  – 4 ft. or more, you are at risk
  – Fed OSHA requires fall protection be used at:
    • 4 ft in General Industry
    • 5 ft in Maritime Industry
    • 6 ft in Construction Industry
  • Regardless of the fall distance, fall protection must be used when working over dangerous equipment and machinery.

TIP: On scaffolds, fall protection is required at 10 ft. In steel erection, workers on walking/working surfaces with unprotected sides or edges above 15 ft. must be protected. (There are some exceptions for connectors and workers in controlled decking zones for heights between 15 and 30 ft. See 29 CFR 1926.760 for additional information.)
What is a Fall Hazard?

Definitions
Definition of Theoretical or “What If?” Hazards:
• A theoretical (What If?) hazard is a hazard that is not obvious and may take an event or series of events to occur.
• Example:
  – A worker is told to go find a piece of plywood.
  – The worker finds a piece of plywood, picks it up and walks straight into a hole that the plywood was covering, falling to his death.
What is a Fall Hazard?

Definitions

Definition of Theoretical (or “what if?”) Hazards:

• This theoretical hazard became a real and deadly hazard because:
  – The employee was improperly trained in hazard recognition, AND
  – The plywood was not labeled “Danger-Do Not Remove”, or “Danger-Open Hole”, AND
  – The plywood was not secured in place to prevent ease of removal.

• This seemingly good intent of placing a piece of plywood over a fall hazard, created a hidden Fall Hazard ... which is much worse!
What is a Fall Hazard?

Can YOU identify the fall hazards?

While it should be pretty easy for you to identify the extreme risks taken in each of these photos...why couldn’t these workers see it as well? When workers take unsafe risks to get their work done, they aren't just risking their personal lives, they are placing their families’ happiness and future at risk as well.
What is a Fall Hazard?

Fall Hazards:

• Fall hazards become fall incidents when people do not protect themselves from fall hazards.
• Gravity is always working.
• Thinking you can land on your feet, or catch yourself before you fall is often a fatal error in judgment.
What is a Fall Hazard?

Fall Hazards
• How long does it take a person to fall?

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<td>144</td>
</tr>
<tr>
<td>4</td>
<td>256</td>
</tr>
</tbody>
</table>
What is a Fall Hazard?

Examples of Floor Hazards

• Examples recorded as falls:
  – Falls from elevation or ground level to lower levels
  – Falls through existing floor or roof openings (skylights, etc.)
  – Falls through the floor or roof surface (floor/roof collapses)
  – Fall on same level (point of contact was same level supporting individual)
  – Jumps from structures and equipment
What is a Fall Hazard?

More Examples

• You can find accident summaries:
  – OSHA’s website.
  – Go to the link shown below.
  – Within the keyword field, enter a keyword.
  – To view a list of key words, use the keyword list at the bottom of the Accident Investigation Search page.

LINK: http://www.osha.gov/pls/imis/accidentsearch.html
What is a Fall Hazard? II

Workers could fall while climbing on the shoring structure to set it up and remove it.

Ladders and lifts must be provided.
Complacency- The Silent Killer

• Most all workers today know that fall protection is required when working at heights, so why do so many die each and every year?

  **Complacency**

• Complacency defined (Dictionary.com)
  
  – a feeling of quiet pleasure or security, often while unaware of some potential danger, defect, or the like; self-satisfaction or smug satisfaction with an existing situation, condition, etc.
What is a Fall Hazard? II

How does complacency occur?

• Studies have shown that complacency has many causes, including:
  – Repetition of work
  – Unsafe acts and conditions going uncorrected
  – Workers losing their drive and ambition
  – Management not evaluating and enforcing safe work procedures
  – Major focus on production over safety
What is a Fall Hazard? II

Combating Complacency

• The keys to preventing complacency are:
  – Effective Pre-Task Hazard Recognition Planning
    • Developed daily and signed by the work crew or individual
  – Effective safety audits of work procedures
    • Performed to ensure compliance
  – Effective safety culture where workers look out for each other
    • Employees are empowered to take ownership of safety
What is a Fall Hazard? II

Statistics

• Bureau of Labor Statistics (BLS)
  – Leading cause of worker deaths in the construction industry were FALLS
  – In 2009, falls accounted for more than one-third of fatal occupational injuries in construction (34%).
  – Nearly half (48%) of all fatal falls in private industry involved construction workers.
What is a Fall Hazard? II

Statistics
- Data from a long-term study
  - Between 1992 and 2005:
    - 1/3 (33%) of the fatal falls in construction were from roofs
    - 18% were from scaffolding or staging
    - 16% were from ladders, and
    - 8% were from girders or structural steel.
  - Remaining 25% of fatal falls were related to:
    - Existing floor openings,
    - Non-moving vehicles
    - Aerial lifts
    - Other

TIP: Occupational fatalities caused by falls are a serious concern. This lesson will help you identify fall hazards at construction worksites so that you can be protected.
What is a Fall Hazard? II

Statistics

- As a follow-up to these statistics
  - Each of the numbers on the preceding screens represent family, friends, neighbors and co-workers that lost their lives at work.
  - Each death and serious injury that occurs is 100% preventable.
  - We must learn from previous incidents or we are destined to repeat them.
  - By learning how to recognize and mitigate fall hazards, you can save your life and the lives of your co-workers.

LINK:  http://www.bls.gov/iif/
What is a Fall Hazard? II

Unprotected open-sided floors 6 ft. or more above ground level.

Guardrail systems, safety net systems or personal fall arrest systems are required.

Impalement Hazards
Major Hazards

• What are the major types of fall hazards in construction?

1. Unprotected leading edges:
   • Roof edges
   • Roof and floor openings
   • Steel erection
2. Improper scaffold construction
3. Unsafe use of portable ladders
Fall Hazards in Construction

Type of fatal falls

- From roof: 32.4%
- From ladder: 17.0%
- From scaffold/staging: 16.6%
- To lower level, n.e.c.: 9.4%
- From building girders: 6.4%
- From non-moving vehicle: 5.1%
- Other: 13.1%

Unprotected Leading Edges

• Falls to a lower level is the major cause of death in construction.

• Failure to erect and maintain proper handrails, barricades, cables or other leading edge protective systems is an extremely unsafe condition

• Unsafe conditions don’t just happen, they are created!
Unprotected Leading Edges

- Major hazards:
  - Almost all sites have unprotected sides and edges, wall openings, or floor holes at some point during construction.
  - Leading edges and openings are always a hazard when left unprotected.
  - Injuries from falls can result in:
    - Sprains
    - Broken bones
    - Concussions
    - Paraplegic and quadriplegic injuries
    - Coma (short and long term)
    - Death
Fall Hazards in Construction

Controlling Roofing Hazards

• Roofing falls are
  – The leading cause of roofing injuries and fatalities.
  – Roofing, siding and sheet metal workers have the highest rate of occupational injuries and illnesses for a non-manufacturing industry.

• Most frequently cited serious OSHA violation:
  ▪ Unprotected sides and edges.

• Most workers realize the hazards but assume the risk.
• You have the right to request fall protection!
Fall Hazards in Construction

Controlling Roof Hazards

- Limiting Access - Leading Edges & Penetrations
  - A roof permit system is a process that restricts access to the roof to authorized employees.
  - Only employees trained to recognize, evaluate and control fall hazards are allowed access to the roof.

- Before entering the roof, employees must:
  - Complete a roof access permit
  - Conduct a JHA
  - Identify a fall protection method consistent with work scope

- Permit must be approved by a person qualified to determine the adequacy of the fall protection methodology.
Fall Hazards in Construction

Controlling Roof Hazards

• Train all employees exposed to fall hazards on:
  – All roof fall hazards that may be encountered;
  – Fall protection standards and requirements;
  – Procedures for erecting, maintaining, disassembling, inspecting and using fall protection systems
  – The method for reporting problems or obtaining guidance on fall protection issues

• Retrain:
  – Whenever an employee does not understand the requirements or cannot demonstrate competence
  – Whenever changes in workplace conditions or scope occur
Controlling Roof Hazards

• Conduct a Job Hazard Analysis (JHA)
  – Identify the Hazards
  – Evaluate the Hazards
  – Mitigate the Hazards

• Develop Fall Protection Plan from JHA
  – Solution must be based on the lowest overall exposure to risk for all workers.

Link: http://www.osha.gov/Publications/osha3071.pdf
Controlling Roof Hazards

• Evaluation and continuous improvements
  – When works begins:
    • Evaluate actual work against Fall Protection Plan
      – Are the employees following the plan?
        » If not, update plan or retrain employees.
      – Is the plan effective in preventing employee falls?
        » If not, stop work and update plan to ensure effectiveness.
    • Ensure all changes made are incorporated for future use.
  • Continuous improvements are a critical part of all safety plans!
Fall Hazards in Construction

Workers are installing a new metal roof without fall protection.

NOTE: Remember that ladders must extend 3 feet above the landing area.
Fall Hazards in Construction II

Steel Erection

• Workers involved in steel erection are exposed to serious fall hazards on a daily basis
• More Ironworkers are killed from falls than any other construction occupation.
  – Ironworkers are 10 times more “at risk” of death than the construction average.
  – The most frequently cited serious OSHA violations involving steel erection are:
    • Fall Protection
    • Fall Hazard Training
    • Fall Protection for Connectors.

TIP: Many fall hazards could be prevented by designing the hazards out. See: http://www.designforconstructionssafety.org/
Steel Erection

- Effective fall protection saves lives
  - Wearing your harness is NOT fall protection
  - The harnesses of many fall victims were NOT tied off!
  - Effective fall protection means effective:
    - Training
    - Equipment
    - Inspections
    - Installation
    - Connections
    - Use

- There is nothing macho about death or disabling injuries!
Fall Hazards in Construction II

Additional info:

• For additional information on falls from elevations:
  – Preventing Fatal Falls in Construction, OSHA page:
  – Falls from Elevations, NIOSH page:
    http://www.cdc.gov/niosh/topics/falls/
  – Aerial Lifts OSHA Quick Card (also available in Spanish):
Fall Hazards in Construction II

Practical Exercise

- Example #1

  - An ironworker was standing on a tilt-up concrete wall, throwing out bridging.
  - He was wearing a harness and lanyard but was not tied-off.
  - He fell 30 feet to the ground and sustained crushing injuries to his spine, resulting in permanent paralysis below the chest.
  - How could this accident have been prevented?

**Answer:** The accident could have been prevented if the ironworker was properly tied off.
Scaffolds

• Major Hazards

  – Improper scaffold construction is one of the most cited OSHA violations every year.
  
  – Major hazards include:
    ▪ Unsafe construction
    ▪ Unsafe use
    ▪ Unsafe modifications
    ▪ Overloading
    ▪ Unstable support system
    ▪ Mix and matching components

**TIP:** For additional information on scaffolds, see: Supported Scaffold Safety Tips OSHA Quick Card, http://www.osha.gov/OshDoc/data_HurricaneActs/supportedscaffold_tips.pdf
Scaffold Hazards
• 88 deaths occurred in 2007 due to unsafe scaffolding
• Major failure causes:
  – Unsafe erection
  – Lack of supervision/inspection
  – Incomplete (no handrails/mid-rails/toe-boards
  – Use of incompatible parts
  – Excess weight
  – Used in unsafe conditions (weather related)
  – Unstable foundations
  – Unsafe modifications

TIP: Supported Scaffold Inspection Tips OSHA Quick Card
Scaffolds

• Major hazards:
  • Using heavy equipment and building materials on scaffolds
  • No or inadequate handrails and mid-rails
  • Unsafe access points
  • Falling objects due to lack of toe-boards and tool restraints
  • Inadequate sill plate support
  • Inadequate securing of scaffold
  • Inadequate planking
  • Inadequate materials
  • Overloading

**TIP:** For additional information on scaffolds, see: Supported Scaffold Safety Tips OSHA Quick Card, http://www.osha.gov/OshDoc/data_Hurricane Acts/supported_scaffold_tips.pdf
Fall Hazards in Construction II

Lack of fall protection for workers on fabricated frame scaffolds.

The workers are exposed to a 35-foot fall hazard from a scaffold while stacking blocks prior to overhand bricklaying operations.

Planks appear to be overloaded and there is no safe access for workers.
Scaffold Hazards

• The majority of workers injured in scaffold accidents attribute:
  — Planking or supports failing
  — Lack of guardrails
  — Lack of fall protection

• OSHA’s most frequently cited serious scaffold violations include:
  — Lack of proper fall protection
  — Lack of safe scaffold access
  — Use of aerial lifts without body belts and lanyards
  — Platform construction
  — No worker training

TIP: Supported Scaffold Inspection Tips OSHA Quick Card
Classroom Exercise

- Example #1
  - A construction worker was working from a carpenter’s wall bracket scaffold without fall protection.
  - The worker fell 19 feet to the ground, sustained blunt trauma to the head, and later died.
  - How do you think this incident could have been prevented?

Answer: Fall protection should have been provided and used to include personal fall restraint, fall arrest, guardrails or safety nets.
Ladders

• BLS data show that
  – Falls from ladders account for over 100 fatalities each year.
  – Contributing factors include:
    ▪ Falls from ladders
    ▪ Slips from ladders
    ▪ Ladders moving, unsecured
    ▪ Worker overreaching
    ▪ Defective equipment
    ▪ Improper ladder selection

Ladders

• OSHA Regulations are written in the blood of fellow workers that have died on the job.
• OSHA cites companies to drive compliance to safe work practices.
• Frequently cited OSHA ladder violations include:
  1. Ladder not extended 3 feet above the landing
  2. No worker training
  3. Improper use of the top step of stepladders

TIP: For additional information on ladders, see: Portable Ladder Safety Tips OSHA Quick Card
Portable Ladder Hazards

- Stability:
  - Ensure it won’t move or slip from its supports.
  - You can also lose your balance on an unsteady ladder.
  - Secure all ladders from movement and ask for someone to hold the ladder if necessary.

TIP: Go to: http://www.osha.gov/pls/imis/accidentsearch.html and search by keyword for additional examples
Fall Hazards in Construction III

Classroom Exercise

• Example #1 – Ladders
  – A worker was climbing a 10 foot ladder to access a landing, which was 9 feet above the adjacent floor.
  – The ladder slid down, and the worker fell to the floor, sustaining fatal injuries.
  – Although the ladder had slip-resistant feet, it was not secured and the railings did not extend 3 feet above the landing.
  – What would you have done differently to prevent this fatal incident from happening to you?

Answers:

1. Position portable ladders so the side rails extend at least 3 feet above the landing
2. Secure side rails at the top to a rigid support and use a grab device when 3 foot extension is not possible.
3. Make sure that the weight on the ladder will not cause it to slip off its support.
4. Before each use, inspect ladders for cracked, broken, or defective parts.
5. Do not apply more weight on the ladder than it is designed to support.
6. Use only ladders that comply with OSHA standards.
Ladder-to-work platform is not of sufficient length.

It must extend 3 feet above the working surface.
Excavation & Trench Fall Hazards

- Any excavation has the potential as a fall hazard
  - OSHA requires fall protection for all fall hazards that are 6 feet or more.
  - Many people believe that excavations are exempt, but that is not the case.
  - A fall hazard is such whether it is from a ladder to the ground or from the ground to the bottom of a trench.
  - Protect yourself from falls at all times, even around excavations and trenches.
Unloading and Loading Truck Fall Hazards

• Truck related fall hazards exist when workers climb on trailers or loads that exceed 6 feet from the ground.

• Fall protection, fall prevention or a loading dock arrangement that limits the fall distance on both sides must be utilized to protect these workers.
Protection from Fall Hazards

Hierarchy for Controlling Fall Hazards

- The order of controlling fall hazards is:
  1. Elimination of Hazard
  2. Prevention of Hazard
  3. Safe Work Platforms
  4. PPE – Fall Protection Equipment
  5. Administrative Controls
Protection from Fall Hazards

Elimination

• Removing the hazard
  – Eliminate the hazard
  – Change tasks/methods
  – Change process
  – Change/improve controls
  – Eliminate need to work at heights and subsequent exposure to fall hazards
Protection from Fall Hazards

Prevention

• Preventing fall hazards is a critical part of the construction planning process.

• Planning and communication are critical to identify and mitigate all newly created fall hazards by installing:
  – Guardrails
  – Handrails
  – Walls
  – Protective covers
  – Parapets
Protection from Fall Hazards

Elevated Work Platforms

- Mobile work platforms such as scissor and aerial lifts are safe and reliable means to limit exposure to fall hazards.
- Fixed work platforms such as scaffolds are a safer alternative to working off of ladders.
Protection from Fall Hazards

Personal Protective Systems

• Fall Protection Systems include:
  – Fall restraint
  – Fall protection (personal fall arrest)
    ▪ Full body harness
    ▪ Lanyard
    ▪ Lifeline
Protection from Fall Hazards

Administrative Controls
• Develop and Implement new work practices that:
  – Reduce the risk of falling from heights
  – Warn workers how to avoid approaching a fall hazard
    • Warning systems
    • Warning lines
    • Audible alarms
    • Signs
    • Training of workers to recognize specific fall hazards
How would you prevent this hazard?

This photo shows workers with no fall protection working on a roof that exposes them to a 20 foot fall. While many will look at this photo and not think that this is unsafe, the reality is that conditions like this claim the lives and livelihoods of hundreds of workers each and every year. Using a roofing fall protection anchorage point, like the one shown, is an easy solution to ensure one mistake doesn’t take your future away.
Protection from Fall Hazards

• How can I protect myself from fall hazards?
  – Use fall protection equipment
    • Guardrail systems
    • Safety net systems
    • Personal fall arrest
    • Fall restraint systems
  – Safe ladder use
  – Training
Protection from Fall Hazards

Protective Systems

• Fall Protection Equipment
  – Three generally acceptable methods of protection for vertical drops of 6 feet or more are:
    • Guardrails
    • Safety net systems
    • Personal fall arrest systems
Protection from Fall Hazards

Three Protective Systems

• Protective system basics include:
  – Guardrails are an excellent prevention system as they prevent you reaching a leading edge fall hazard.
  – A personal fall arrest system consists of an anchorage, connectors, and a full-body harness that work together to break your fall.
  – Safety net systems are designed to catch you and break your fall. They must be placed as close as practicable under your working surface, but never more than 30 feet below.

TIP: The anchorage for a worker’s personal fall arrest equipment must be independent of any anchorage used to support or suspend platforms. It must be able to support at least 5,000 lbs. per worker attached to it.
Protection from Fall Hazards

Guardrails

• Guardrails are the safest protective system
  – Preventing access to fall hazards is far more effective and safer to the workforce than employing fall arrest systems.
  – Injuries from sudden deceleration or striking objects are a common result from a fall arrest, even if the fall protection system worked perfectly.

TIP: When working next to a fall prevention barrier from an elevated position, such as a step ladder next to a guardrail, the guardrail no longer serves as a fall protection device. Additional protection is needed.
Protection from Fall Hazards

Guardrails

• Guardrail specifications:
  – Top rails must be at least ¼ inch thick to prevent cuts and laceration;
  – Must be between 39 and 45 inches from the working surface;
  – If wire rope is used, it must be flagged at least every six feet with highly visible materials;
  – Midrails, screens or mesh must be installed when there are no walls at least 21 inches high;
  – Screens and mesh must extend from the top rail to the working level.
Protection from Fall Hazards

Guardrails

- Guardrail specifications:
  - There can be no openings more than 19 inches.
  - Top rail must withstand at least 200 lbs. of force.
  - Mid-rail must withstand 150 lbs. of force.
  - The system must be smooth enough to protect workers from cuts and getting their clothes snagged by the rail.
  - Guardrails around access points such as a ladder-way, must:
    - Use a gate to prevent falling through the hole
    - Be offset to prevent walking into the hole.
Protection from Fall Hazards

Safety Net Systems

• Safety nets must:
  – Be as close as practicable under the working surface, but never more than 30 feet below
  – Be inspected every week for damage
  – Have a border rope with a minimum strength of 5,000 lbs.
  – Extend outward a sufficient distance
  – Absorb the force of a 400-pound “drop test
  – Remove items in net as soon as possible.

SOURCE: Construction Safety & Health Fall Hazards, Central New York COSH, 2007, OSHA grant product
Protection from Fall Hazards

Personal Fall Arrest Systems

- Are one way to protect workers from falls
- Required when exposed to a fall hazards 6 feet or more
- Required for workers on a suspended scaffold more than 10 feet above the working surface, or when they are working in bucket truck or aerial/boom lift.
Protection from Fall Hazards

Personal Fall Arrest Systems

• Three major components of a Personal Fall Arrest System (PFAS):
  – Anchor and the anchorage connector
  – Connecting device, which is a lanyard or a retractable lifeline, with snap hooks
  – Full-body harness

Source: Construction Safety & Health Fall Hazards, Central New York COSH, 2007, OSHA grant product
Critical information regarding Personal Fall Arrest Systems (PFAS)

- A personal fall arrest system is made up of an anchorage, connecting device, and a full-body harness.
- The connecting device may be a lanyard with snap-hooks, or a self-retracting lifeline.
- A lanyard should include a deceleration device.
- Make sure you are using components from the same manufacturer to ensure that the system works as it should.
- If not, any substitution or change must be evaluated or tested by a competent person to ensure that it meets the standard.
Protection from Fall Hazards

Personal fall arrest system

Here we see 2 elements of a Personal fall protection system, a fall protection harness and a dual shock absorbing fall protection lanyard.
Protection from Fall Hazards

Personal Fall Arrest Systems

• Critical Information:
  – Body belts cannot be used for fall arresting service.
  – However, a body belt is allowed as part of a positioning or fall restraint system.
  – A positioning or restraint system prevents falls by keeping your body in a position where you are not able to reach the fall hazard.
  – For all situations where you could actually fall, you always need to wear a full-body harness.
Protection from Fall Hazards

Positioning Systems

- Consist of full body harness allowing worker to be supported on vertical or inclined surface
- Allow worker to work with both hands
- Require separate fall protection system
Protection from Fall Hazards II

Personal Fall Arrest Systems

• Lanyard Types:

  - **Rope Lanyard**: Offers some elastic properties for all arrest; used for restraint purpose.
  - **Web Lanyard**: Ideal for restraint purposes where fall hazards are less than 2 feet.
  - **Cable Positioning Lanyards**: Designed for corrosive or excessive heat environments and must be used in conjunction with shock absorbing devices.
  - **Shock Absorbers**: When used, the fall arresting force will be greatly reduced if a fall occurs.
Protection from Fall Hazards II

Employer Fall Prevention Requirements
Provide Fall Protection

• OSHA’s fall protection standards
  – Require employers to provide fall protection for you when you are exposed to a fall hazard.
  – Standards set the criteria and practices for fall protection systems and require training.
  – Standards cover hazard assessment, fall protection and safety monitoring systems.
  – Controlled access zones, safety nets, and guardrail, personal fall arrest, warning line and positioning device systems are also addressed.

Protection from Fall Hazards II

Employer Fall Prevention Requirements

Positioning Device Systems

- This positioning device is used to help position employees while working on vertical walls.
- Employers may supply positioning devices for use in positioning or fall restraint; however, they are never allowed to be used as a fall protection.
- Many workers use fall positioning and fall protection simultaneously to ensure their safety when working at vertical heights that exceed 6 feet from the ground.
Connectors

• All connecting components used in PFAS shall be compatible and shall be used in accordance with manufacturers’ recommendations.
Protection from Fall Hazards II

Retractable Lanyards

- Automatically limit free fall distance to 2 ft. or less
- 3600 minimum tensile strength
- No shock absorber needed
- Select use with care and avoid the swing fall or pendulum effect hazard
Protection from Fall Hazards II

Personal Fall Arrest Systems

• Critical Information:
  – Your personal fall arrest system must be inspected for damage each and every time you wear it.
  – If there are defects found during the inspection, or if the equipment has been used in an arrest, it must be removed immediately from service.
  – The attachment location of the body harness must be in the center of your back, near the shoulder level, or above your head.
Protection from Fall Hazards II

Case Study on Inspecting your PFAS

- Lanyard fails after arresting fall
  - A painter wore his PFAS everyday.
  - Every night he threw his harness and lanyard into the back of his truck.
  - One day he fell from a scaffold while painting, and his PFAS worked... preventing him from falling 50 feet to the ground below.
  - He hung there for 18 minutes waiting for rescue when... his lanyard snapped and he fell to his death!
  - Root cause: lanyard had deteriorated due to the sun, paints and solvent exposures.

- Always take care of your life saving equipment as if your life depends on it... because it does!
Protection from Fall Hazards II

Personal Fall Arrest Systems

• Critical information to remember about PFAS:
  – All PFAS
    • Are designed and rated for specific use
    • Must have both working load ratings and tensile strength ratings listed
  – Working load is the total weight of the worker and his tools
  – The maximum breaking or tensile strength ratings are the maximum arresting force that the component is rated to withstand, in case of a fall.
Protection from Fall Hazards II

Vertical Life Lines

• Are vertically suspended flexible lines with a connector at the upper end
• The minimum tensile strength is 5000 lbs. and rated for one worker at a time.
• Multiple workers require multiple lines.
• Devices used to connect must be capable of locking in both directions.
Protection from Fall Hazards II

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.
Protection from Fall Hazards II

Restraint Systems

- Prevent the user from reaching areas where free fall could occur.
- Anchorage strength = 3,000 lbs.
- Designed by qualified person for fall protection
- Used only on sloped surfaces equal or less than 4:12 slope.
Deceleration Device

- A Deceleration Device is any mechanism, such as a rope grab, rip-stitch lanyard, specially-woven lanyard, tearing or deforming lanyards, automatic self-retracting lifelines/lanyards, etc., which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limits the energy imposed on an employee during fall arrest.

- Rope grab, sleeve or cable/rope attached to a fixed ladder over 20 ft (6m) in length.

- Anchorage strength = 3,000 lbs.

- Free fall not to exceed 2 ft.
Protection from Fall Hazards II

Personal Fall Arrest Systems

• Anchorage Points
  – Anchorages must:
    ▪ Be independent of any anchorage used to support or suspend platforms
    ▪ Be able to support at least 5,000 lbs. per worker attached to it, unless specifically engineered for a fall protective system
Protection from Fall Hazards II

This is FAR from a rated anchorage point!

This 2x4 is not rated for 5,000 pounds... not even 500 pounds! While many people will think that this photo was staged, it was not. Safety professionals have taken hundreds of similar photos where people have tied off to fire sprinkler pipes, drain pipes, 2x4’s, electrical conduit and even a PVC water line. Remember if you cant hang a pick up truck from it, you can’t tie off to it!
Protection from Fall Hazards II

Personal Fall Arrest Systems

• Critical Information on Connectors:
  – Connectors must be made:
    • From steel or equivalent materials
    • With a corrosion-resistant finish
    • With smooth edges
  – Inspect daily for application and damage
  – D-rings and snap-hooks must have a minimum tensile strength of 5,000 lbs.
Personal Fall Arrest Systems

• Critical Information on snap-hooks:
  – Snap-hooks must be a locking-type and designed to prevent opening and slipping off the connector.
  – Snap-hooks cannot be directly connected to:
    ▪ The webbing, rope or wire
    ▪ To each other
    ▪ To a D-ring to which another snap-hook or other connector is attached
    ▪ To a horizontal lifeline
    ▪ To any other object that could cause the snap-hook to open
Safe Ladder Use

• Why focus on ladder safety?
  – Every day, four construction workers die on the job.
  – Falls are the most common cause of fatal injuries to construction workers.
  – The consequences of a fall affect not only the worker, but also family and friends.
Protection from Fall Hazards III

Safe Ladder Use

• Consequences of a fall
  – 35-year-old worker was on a 20 ft. extension ladder working 16 ft. from the ground and fell
  – Suffered severe head injuries and was in a coma for 6 weeks
  – Today, his family feeds him through a tube and changes his diapers 4 times/day.

• This is not how he, nor his family, envisioned their lives.
Protection from Fall Hazards III

Safe Ladder Use

- Falls are 100% preventable
  - Ladders are one of the most common pieces of equipment on a construction site.
  - Falls from ladders can be prevented by proper:
    - Planning
    - Training
    - Equipment
  - Protect yourself by:
    - Selecting the correct ladder for the job
    - Using ladders safely
    - Never getting lazy on a ladder... that’s when the risks escalate
Protection from Fall Hazards III

Ladder does not extend 3 ft past the working level and as such is unsafe to use. In addition, there are electrical hazards in direct proximity that require special precautions such as Lockout/Tagout before ladder should be used.
Protection from Fall Hazards III

Safe Ladder Use

• Be a Role Model- Lead by Example
  – There is nothing macho about taking risks
  – Safety culture in construction must improve

One by one, we can make construction one of the
Safest, not most dangerous, industries to work in.
Safe Ladder Use

• How can YOU prevent a fall from a ladder?
  – Here are 3 suggestions that are related to the leading cause of falls from ladders:
    • Choose the right ladder for the job.
    • Tie the top and bottom of the ladder to fixed points when necessary.
    • Don't carry tools or other materials in-hand while climbing the ladder.
  
• Many falls are related to climbing or descending a ladder and having tools in the hand is a major contributor.
Protection from Fall Hazards III

Safe Ladder Use

• Is a ladder the right tool for the job?
  – Would scaffolding or a mechanical lift be better?
  – Many times, the ladder is the only physical support you have while you are working. If it fails, you can fall. That's why it is so important to find the right ladder when you do need to use one.
  – The three main types of ladders—step ladders, straight ladders, and extension ladders—are used in different situations for different tasks.

• Using the wrong ladder increases your risk of falling.
Protection from Fall Hazards III

Safe Ladder Use

• Extension Ladders - How long is long enough?
  – Extension ladders should:
    • Be long enough to give you something to hold on to when accessing the ladder from the top
    • Extend 3 ft. above the surface you will be working on
    • Be at sufficient angle to help you keep your balance on the ladder
  – Correct angle is 4:1:
    • For every 4 ft. high the ladder is, the base should be 1 ft. out from the wall
    • For example, a 10 ft-high roof requires at least a 14 ft. long ladder to allow 3 ft. of ladder above the roof
    • The base should be a minimum of 2 ½ ft. from the wall.
Safe Ladder Use

• Extension Ladders - Is it in good working condition?
  – It shouldn’t be missing pieces or be cracked or damaged.
  – Check the duty rating on extension ladders – is it high enough for the weight you will be putting on it? Longer ladders don’t always have higher duty ratings, so be sure to check.
  – In construction, the most common ratings are:
    • Heavy Duty (I) supports up to 250 lbs. (113 kg).
    • Extra heavy duty (IA) supports up to 300 lbs. (136 kg).
    • Special duty (IAA) supports up to 375 lbs. (170 kg).
Protection from Fall Hazards III

Safe Ladder Use

• Securing your ladder
  – Secure your ladder whenever possible to fixed points:
  – Tie both sides of the top of the ladder to a fixed point on the roof or other high surface near where you are working.
  – The bottom should be secured as well
  – Securing the ladder prevents the base from sliding, and prevents the ladder from sliding side to side or from falling backwards.
Protection from Fall Hazards III

Portable ladder hazards

– Proper selection of a ladder is critical in preventing falls and injuries.

– Always select a ladder that:
  ▪ Prevents overreaching
  ▪ Allows you to reach your work in a safe and controlled manner
  ▪ Allows you to position yourself without your belt buckle extending past the side rails
Protection from Fall Hazards III

Portable ladder hazards

• Positioning:
  – Improper positioning is also a leading cause of slips and falls from ladders.
  – Take the time reposition your ladder instead of over-reaching.
  – Never let laziness to move the ladder be the reason you don’t go home safe.

TIP: Go to: http://www.osha.gov/pls/imis/accidentsearch.html and search by keyword for additional examples
Protection from Fall Hazards III

Safe Ladder Use

- Ladder Access and Egress
  - Don't carry tools or other materials in-hand while climbing the ladder.
  - Take precautions when you are going up or down a ladder as missing a rung or step is a major cause of falls.
  - Instead of carrying tools, boards, or other materials in your hands:
    - Use a tool belt
    - Install a rope and pulley system, or
    - Tie a rope around your materials and pull them up once you have reached the work surface.
  - Ask for help to ensure you stay safe while working on a ladder
- OSHA requires 3 points of contact when ascending or descending a ladder.
Protection from Fall Hazards IV

Scaffold Systems

• “Scaffold Work Can Be Dangerous: Know the Basics of Scaffold Safety”
  – There are thousands of scaffold-related injuries – and about 40 scaffold-related deaths every year in the U.S.
  – If you are doing work on scaffolds, know how to work on them safely – it could save your life!
Protection from Fall Hazards IV

Scaffold Systems

• A competent person must be available to direct workers who are constructing or moving scaffolds.
  – The competent person must:
    • Train workers
    • Inspect the scaffold and its components before every work shift and after any event that could affect the structural integrity of the scaffold.
    • Be able to identify unsafe conditions and be authorized by the employer to take action to correct unsafe conditions to make the workplace safe.
  
• A qualified person, someone who has very specific knowledge or training, must actually design the scaffold and its rigging.
Scaffold Systems

- Design Specifications
  - Every supported scaffold and its components must support, without failure, its own weight and at least four times the intended load.
  - The intended load is the sum of the weights of all personnel, tools and materials that will be placed on the scaffold.
  - Never load a scaffold system with more weight than it can safely handle or catastrophic results are imminent.
Protection from Fall Hazards IV

Scaffold Systems

• **Supporter Scaffolds**
  – Supported scaffolds, working platforms/decks must be planked close to the guardrails.
  – Planks are to be overlapped on a support at least 6 inches, but not more than 12 inches.
Scaffold Systems

• Supported Scaffold Inspections
  – Inspections of supported scaffolds must include:
    • Checking metal components for bends, cracks, holes, rust, welding splatter, pits, broken welds and non-compatible parts
    • Covering and securing floor openings and labeling floor opening covers
Protection from Fall Hazards IV

Scaffold Systems

• Suspended Scaffolds
  – Each rope on a suspended scaffold must support the scaffold’s weight and at least six times the intended load.
  – Scaffold platforms must be at least 18 inches wide and guardrails and/or personal fall arrest systems must be used for fall protection any time you are working 10 feet or more above ground level.
  – Guardrails must be between 39 and 45 inches high, and midrails must be installed approximately halfway between the toprail and the platform surface.
Scaffold Systems

• Suspended Scaffolds
  – OSHA requires that all workers have fall protection when working on suspended scaffolds that are 10 or more feet above the ground.
  – OSHA also requires:
    • The use of a guardrail OR a personal fall arrest system
    • BOTH a guardrail AND a personal fall arrest system when working on a single-point or two-point suspended scaffold.
    • A personal fall arrest system when working on an aerial lift.
Protection from Fall Hazards IV

Scaffold Systems

• Suspended Scaffolds
  – Lifelines must be tied back to a structural anchorage capable of withstanding 5,000 lbs. of dead weight per person.
  – Attaching your lifeline to a guardrail, a standpipe or other piping systems will not meet the 5,000 lb. requirement and is unsafe.
Protection from Fall Hazards IV

Scaffold Systems

• Scaffold Access
  – Your employer must provide safe access to the scaffold when a platform is more than 2 ft. above or below the point of access, or when you need to step across more than 14 inches to get on the platform.
  – Climbing on cross braces is not allowed!
  – Ladders, stair towers, ramps and walkways are acceptable means of providing safe access.
the worker is 6 feet tall and the trench is over 10 feet deep... there should be barricading around the perimeter to warn others of the fall hazard and all employees should be trained in and using a personal fall arrest system for their protection.
Training Requirements

• Your employer must provide you with
  – Training on how to use equipment (like ladders) that exposes you to fall hazards
  – Training on how to recognize fall hazards and how to mitigate or minimize fall hazards
  – Training on scaffolds and whenever required to work at heights of 6 ft. or more
Protection from Fall Hazards IV

Fall Protection Basics

• Understand your company’s written fall protection plan.
• Attend and participate in fall prevention training.
• Use fall protection equipment if required for the job. Be sure the equipment is right for the task, fits properly and is in good condition.
• Inspect fall protection equipment and devices before each use.
• Make sure that floor holes, open shafts and leading edges are protected by sturdy guardrails or covers.
• Get specialized training before working on scaffolds, lifts or ladders.
Protection from Fall Hazards IV

Fall Protection Guidelines

• When using scaffolds, make sure there is proper access, full planking, stable footing, and guard railing.
• Keep your feet firmly on the platform on a boom lift and tie-off at all times.
• Choose the correct ladder for the task, read the instructions and be sure that the ladder is in good condition. Check for surrounding hazards, stable footing and the proper angle.
• Identify skylights and make sure they are properly protected.
• Contact your supervisor if you see hazards or have any questions about fall prevention. Do not work until unsafe conditions have been corrected.
Employer Fall Prevention Requirements

- What is my employer required to do to protect workers from falls?
  - Provide fall protection
  - Ensure proper scaffold erection
  - Ensure safe ladder selection and use
  - Conduct worksite maintenance
  - Provide training
Employer Fall Prevention Requirements

Provide Fall Protection

• Employers are required
  – To assess the workplace to determine if the walking/working surfaces on which you work have the strength and structural integrity to safely support workers.
  – You are not permitted to work on those surfaces until it has been determined that the surfaces have the strength and structural integrity to support all workers.
Provide Fall Protection

- Attachment/Anchorage Points
  - Employers must:
    - Identify and evaluate attachment points to ensure they are adequate
    - Ensure workers are connecting properly
    - Ensure workers know how to properly don and inspect the equipment
Employer Fall Prevention Requirements

Provide Fall Protection Rescue

• Fall Protection Rescue
  – OSHA requires employers to provide for “prompt rescue of employees in the event of a fall or shall assure that employees are able to rescue themselves.”
  – This includes identifying rescue procedures that address the potential for suspension trauma or orthostatic intolerance.
  – Click on the link to see OSHA’s Suspension Trauma Safety and Health Information Bulletin for additional information.

Employer Fall Prevention Requirements

Scaffold Construction

- Employers must
  - Construct all scaffolds according to the manufacturer’s instructions.
  - A “competent person” must supervise as scaffolds are erected, moved, taken apart or changed, and must inspect the scaffolding.
  - A guardrail system or a personal fall arrest system is required for scaffolds more than 10 ft above a lower level.
  - In addition, employers must provide safe access to scaffold platforms.

**TIP:** OSHA defines a “competent person’ as “one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to workers, and who has authorization to take prompt corrective measures to eliminate them.”
Employer Fall Prevention Requirements

Supported Scaffold Safety

• Scaffold user training must include:
  – The hazards of type of scaffold being used
  – Maximum intended load and capacity
  – Recognizing and reporting defects
  – Fall hazards
  – Electrical hazards including overhead lines
  – Falling object hazards
  – Any other hazards that may be encountered
In Review

Fall Protection Equipment

• Boom Lifts
  — Fall protection is required at all times when operating or working from a boom or aerial lift.
  — Never tie off outside of a boom or aerial lift, always inside to a rated anchorage point designed by the manufacturer.
In Review

Personal Fall Arrest Systems (PFAS)

• PFAS consists of full body harness, lanyard and an anchorage system.

• Inspect daily before use

• Treat your fall protection equipment with care; your life depends on it!
Snap-hooks & Carabineers

- Snap-hooks and Carabineers must be of the locking type with a self-closing, self-locking keeper which remains closed and locked until unlocked and pressed open for connection or disconnection.
Lanyards

- Lanyards must be made of ropes, straps or webbing made from synthetic materials.
- **Lanyard Types:**
  - **Rope Lanyard:** Offers some elastic properties for all arrest; used for restraint purpose.
  - **Web Lanyard:** Ideal for restraint purposes where fall hazards are less than 2 feet.
  - **Cable Positioning Lanyards:** Designed for corrosive or excessive heat environments and must be used in conjunction with shock absorbing devices.
  - **Shock Absorbers:** When used, the fall arresting force will be greatly reduced if a fall occurs.
In Review

Lanyards:

• 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 5,000 lbs.
Retractable Lanyards

• Automatically limit free fall distance to 2 ft. or less
• 3,600 min. tensile strength
• No shock absorber needed
• Swing fall hazard possible
Anchorage Points

• Anchorages used for attachment of personal fall arrest equipment shall be independent of any anchorage being used to support or suspend platforms and be capable of supporting at least 5,000 lbs. per connected employee.
In Review

Improper Anchorage Points... don’t become an anchorage point dummy!
In Review

Vertical Lifelines

- Vertically suspended flexible lines connected to a rated anchorage point
- Minimum tensile strength is 5,000 lbs.
- Multiple workers require multiple lines.
- Devices used to connect must be capable of locking in both directions.
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.

• Competent person should evaluate the use of retractable lanyards when used on a horizontal lifeline due to the possibility of it releasing after a fall arrest.
Positioning Systems

• Consist of full body harness allowing worker to be supported on vertical or inclined surface

• Allows worker to work with both hands

• Requires separate Fall Protection System
Restraint Systems

- Prevent the user from reaching areas where free fall could occur.
- Anchorage strength = 3,000 lbs.
- Designed by qualified person for fall protection.
- Used only on sloped surfaces equal or less than 4:12 slope.
Deceleration Device

• A Deceleration Device is any mechanism, such as a rope grab, rip-stitch lanyard, specially-woven lanyard, tearing or deforming lanyards, automatic self-retracting lifelines/lanyards, etc., which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limits the energy imposed on an employee during fall arrest.

• Sleeve, cable or rope attached to a fixed ladder over 20 ft. high

• Anchorage strength = 3,000 lbs.

• Free fall not to exceed 2 ft.
During this lesson, you have been given an overview of major fall hazards, ways to protect yourself, and what employers must do to protect workers from fall hazards.
Summary

• Thank you so much for your time, attention, and involvement in the session.
  – Important references/sources for this course can be found by clicking on the Safety Tip.
  – These references and sources of information can be helpful as you continue your pursuit of construction safety and health and Fall hazards and prevention.