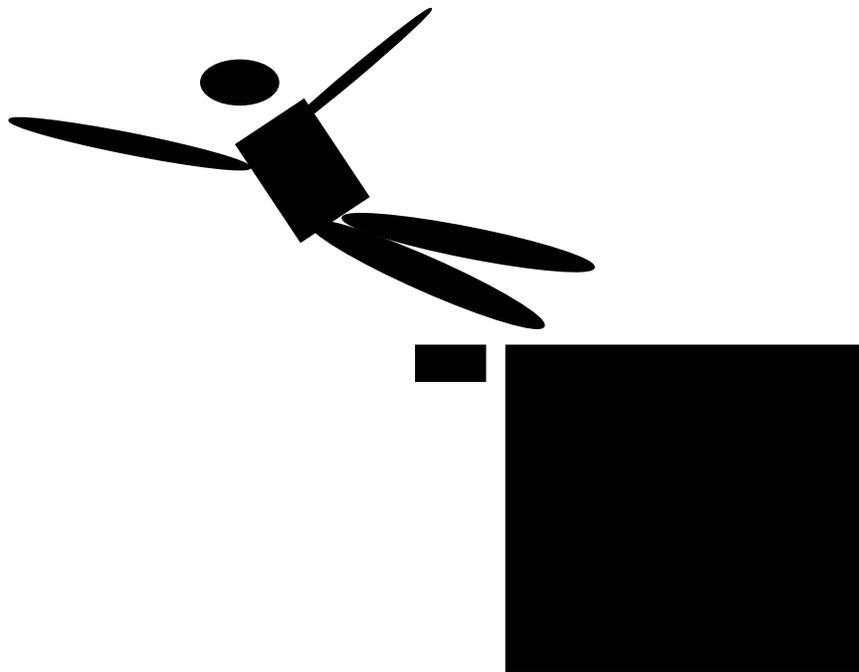


National Park Service  
Historic Preservation Training Center



Fall Protection Awareness  
Participant Guide

**September 29, 2004**  
**1:00-4:00 PM Eastern Time**

*PRESENTED BY:*



The Maryland Fire and Rescue Institute, University of Maryland College Park developed the Introduction to Fall Protection safety program to introduce employees to the nature of fall hazards; the use and inspection of fall protection systems; the role of the “competent person” in the workplace; and the knowledge necessary to identify safe practices in the fall protection environment.

Special Programs Section  
Maryland Fire and Rescue Institute  
University of Maryland College Park

**UNIVERSITY OF MARYLAND**  

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**MARYLAND FIRE AND RESCUE INSTITUTE**

## WELCOME...

Welcome to this TEL (Technology Enhanced Learning) training event. We are excited that you will be joining us today for *Fall Protection Awareness*. We look forward to helping you to get as much out of this time as possible.

We purposely keep the class size small to assure that if you have a question, there is time to get it answered. Don't hesitate to ask—if you have a question, there are probably several others in the class who have the same question—you might as well be the one to ask! It is our goal that you leave class today with no unanswered questions.

## HOW TO INTERACT WITH THE INSTRUCTOR

We encourage you to ask questions and share your comments with the instructors throughout this TELNPS course. If you were physically in the classroom with the instructor, you would raise your hand to let her/him know you had a question or comment. Then you would wait for the instructor to recognize you and ask for your question. We are all familiar with that “protocol” for asking questions or making comments. With TELNPS courses there is also a “protocol” to follow to ensure that you can easily ask questions and others can participate as well. It may seem a little strange at first asking a question of a TV monitor. Remember, it is the instructor you are interacting with and not the monitor. As you ask more questions and participate in more TELNPS courses, you will soon be focusing only on the content of your question and not the equipment you are using to ask it.

As part of the TEL station equipment at your location, there are several push-to-talk microphones. Depending on the number of students at your location, you may have one directly in front of you or you may be sharing one with other students at your table.

**When you have a question, press and hold down the push-to-talk button, maintaining a distance of 12-18 inches, and say, “Excuse me [instructor’s first name], this is [your first name] at [your location]. I have a question (or I have a comment).”**

Then release the push-to-talk button. This is important. Until you release the button, you will not be able to hear the instructor. The instructor will acknowledge you and then ask for your question or comment. Stating your name and location not only helps the instructor, but also helps other students who are participating at different locations to get to know their classmates.

## OVERALL COURSE OBJECTIVE

Given an opportunity to discuss and question current regulations and informational sources, explain the impact falls have on health and safety in the workplace and identify the principle measures available for their elimination, so that students apply fall protection provisions of OSHA standards towards the elimination of serious injury caused by falls in the workplace.

## COURSE OUTLINE

- Introduction
- Background of regulations
- Definitions and explanations of:
  1. Fall arrest/physics of falls
  2. Slips, trips and falls
  3. Leading edge
  4. Dangers in your workplace (local discussion)
- Developing Fall Protection Programs
  1. Hazard Identification
  2. Competent and Qualified Persons
  3. Hierarchy of Controls
    - Engineering
    - Administrative
    - PPE
  4. Hazard Analysis
  5. Program/Policy
  6. Training
- Identification and inspection of equipment
  1. Harnesses
  2. Hardware
  3. Arrest devices (lanyards, retractors, etc.)
  4. Inspection of your equipment (local discussion)
- Anchorage points and system installation
  1. Manmade
  2. Natural
  3. Engineered
- ‘After the fall’ issues, self rescue possibilities, emergency services intervention
- Answers to frequently asked questions (FAQ’s)



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**Overview**  
General Statistics

Fatalities: Falls and Falling Objects

NPS Lost Time Injuries: 1334 cases of slips trips and falls in 2003 = 31% of total reportable injuries!



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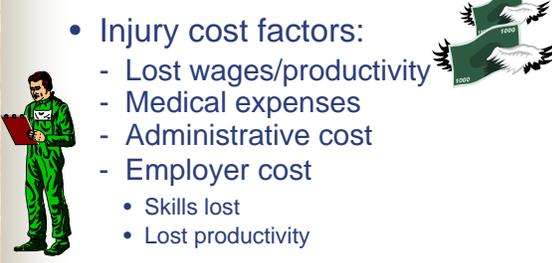
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## Impact on Business/Personal Loss

- Injury cost factors:
  - Lost wages/productivity
  - Medical expenses
  - Administrative cost
  - Employer cost
    - Skills lost
    - Lost productivity




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## Impact on Business/Personal Loss (cont'd.)

- Worker's compensation cost
  - NPS paid \$4.5 million in 2003 for slips, trips and falls
- Third party claims
  - Lawsuits
- Regulatory fines
- Pain and suffering/loss of loved one




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## Physics of Slips, Trips & Falls

- Contributing factors:
  - Friction-resistance between two surfaces
  - Momentum-relationship to speed and size
  - Gravity-forces pulling you towards the ground

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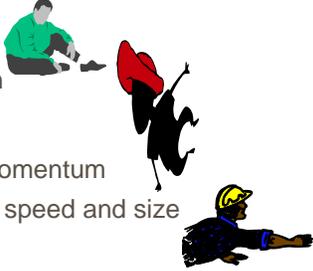
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## Physics of a Fall

- Slips
  - Loss of traction
- Trips
  - Uncontrolled momentum
  - Relationship to speed and size
- Falls
  - Moving off center beyond point of recovery



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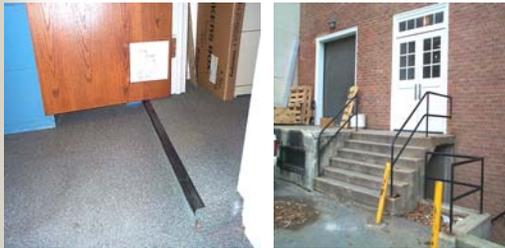
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## Trips-



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## Falls-



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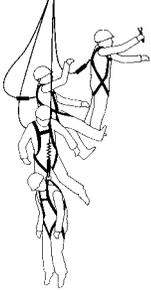
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**Calculating Fall Clearances**

$C = H - X + L + D + K$

X=Height of anchor point above standing surface  
H=Height of D-ring on persons body harness  
L= Length of lanyard  
D=Deceleration distance  
K=The stretch factor for the system

Maximum arresting force is 1800 pounds




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**Overview of current and Proposed Regulations**

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**History**

- General duty clause – public law 91-596, December 1970
- General industry – proposed 1990
- Construction industry - 1995
- Steel erection – January 2002
- Scaffolds - 1996

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## Sources of Information

•Federal Register-Vol. 55, No 69/ April 10, 1990



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## Sources of Information

•Code of Federal Regulations



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## Sources of Information

### ■ Internet

- <http://inside.nps.gov> "Safety, Health & Workers' Compensation" link under "Reference Desk"
- <http://www.osha.gov>
- Laws and Regulations
- OSHA Regulation (Standard 29 CFR)
  - Part 1910- General Industry
  - Part 1915- Ship Yard
  - Part 1926- Construction Industry
  - CFR 29-1926-Subpart M- Fall Protection

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## Sources of Information

- <http://www.osha.gov>
- CFR= Code of Federal Regulations
- 29 = Department of Labor
- Part 1926= Construction Standard
- Subpart M = Fall Protection (500-503)
- Subsection 502(b)= Guardrails

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## Sources of Information

**Publications-** Government Printing Office



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## Sources of Information

- Consultation



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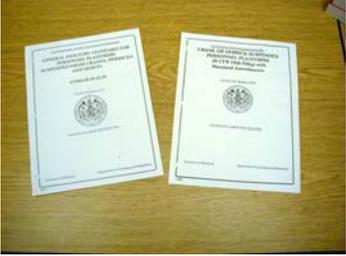
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## Sources of Information



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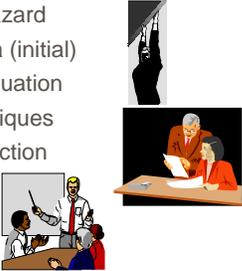
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## Rescue Considerations

- **Rescue Team/Rescue Service Evaluation**
  - Analysis of the hazard
  - Evaluation criteria (initial)
  - Performance evaluation
  - Self-rescue techniques
  - Review and correction



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## Review:

- Statistical overview of falls
- Physics of slips, trips, and falls
- Introduction to standards
- Informational resources
- Rescue considerations

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### Developing a Fall Protection Program

- Preparatory steps:
  - Identify the hazards
    - Competent person
    - Qualified person
  - Evaluate the hazards
  - Determine the appropriate protection control method



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### Designing in Fall Protection

- Starts at the planning stage in new construction
- Existing structures:
  - Review history of fall incidents
  - Do a hazards survey
  - Design means of limiting free fall incidents
    - This includes falling object hazards



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## Analyze the Hazard

- Establish equipment/systems policies
- Develop reporting methods
- Develop a review procedure
- Develop a rescue procedure
  - Communications
  - Evaluation of outside services
  - Determine need for rescue team based on equipment failure, history, and near misses.



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## Policies Stated and Enforced

- Firm policies must be stated and enforced to assure compliance.
- Contractors and sub-contractors must be challenged to comply.
- Workers must be monitored.
- Infractions should be penalized.

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## Dispelling Myths and “Macho” Attitudes

- Equally apply to men and women.
- Peer pressure
- Workers only die from falls of great heights.
- Can't be done practically
- Fall protection restricts mobility
- “I've done it a thousand times.”
- Falls only happen to the other guy.



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## Develop Training Program

- The minimum training program should include:
  - Types of equipment used, and what devices should be used in various situations.
  - Procedures for assembly, storing, inspecting, and securing equipment and materials.
  - Rescue procedures



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## Review:

- Requirements for developing a fall protection program.
- Discuss and identify a Job Hazard Analysis
- Develop programs for training employees who may be exposed to fall hazards in the workplace
- Duties of the competent person and the qualified person.
- Training role of the competent person and the qualified person in the employer's training program.

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# Fall Protection Systems

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- ## Fall Protection Systems
- Engineered systems - designed
    - Guardrails – 1926.502(b)
    - Safety nets – 1926.502(c)
    - Anchors – permanently installed – 1926.502(d)(15)
    - Covers – 1926.502 (i)
    - Canopies and toeboards – 1926.502(j)
    - Ladder safety devices – 1926.1053
    - Ladder cages – 1926.1053(a)(20)

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## Engineered Systems

Guardrails- 1926.502(b)



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**Engineered Systems**  
**Permanently Fixed Anchor-**  
**1926.502(d)**

Horizontal Rail Carrier System  
 Passive System




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**Engineered Systems**  
**Covers – 1926.502 (i)**




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**Engineered Systems Ladder**  
**Climbing Device** 1926.1053 (a)(22)

Positive fall control system  
 Totally passive device  
 Arrest free fall in 2 feet or less  
 9 inches maximum attachment between harness and device  
 Rail or wire installation




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## Engineered Systems Ladder cages - 1926.1053(a)(20)



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## Personal Fall Protection Systems

- **Personal fall arrest systems:**
  - Passive systems.
  - Consist of an anchorage, lanyard (connecting means), full body harness (body holding device).
  - Other components include shock-absorbing lanyards, deceleration devices, lifelines, or a combination of these devices.

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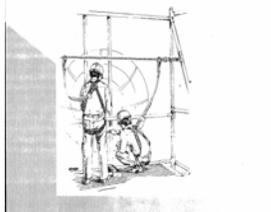
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## Personal Fall Arrest System

Full body harness  
Shock absorbing lanyard  
Anchorage



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## Anchorages

- Natural
- Man-made
- Preparation
- Masonry and wood
- Contaminants
- Anchor connections
- Anchor straps and webbing
- Trolley
- Beam Clamps
- Nailed on anchorage
- Anchor location

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## Connecting Devices

- Snaplocks & carabiners
- Self-retracting lifeline
- Lanyards
- Climbing devices
  - Vertical lifeline and rope/cable grabs
  - Fixed rail systems (vertical and horizontal)

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## Body Holding Devices

- Full body harness – Class III harness
  - Fall arrest or positioning device
- Body belt – Class I harness
  - Positioning device only
    - Consist of a body holding device and an anchorage
    - Used only when no free-fall is possible

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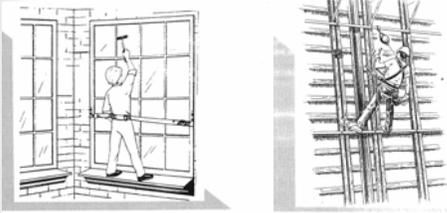
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## Positioning Devices



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## Other Fall Arrest System Components

- Shock absorbing lanyards
- Vertical lifelines
- Horizontal lifelines
- Self-retracting lifelines
- Rope grabs

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## Use of Non-Conventional Systems

- Warning lines – 1926.502(f)
- Controlled Access Zones – 1926.502(g)
- Safety Monitoring Systems – 1926.502 (h)
- Fall Protection Plan – 1926.502(k)

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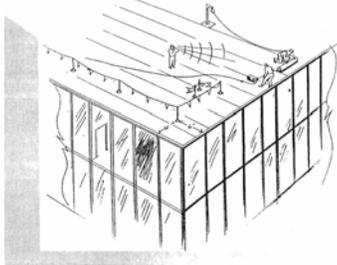
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### Warning Line and Monitoring System-



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### Inspection

- Inspected before and after each use
- If shock loaded:
  - Tagged and placed out-of-service until inspected and approved by a qualified person or:
    - Destroyed, or
    - Returned to manufacturer for recertification

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### Care and Maintenance

- Wash in clear water
- Stored properly out of strong sunlight
- Dry thoroughly before storing
- Never oil unless manufacture requires it
- Follow the manufacturer's recommendations

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## How the Personal Fall Arrest System Works

- Physics of the System:
  - Free fall- Maximum 6 feet
  - Deceleration distance- Limited to 3.5 ft.
  - Arresting forces- Maximum 1,800 lbs.

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## Limitations of Personal Fall Protection Systems

- **Components of the system at work:**
  - Anchors
  - Swing fall (pendulum action)
    - What it is and how to avoid it
  - Striking the lower level avoidance
    - Calculating maximum distance to impact
  - Methods for reducing the shock load

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## Review:

- Described and Identified engineered systems.
- Identifies the components and operating limits of personal fall protection systems.
- Identified components of personal fall arrest systems.
- Identified components of other fall arrest systems and their use.
- Identified and discussed the functions and limitations of non-conventional systems.
- Discuss and demonstrate the inspection, care, and maintenance of fall protection equipment.
- Described how personal fall arrest systems operate.

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# Leading Edge Safety

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**Definition of Leading Edge**

- Edge or floor, roof, or form work for a floor, or other walking or working surface which changes location as work continues. The unprotected side and edge.

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**Leading Edge Fall Protection Requirements**

- Unprotected side and edge:
  - Threshold 6 feet or greater.
    - Guardrail System, or
    - Safety Net System, or
    - Personal Fall Arrest System

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### Leading Edge Fall Protection Requirements

- Leading edge (engaged in work):
  - Threshold 6 feet or greater.
    - Guardrail System, or
    - Safety Net System, or
    - Personal Fall Arrest System
    - Exception – 502(k)

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### Leading Edge Fall Protection Requirements

- Leading edge (not engaged in work):
  - Threshold 6 feet or greater.
    - Guardrail System, or
    - Safety Net System, or
    - Personal Fall Arrest System
    - Controlled Access Zone (CAZ), or
    - Control line in lieu of guardrail (warning line)

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### Leading Edge Fall Protection Requirements

- Hoist area (open)
  - Threshold 6 feet or greater.
    - Guardrail System, or
    - Safety Net System, *and*
    - Personal Fall Arrest System

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## Leading Edge Fall Protection Requirements

- Holes
  - Threshold 6 feet or greater.\*
    - Guardrail System, or
    - Personal Fall Arrest System
    - Covers (\*required at any height where a danger of tripping into or through, or where objects might fall through to a lower level.)

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## Review:

- Define leading edge in the construction industry.
- Discuss the changing nature of leading edges in the construction workplace.
- Discuss the hazards of working near or at unprotected sides and edges.
- Discuss the use of Controlled Access Zones, Guardrails, Warning Lines, and the concept of developing a fall protection plan.
- Demonstrate basic figure eight knots and their uses in fall.
- Demonstrate techniques for the anchoring of positioning devices and fall arrest systems.

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