New Fall Protection Code/Standards and Comparison with Navy FP Requirements

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Presentation Outline

- Introduction – Fall mishap statistics
- Existing Regulations and standards
- Fall Protection Systems
- New FP Code/Standards Update and Changes
- Comparison with Navy FP Requirements
- New ANSI projects
- Handouts

Introduction

- Falls are the leading cause of work related injuries and fatalities
- Three fall fatalities occur every work day in the US
- Over 300,000 injuries annually
- Account for 14% of all fatalities at work places
- More than half of fall fatalities occurred in the general industry
- Most cited violation by OSHA
- Fall mishaps can be prevented

CONUS Fatal Occupational Injuries (BLS)

Type of exposure	2005	2006
1. Transportation incidents	2493	2413
2. Contact w/objects & equipment	1005	983
3. Falls	770	809
Same level falls	84	59
4. Assaults and violent acts	792	754
5. Exposure to harmful substances or environments	501	525
Contact w/electric current	251	247
6. Fires and explosion	159	201

Navy Civilian & Military Fatalities FY90-02 (Excluding Transportation and Aviation Fatalities)

Falls	52
Drowning	42
Heart Attack/cardiac arrest	40
Impact/crash with equipment or objects	35
Fatal burn	18
Fatal crash/aircraft	14
Electric shock	12
Collapsed during or after training	9
Fatal atmosphere	8
Fire	3
Gunshot	3
Unknown cause	2
Explosion	1
Total	239

All Types of fall mishaps within the Navy for FY02, 03 and first 6 months of 04

- Same level falls or falls thru ---------- 3,529
- walkways and other surfaces
- Falls to lower level ---------- 831
- Falls down stairs ---------- 462
- Falls from/onto equipment ---------- 419
- Structures or objects
- Walking without incident but injured- 207
- Falls from ladders ---------- 197
- Falls from moving and non ---------- 144
- moving vehicles
- Falls on/from ship or boat ---------- 47

Total 5,836

*Note: Data source is the Naval Safety Center

How long does it take to Fall

Height (feet)	Time (seconds)
4	0.5
16	1.0
36	1.5
64	2.0
100	2.5
144	3.0

Applicable OSHA and Navy Fall Protection Standards/Regulations/Requirements

Navy Personnel shall comply:

- OPNAVINST 5100.23G, Ch 13, FP Program
- 29 CFR 1910 - Occupational Safety and Health Standards for general industry
  - Subpart D - Walking working surfaces
  - Subpart F - Powered Platforms, Man-lifts and Vehicle Mounted Work Platforms
    - ⇨1910.66 Appendix C – Personal Fall Arrest System
- Notices of Proposed Rulemaking, 29 CFR 1910 (1990) - Walking and Working Surfaces and Personal Protective Equipment (FP Systems)

OSHA/Navy Fall Protection Standards/Regulations (continued)

- 29 CFR 1915 – OSH Standards for Shipyard Employment
- 29 CFR 1960 – Basic Program Elements for Federal Employees OSH Program

Navy Contractors shall comply:

- USACE EM 385-1-1 Safety and Health Requirements Manual
- 29 CFR 1926.500 – (Subpart M) FP in Construction

Existing ANSI Fall Protection Standards

General Industry

- ANSI Z359.1: Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components
- ANSI A1264.1: Safety Requirements for Workplace Walking/Working Surfaces and Their Access, Workplace Floor and Wall Openings, Stairs and Guardrail Systems

Construction Industry

- ANSI A10.32: Personal Fall Protection used in Construction and Demolition
- ANSI A10.14: was withdrawn
- ANSI A14.3: Safety Requirements for Fixed Ladders

FP Requirements

- **Each employee on a walking working surface with unprotected side or edge, shall be protected from falling to lower level by the use of guardrail, safety net, personal fall arrest system or the equivalent**

- **Trigger height for providing fall protection**
  - ✓ **OPNAVINST 5100.23G ---------- 4 ft**
  - ✓ **29 CFR 1910 General Industry ----- 4 ft**
  - ✓ **29 CFR 1926 FP in Construction -- 6 ft**
  - ✓ **USACE EM 385 Manual ---------- 6 ft**
  - ✓ **29 CFR 1915 Shipyards ---------- 5 ft**

Or falling from any height onto dangerous equipment, hazardous environment or onto an impalement hazard

FP Program Requirements

- **Every Command which has personnel exposed to fall hazards is required to establish a managed Fall Protection Program as per:**
  - ✓ **OPNAVINST 5100.23G: Navy Safety and Occupational Health Program Manual**
    - ✓ **Navy FP Guide for Ashore Facilities**
  - ✓ **NAVFACINST 5100.11J: S&H Program Manual**
  - ✓ **ANSI Z359.2 (New): Minimum Requirements for a Comprehensive Managed FP Program**

Components of FP Program Per OPNAVINST 5100.23G

- Activity policy
- Assigning responsibilities
- Surveying and assessing fall hazards
- Training
- Prevention and control measures
- Selection and use of FP systems and equipment
- Selection of safe anchorages
- Rescue procedures
- Mishap reporting
- Audits and evaluation

Fall-hazard Prevention and Control

Hierarchy or preferred order of control measures

- **Elimination - Removing the hazard from work place**
  - ✓ **Building a wall at an unprotected edge**
- **Prevention (traditional) - Same level barriers (guardrails, covers)**
- **Engineering controls**
  - ✓ **Design change or use different equipment or techniques such as aerial lift equipment**

Fall Hazard Prevention and Control (Continued)

Preferred Order of Control Measures (continued)

- Administrative controls
  - ✓ Correct way to set up ladders/warning line system
- Personal protective systems and equipment
  - ✓ Considered only if other control measures are not practical

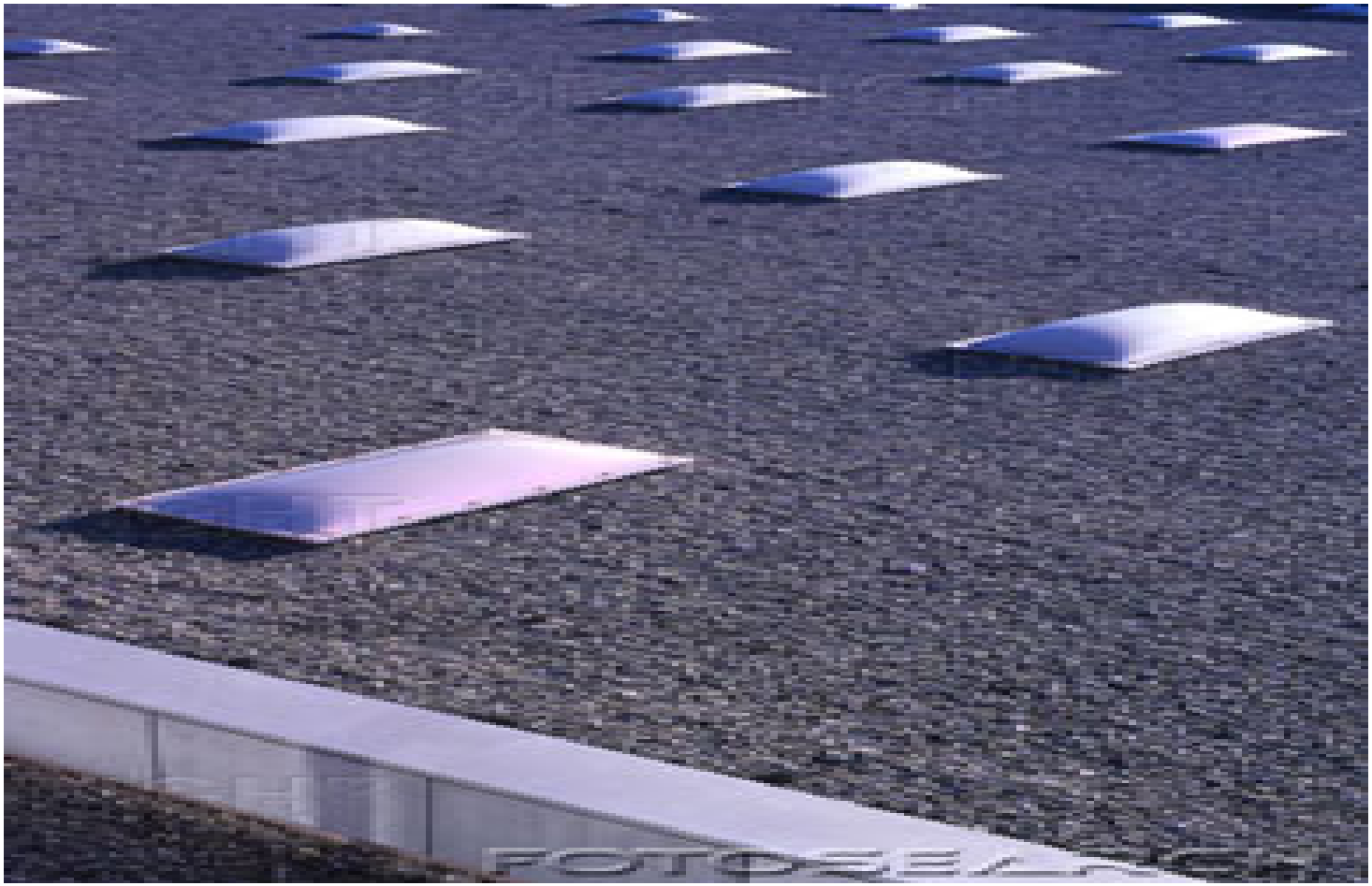
Fall Related Hazards

Examples of Fall Related Hazards

- **Unprotected sides or edges**

Examples of Fall Related Hazards (Continued)

- **Flat roofs w/no parapets or guardrails**



Examples of Fall Related Hazards (Continued)

- **Locating equipment at roof edges w/no guardrails or other means of fall protection**

Examples of fall related hazards (continued)

- **Servicing water valves, meters and instrumentation at high locations**

Examples of fall related hazards (continued)

Climbing and maintaining communication or water towers

Examples of fall related hazards (continued)

- Aircraft maintenance
- Climbing fixed ladders
- Maintenance of projectors, cameras, flag poles on roofs or high places
- Working near hatches, openings and skylights
- Lighting fixture replacement hazard

Examples of fall related hazards (continued)

Crane Rail Inspection

Equipment maintenance

Examples of fall related hazards (continued)

- Window washing hazard

Examples of fall related hazards (continued)

- Maintenance work to be performed on top of elevator shafts and mechanical rooms
- Delivery of material, equipment and furniture to high locations
- Inspection and investigation work

Examples of fall related hazards (continued)

Confined space entry

Examples of fall related hazards to (continued)

Weapon Storage Facility

Fall Protection Systems

Prevention Systems

Guardrails, Work Platforms and Covers

(Passive fall protection systems)

Guardrail System

- **Guardrail system is installed at all open sided floors, openings and platforms where a person is required or permitted to work or pass**
- **Guardrail system consists of:**

• **Top rail**	**---**	**39-45 inches high**
• **Mid rail**	**---**	**21 inches high**
• **Posts**	**---**	**Spaced no more than 8 feet apart**
• **Toeboards**	**---**	**3 1/2 inches high**

Guardrail System (Continued)

Minimum Material of Construction:

- **Wood**
  - Top rail and posts (2X4),
  - Mid rail (1X6), toeboard (1X4)
- **Structural Steel**
  - ✓Top rail, mid rail and posts (2 in X 2 in X 3/8 in) angels
- **Pipe railing**
  - Top rail, mid rail and posts (1 ½ in nominal diameter, schedule 40 pipe)
- **Steel cable**
  - Toprail & midrail (1/4 in steel cable) flagged every 6 ft w/highly visible material

Guardrail System (Continued)

Strength requirements:

- ✓ **Top rail:** Shall withstand a force of 200 lbs applied 2 inches from the top in any outward or downward direction
- ✓ **Mid rail:** 150 lbs
- ✓ **Toe board:** 50 lbs

- ✓ Top rails shall not deflect more than 3 inches when a 200 lbs force is applied

1 Kilo Newton = 225 Pounds

Guardrails (Continued)

Covers

- **Install covers on any hole 2 inches or more in its least dimension in walking working surface such as floors, roof or other openings.**

- **Covers shall be capable of supporting without failure, at least twice the weight of the employee, equipment and material combined.**

Hatches

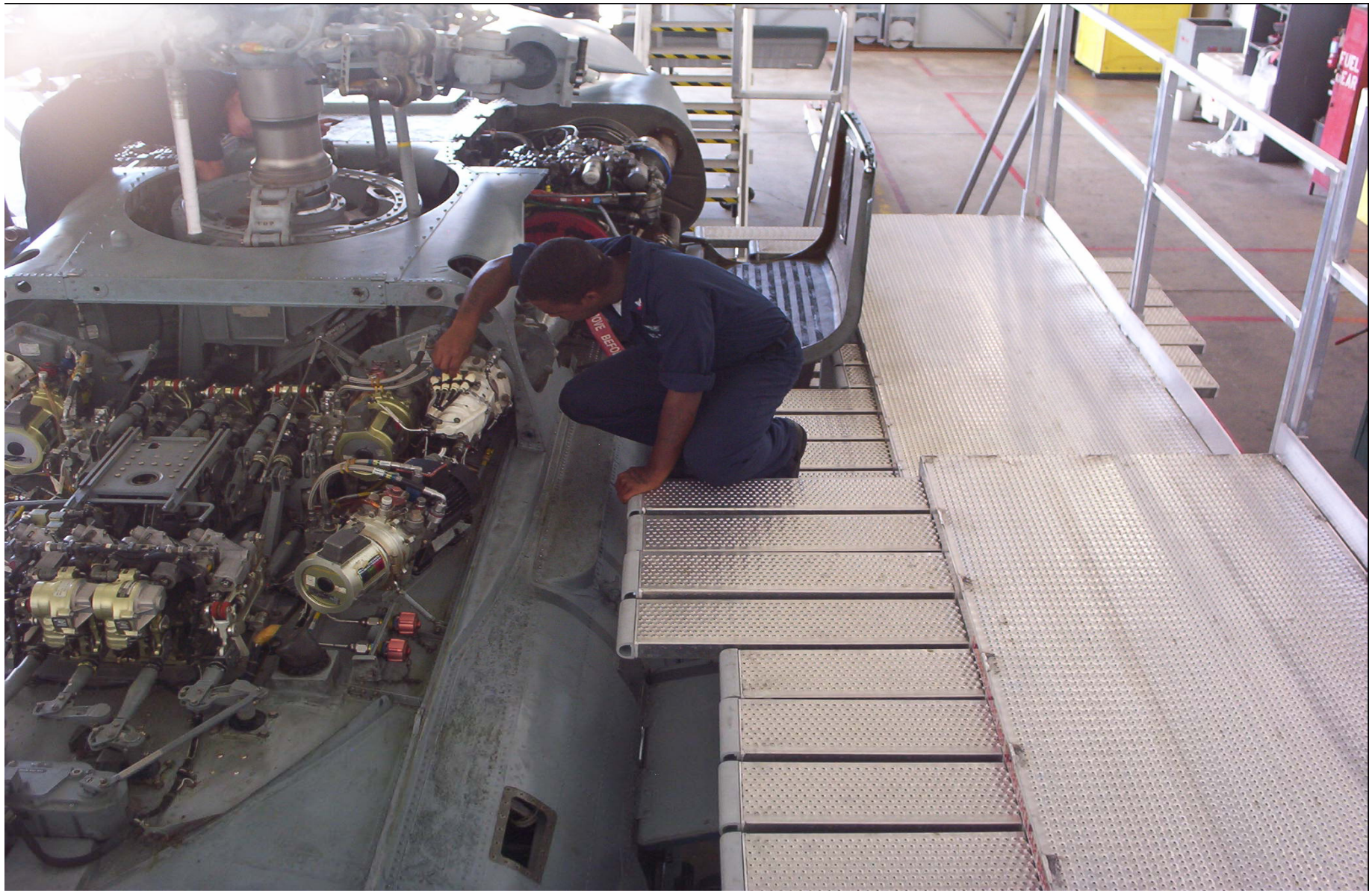
- Shall always be protected when opened

- If ladder is used to access thru the hatch, it shall extend at least three feet above the walking working surface

Work Platforms

When working from elevated work platform, it shall be equipped with standard guard rail or other FP system

Work Platforms



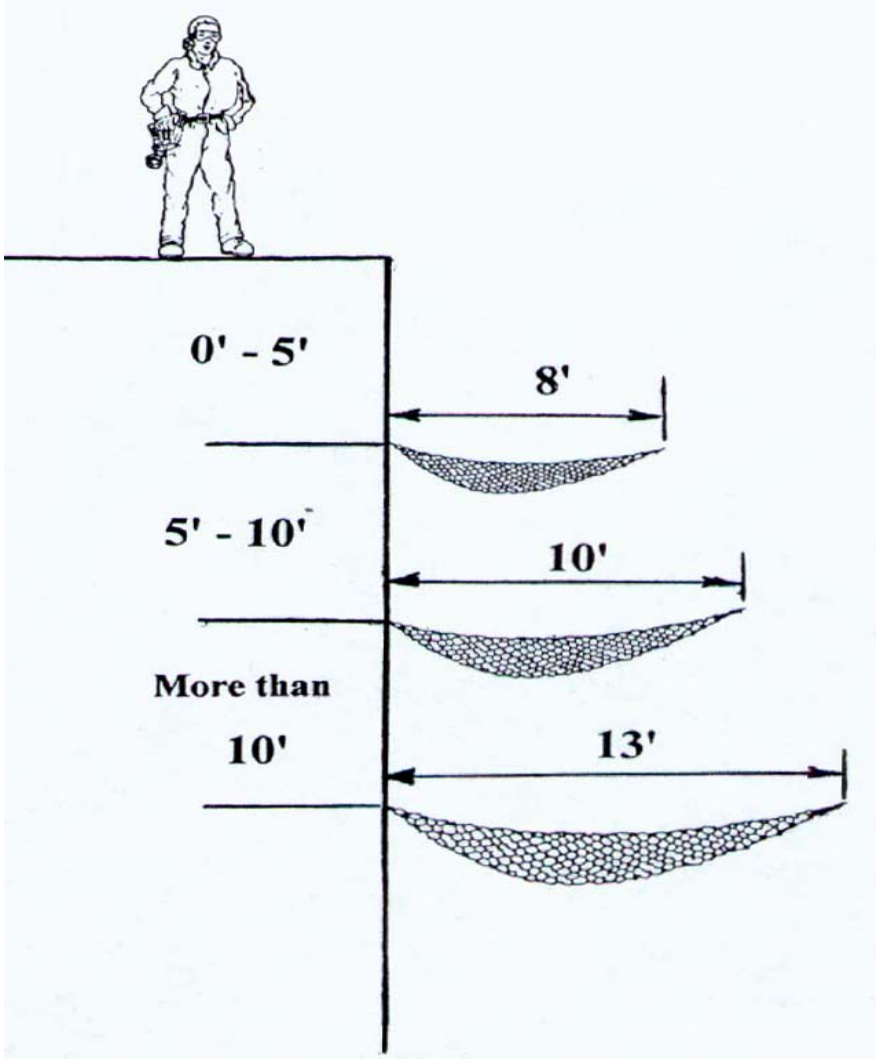
Walkways

Safety Nets

Safety Nets

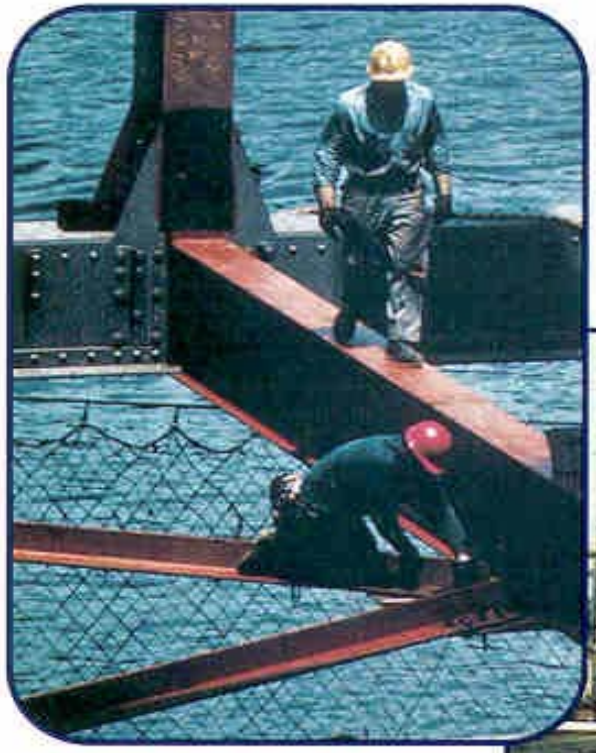
- **Installed as close as practicable under the walking/working surfaces**
- **Minimum breaking strength of 5,000 lbs for the border rope or webbing**
- **Tested and certified by a qualified person immediately after installation and at six months intervals w/400 lbs sand bag dropped from the same elevation a person might fall**
- **Maximum size of mesh opening not to exceed 36 square inches and no longer than 6 inches on any side**
- **Safety net standards – ANSI A10.11**

Safety Nets Outward Extension



Safety Nets (Continued)

Shall not be installed lower than 25 ft from the working surface



Inspection

- ✓ After installation
- ✓ At least weekly thereafter
- ✓ Following any repair or alteration
- ✓ With Documentation

Fall Arrest System

- Assembly of components and subsystems used to arrest a fall
- System Requirements
  - ✓Limit maximum arresting force on the body to 1,800 lbs, when using full body harness
  - ✓Max free fall distance of 6 ft
  - ✓Shall stop the fall with a deceleration distance of not more than 42 inches
  - ✓Prevent worker from contacting lower level or objects

Fall Arrest System (Continued)

Fall Arrest system -- Active System

Consists of:

- Anchorage system
- Connecting Means
- Body Support (full body harness)
- Rescue

Fall Arrest System

Anchorage System

Anchorage system consists of

- **Anchorage (hard point):**
  - ✓ **Can be a beam, column or any rigid part of structure or equipment**
  - ✓ **Shall withstand a minimum force of 5,000 lbs per person or designed by a qualified person for twice the maximum arresting force**
- **Anchorage connector:**
  - ✓ **A component intended for attaching personal fall arrest system to an anchorage**
  - ✓ **Withstands a force of 5,000 lbs**

Various Anchorage Connectors

Anchor strap w/Energy Absorber

Anchor Strap

Connecting Means

Method or subsystem to connect body support to an anchorage

- **Subsystems may include:**
  - ✓ **Energy absorber (shock absorbing lanyard) used to dissipate energy: A deceleration device made of rope, strap or webbing with snaphooks or carabiners at each end**
  - ✓ **Fall arrestor (rope/cable grab) connected to a lifeline or a rope lanyard, or**
  - ✓ **Self retracting lanyard**

Connecting Means (Continued)

Self Retracting lanyards

- A deceleration device
- Limit free fall distance to 2 ft
- Sustain a minimum tensile load of 3,000 lbs
- Inspection performed by the manufacturer
- Use only in vertical application (not designed for horizontal application)

Self Retracting Lanyard

Body Support

Full body harness:

- Straps connected together to distribute the arresting forces over the upper thighs, waist, shoulders, chest and pelvis with a Dorsal D-ring integrally attached at the upper back between the shoulders for attaching a lanyard to other components of the system
- Maximum arrest force on the body shall not exceed 1,800 lbs
- Max dynamic force for energy absorber is under 900 lbs **(Per ANSI Z359.1)**
- Breaking strength of the straps is 5,000 lbs

Lifelines

Horizontal Lifeline

- A fall arrest system that uses a flexible wire, rope or synthetic cable, spanned horizontally between two end anchorages, may include in-line energy absorber or lifeline tensioner turnbuckles and intermediate anchorages
- HLL shall be designed installed and used under the supervision of a qualified person as part of a complete fall arrest system which maintains a safety factor of at least two
- Depending on the angle of sag and the line's elasticity, the forces generated by a fall are greatly amplified at the anchorages
- Presently there are no US standards for HLL

Horizontal Lifeline (continued)

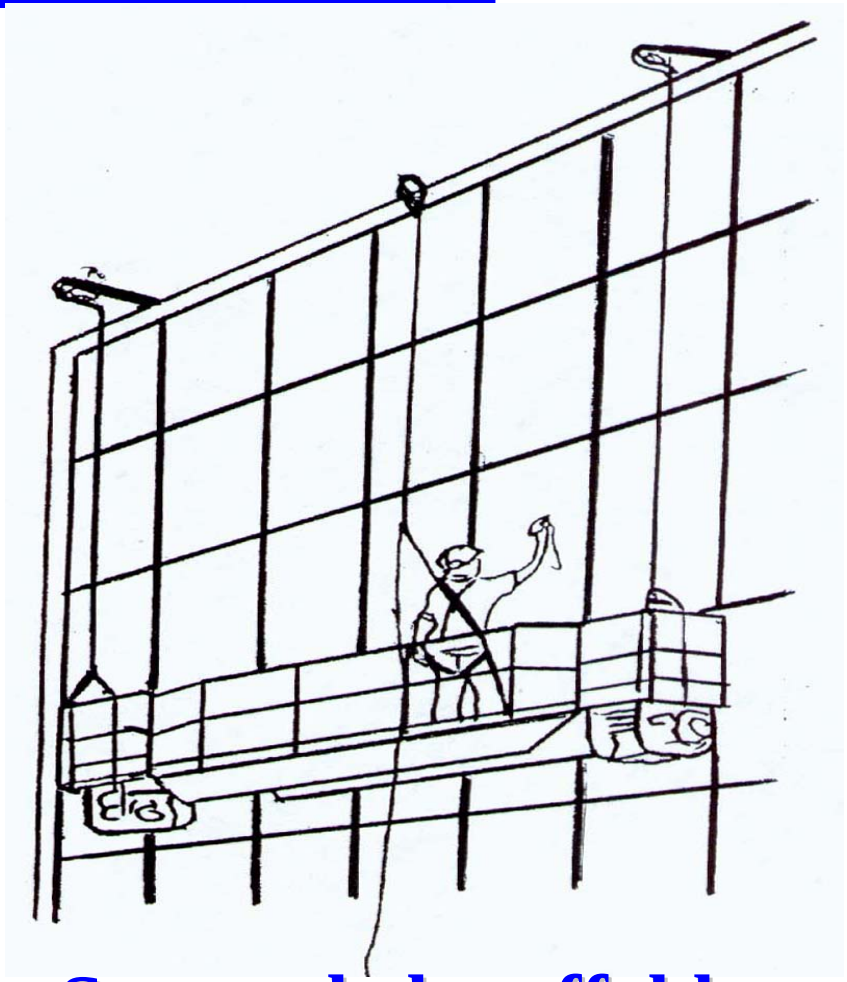
Horizontal Lifeline (continued)

Vertical Lifeline

- A vertically suspended flexible line with a connector at the upper end for tying it to an 5,000 lbs overhead anchorage along which a fall arrestor (rope grab) travels

- Vertical lifeline shall have a minimum tensile strength of 5,000 lbs

- Each employee shall be attached to a separate lifeline system



Suspended scaffold w/independent vertical lifeline

Vertical Lifeline

Work Positioning and Travel Restraint System

Work Positioning System

- A combination of FP equipment that permits the user to have both hands free while supported on an elevated vertical work surface (e.g. rebar assembly, towers or poles)
- System Requirement
  - ✓Limit free fall distance to 2 ft
  - ✓Secured to an anchorage capable of supporting at least twice the potential impact load of an employee fall or 3,000 lbs whichever is greater

Work Positioning Systems (Continued)

Positioning system

Positioning system

Travel Restraint System

A system that prevents a worker from reaching an unprotected side or edge

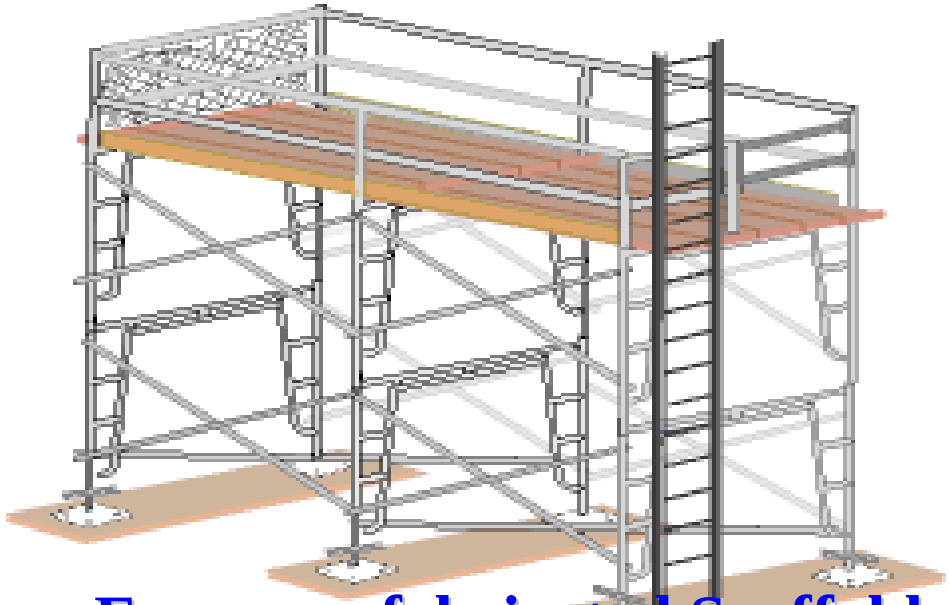
Anchorage strength requirement is 3,000 lbs

Scaffolds
Aerial Lift Equipment,
Movable Work
Platforms

Scaffolds

- **Scaffolds shall be equipped with a standard guardrail or other fall protection system**
- **Scaffold erection and dismantling/staging**
  - ✓ **OSHA recognizes the difficulty of providing fall protection**
  - ✓ **Evaluation shall be conducted by a competent person to determine the feasibility and safety of providing fall protection for personnel erecting scaffolds**
  - ✓ **When erecting supported scaffolds do not tie off to the scaffold**

Scaffolds

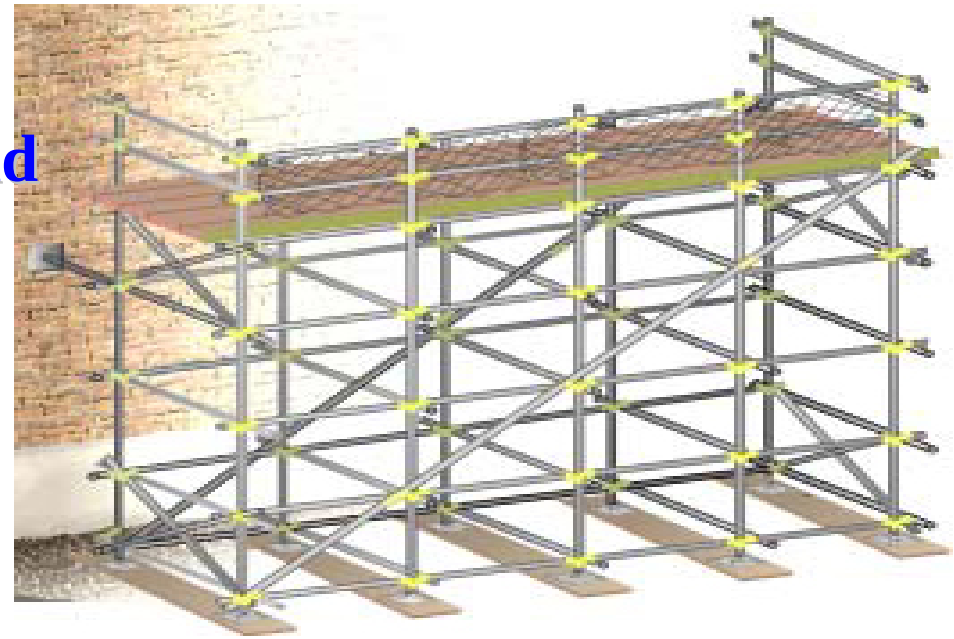


Frame or fabricated Scaffold

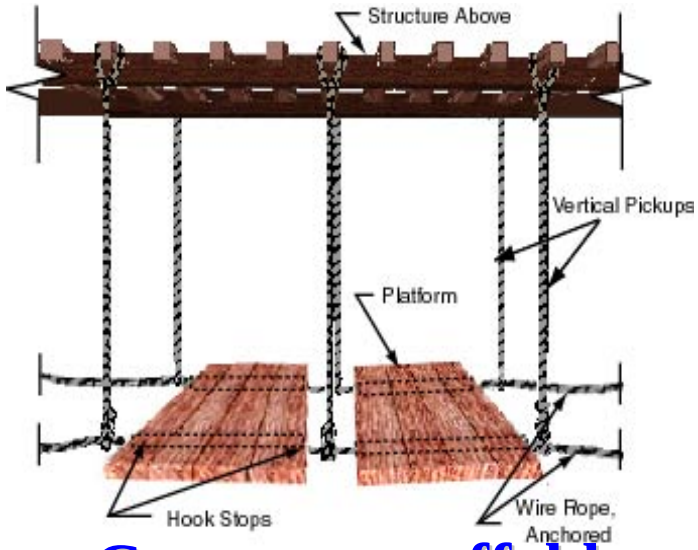
Mobile Scaffold

Pole Scaffold

Tube and coupler



Suspended Scaffolds

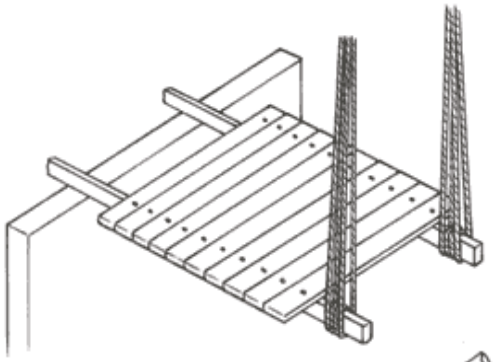


Catenary scaffold

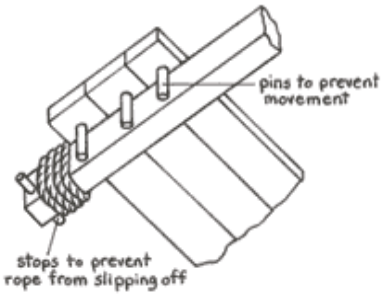
Personal Fall Arrest system is required

Boatswain Chair

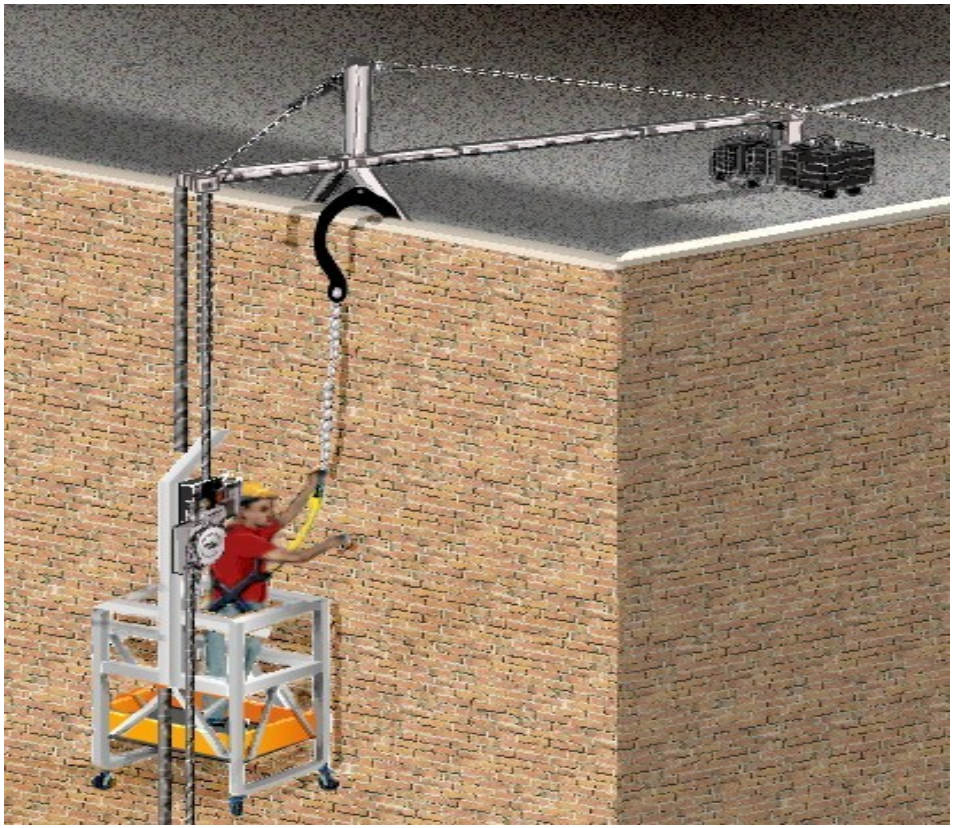
Float Scaffold



Needle beam scaffold



Suspended Scaffolds (continued)



Single point scaffold

Two point scaffold

- When working in a single point or two point suspended scaffolds, in addition to railings, workers shall also be tied off to an independent vertical lifeline using full body harness

Aerial lift equipment/scissors lift

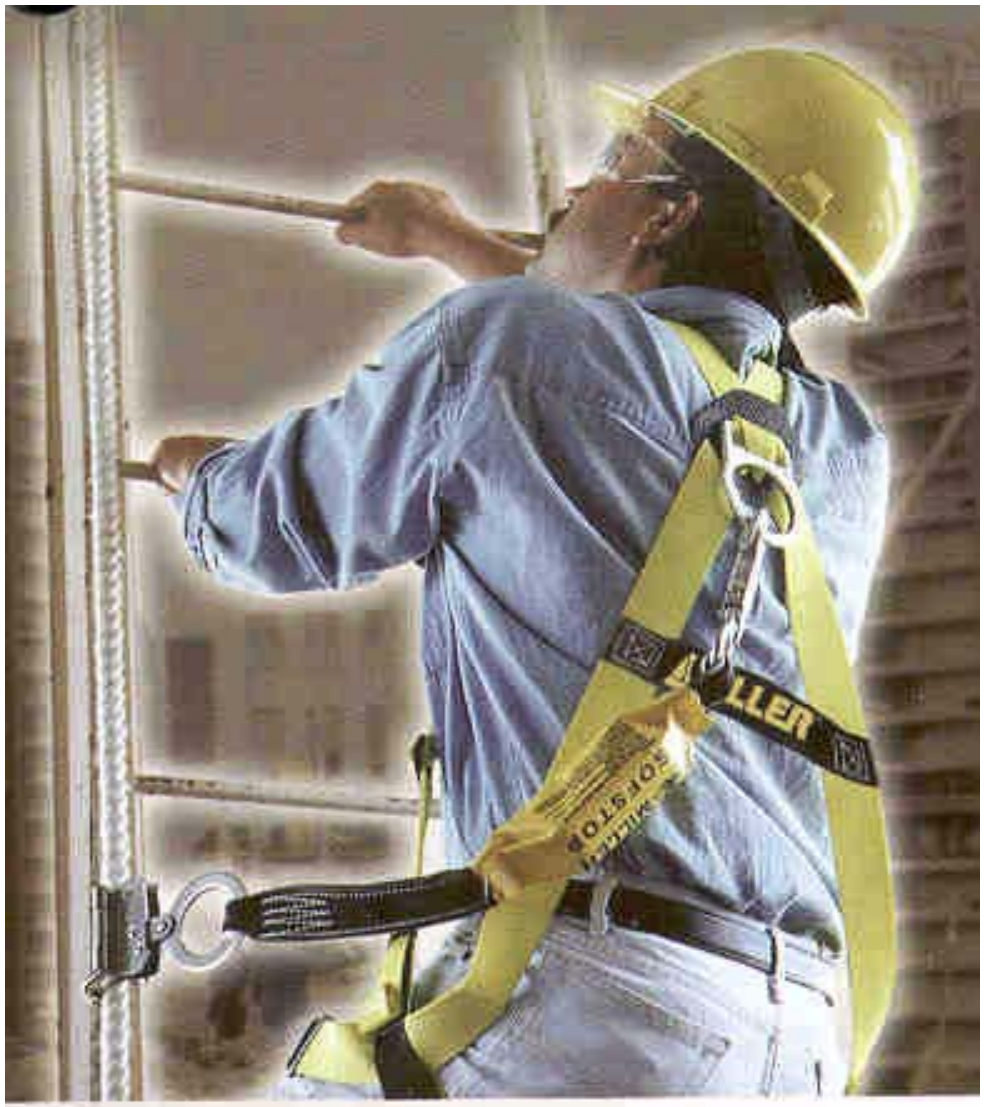
- When using aerial lift equipment, workers shall be tied off to the boom or basket.
- Belting off or tying off to an adjacent pole or structure is not permitted
- Scissors lift: When working from elevated scissors lift, a worker need only be protected from falling by a standard guard rail system

Scissors Lift

Ladder Safety

Fixed Ladders

- **Ladder climbing device**
  - Is a sleeve or a cable/rope attached to a fixed ladder over 20 ft in length
  - Anchorage strength requirement is 3,000 pounds
  - Free fall distance is limited to 2 feet



What is wrong with this picture?

Ladder Climbing Devices (continued)

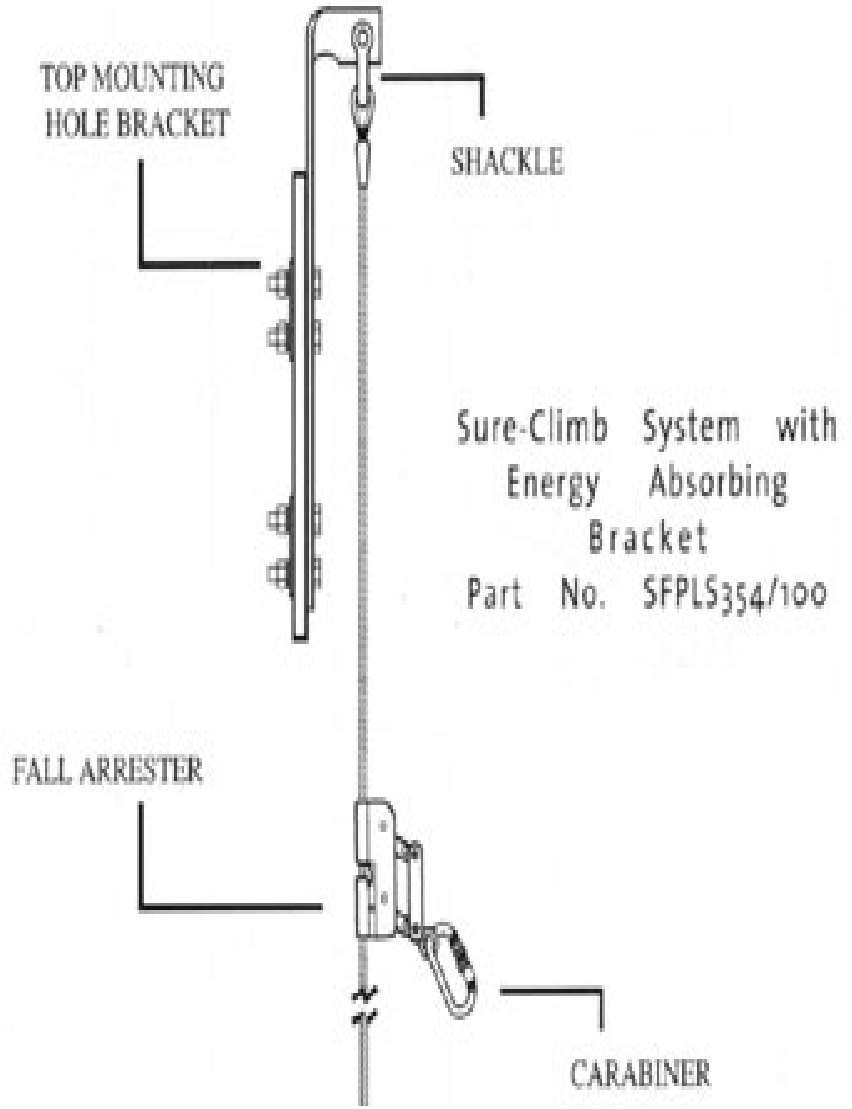
Correct way to connect to a ladder

- **The connector between front D-ring and the ladder cable is 9 inches long**
- **Three types of fall arresters (cable/rope grab)**
- **100% transition at the top**

Ladder Climbing Devices (continued)

- **Standard fixed industrial ladder is designed to absorb 500 lbs for one person with ¾ inch rungs (OSHA)**

- **For Ladder Climbing system, the top connection shall withstand:**
  - **3,375 lbs per person**
  - **6,300 lbs for four users**



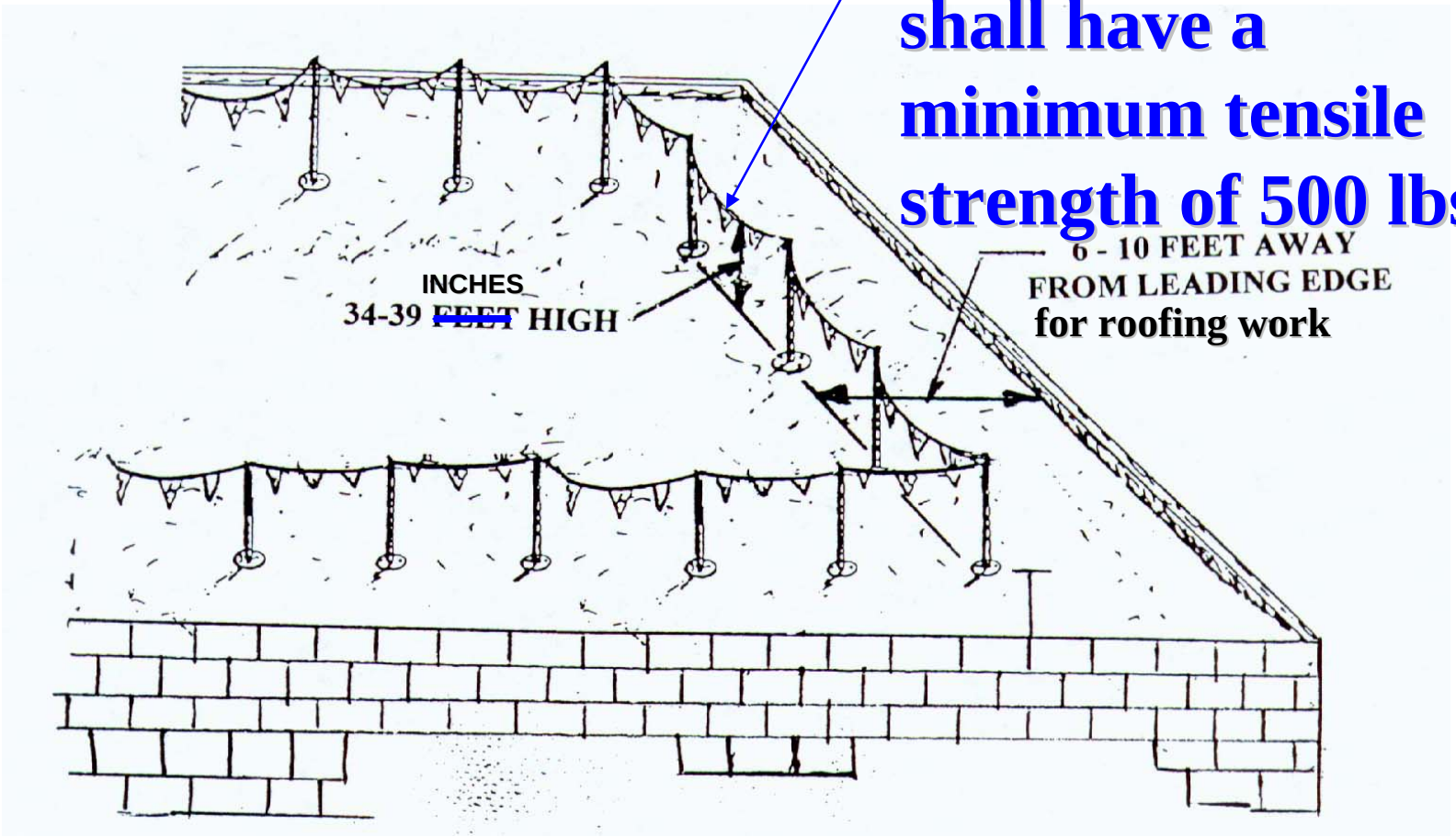
Warning Systems

Warning Line System

- A barrier erected on a roof to warn workers that they are approaching an unprotected side or edge
- Consists of rope, wires or chains 34-39 inches high, flagged every 6 feet, with supporting stanchions
- Stanchions shall be capable of resisting a force of 16 lbs
- Working within the line does not require fall protection. FP is required when working outside the line
- Located around all sides of the work area

Warning Line System

Wire, rope or chain shall have a minimum tensile strength of 500 lbs



Erected near the edge of the roof (6-10 ft for roofing work, 15 feet for other trades or work)

Safety Monitoring System

- **Monitoring system: A competent person designated to oversee workers when it is not feasible to provide fall protection system (exposed to fall hazard)**
- **Safety Monitoring System:**
  - ✓ **Not adequate and is not authorized**
  - ✓ **Should be used with other fall protection methods**

Controlled Access Zone

- Similar to warning line system
- Established when fall protection cannot be provided to personnel exposed to fall hazards

Fall Protection Plan

- **Allowed to be developed by contractors**
- **Only if:**
  - ✓ **Contractors can demonstrate that it is infeasible or creates a greater hazard to use a fall protection system**
  - ✓ **Plan shall be prepared by a qualified person**
- **29 CFR 1910 does not allow it**
- **Allowed by OSHA (Subpart M)**

Applicability of FP Standards to Unique Military Equipment, Systems and Operations

- **Executive Order 12196 and the 29 CFR 1960, OSH Programs for Federal Employees apply to all:**
  - ✓ **Agencies of the executive branch,**
  - ✓ **Federal employees**
  - ✓ **Working Conditions**

  Except those involving unique military equipment, systems and operations
- **However, if work places and operations are comparable to the industry, then they are included within the scope of the order**

New Fall Protection Code

New Fall Protection Code

- American National Standards Institute (ANSI) approved 5 new standards for general industry that make the Fall Protection Code (Effective: November 24 2007)
- The Code is:
  - National in scope
  - Includes best industry practices and applications of FP systems and equipment
  - Improves performance of FP systems and equipment
- ANSI standards are Voluntary National Consensus Standards

New ANSI Fall Protection Code/Standards

- ANSI Z359.0 Definitions and Nomenclature Used for Fall Protection and Fall Arrest
- ANSI Z359.1 Safety Requirements for Personal Fall Arrest Systems, subsystems and components
- ANSI Z359.2 Minimum Requirements for a Comprehensive Managed Fall Protection Program
- ANSI Z359.3 Safety Requirements for Positioning and Travel Restraint Systems
- ANSI Z359.4 Safety Requirements for Assisted-Rescue and Self Rescue Systems, Subsystems and Components

ANSI Z359.0
Definitions and Nomenclature Used for Fall Protection and Fall Arrest

- Contains all the applicable definitions and terminology used in fall protection and fall arrest
- 176 terms defined in this standard
- Definitions can be downloaded free from:

http://www.techstreet.com/cgi-bin/detail?product_id=1519325

ANSI Z359.0
Definitions and Nomenclature Used for FP and FA (continued)

Important Definitions

Qualified Person: (Similar to 29 CFR 1910 General industry standards) –

- A person with a recognized degree or professional certificate and with extensive training and experience in the fall protection and rescue field.
- Who is capable of designing, analyzing and specifying fall protection and rescue systems

ANSI Z359.0
Definitions and Nomenclature Used for FP and FA (continued)

Competent Person: Similar to the Navy Definition.

- An individual designated by the employer
- Responsible for immediate supervision, implementation and monitoring of the FP program
- Who through training and knowledge is capable of identifying, evaluating and addressing existing and potential fall hazards
- Has the employer's authority to take prompt corrective action with regard to such hazard

ANSI Z359.0
Definitions and Nomenclature Used for FP and FA (continued)

Authorized Person: (Navy uses the term end user

- A person assigned by the employer to perform duties at a location where a person will be exposed to a fall hazard

Program Administrator: (The Navy term is FP Program Manager)

- A person authorized by the employer to be responsible for managing the FP program

ANSI Z359.1: Safety requirements for Personal fall arrest Systems, subsystems and components

This updated existing standard is directed for the manufacturers of equipment

Most important changes and highlights:

- Increase the gate strength requirement for the new manufactured snaphooks and carabiners to 3,600 pounds in all directions
  - Previously the gate was designed and tested for 220 lbs against the face and 350 lbs against the side of the gate

ANSI Z359.1: Safety requirements for PFA Systems, Subsystems and Components (Continued)

3,600 lbs gate

ANSI Z359.1: Safety requirements for PFA Systems, Subsystems and Components (Continued)

Impact of changing the gate strength from 350 to 3,600 lbs

- Non compatibility issue will be minimized
  - Note: Manufacturers have issues using their equipment w/other manufacturers' equipment
- Risk of gate loading or forced roll-out between D-ring and snaphook will be reduced
- Attaching a snaphook directly to HLL will be safer

ANSI Z359.1: Safety requirements for PFA Systems, Subsystems and Components (Continued)

Snaphook Misuse

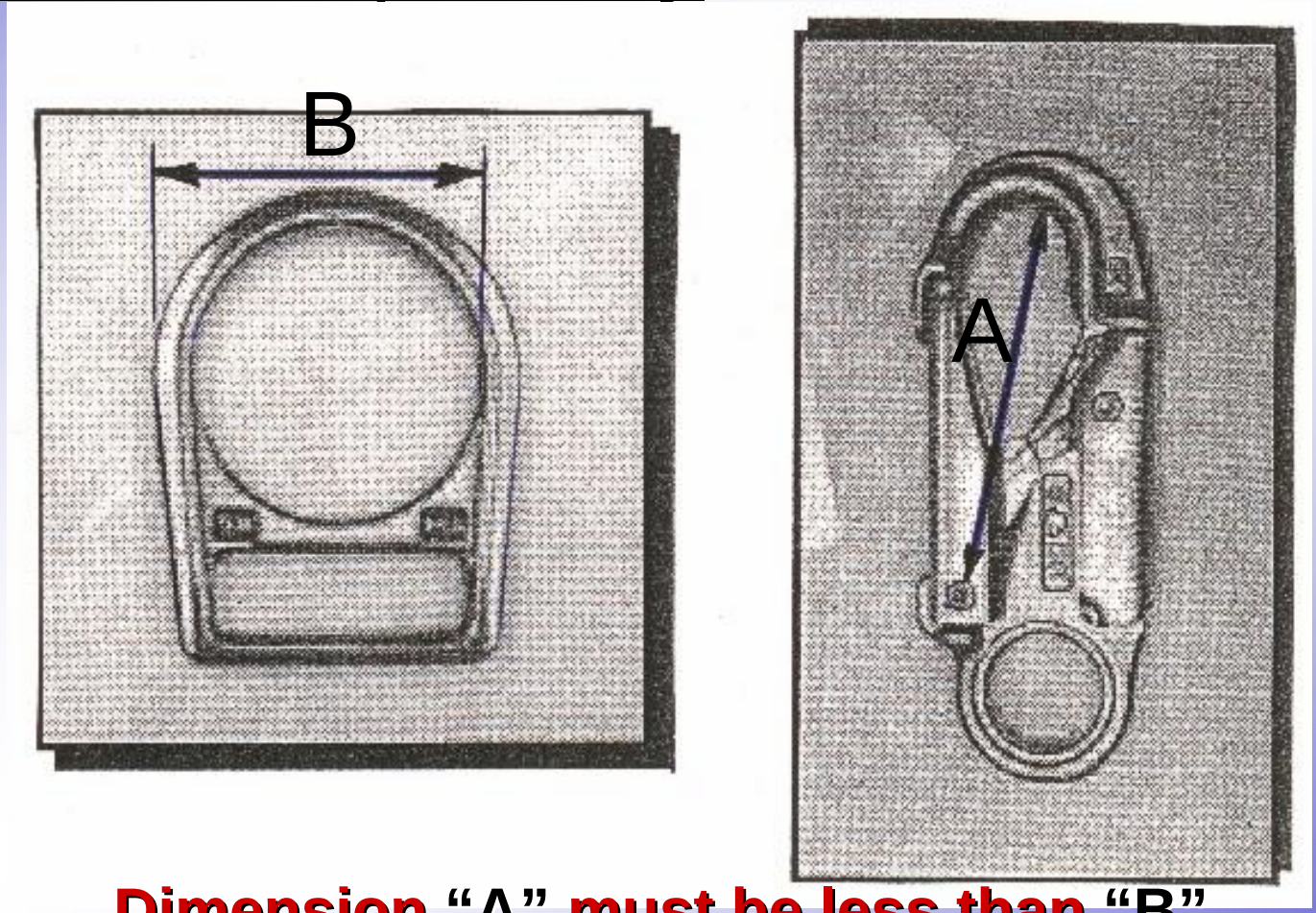
ANSI Z359.1: Safety requirements for PFA Systems, Subsystems and Components (Continued)

Hardware Compatibility

- Is the relationship between components (snaphook and D-ring)
- Snaphook shall be sized so that the gate and keeper is protected and should not be opened by the D-ring itself
- Roll–out (traditional): a non locking snaphook rotates, and the gate is pressed open and disengagement occurs
- Forced Roll-out: The gate of locking snaphook is loaded beyond it's design strength and fails

ANSI Z359.1: Safety requirements for PFA Systems, Subsystems and Components (Continued)

Hardware Compatibility



Dimension "A" must be less than "B"

So that the snaphook will self correct in the event of a fall

ANSI Z359.1: Safety requirements for PFA Systems, Subsystems and Components (continued)

- Allow the use of frontal D ring attachment point (located at the sternum) for fall arrest, only if:
  - Free fall distance is less than 2 feet
  - Maximum arrest force on the body shall not exceed 900 lbs

  (Previously the standard limited the fall arrest attachment point to the Dorsal D ring)
- Criteria for the Dorsal D ring attachment point used for fall arrest is still valid (same as before)
- Dynamic arresting force for energy absorber is still 900lbs

ANSI Z359.1: Safety requirements for PFA Systems, Subsystems and Components (continued)

- The minimum anchorage strength requirement of 3,600 lbs (if designed and selected by a qualified person) was deleted
- New anchorage requirement: “twice the maximum arrest force when certification exists”
- The 5,000 lbs anchorage strength requirement, if selected by a competent person is still valid
- The capacity of the authorized person using the equipment is still the same (130 -310 lbs)

ANSI Z359.1: Safety requirements for PFA Systems, Subsystems and Components (continued)

- New Requirements for twin-leg shock absorbing lanyards
  - New testing requirements and warning
  - The joint between the legs of the lanyard shall withstand a force of 5,000 lbs to prevent any misuse
  - Included warning not to attach the unused leg of the lanyard to any part of the harness

ANSI Z359.1: Safety requirements for PFA Systems, Subsystems and Components (continued)

Twin Leg Lanyard

Designed for 5,000 lbs

ANSI Z359.2: Minimum Requirements for a Comprehensive Managed Fall Protection Program

- This new standard is directed for the user organizations (employers) and safety professionals
- The purpose and applications of the standard are:
  - Identify, evaluate and eliminate or control fall hazards
  - Ensure proper training of personnel
  - Ensure proper installation and use of fall protection and rescue systems
  - Implement safe fall protection and rescue procedures

Comparison between Navy and ANSI Z359.2 FP Program Requirements

Navy		ANSI Z359.2
Activity Policy	------	Policies
Duties and Responsibly	------	Duties and Responsibilities
Workplace Surveys and Assessment of Fall Hazards	------	Fall Hazard Surveys
Fall Protection and Prevention Plan	------	Written Fall Protection Procedures
Fall Hazard Prevention and Control	------	Elimination and Controlling Hazards
Training	------	Training and Evaluations
Inspection, Storage, Care and Maintenance of FP Equip	------	Inspection, Maintenance, & Storage of FP Equipment
Rescue Procedures	------	Rescue Procedures
Mishap Reporting	------	Incident Investigation
Audits and Evaluations	------	Evaluation Program Effectiveness

ANSI Z359.2: FP Requirements

- Duties and Responsibilities
  - The standard addresses in detail the duties, responsibilities, acquired knowledge and expertise of various personnel assigned to, or involved in the fall protection program
  - Included employer's responsibilities

ANSI Z359.2: FP Requirements (continued) Training Requirements

Standard provides detailed training requirements

- Program Administrator (0.8 units/year)*
- Qualified Person (0.8 units/year)*
- Competent Person **(every 2 years)**
- Authorized Person **(every 2 years)**
- Competent Rescuer **(every year)**
- Authorized Rescuer **(every 2 years)**
- Competent Person Trainer (1.6 units/year)*
- Qualified Person Trainer (1.6 units/year)*
- Competent Rescue Trainer (1.6 units/year)*

* Recommended continued education

Hands-on Training

ANSI Z359.2: FP Requirements (continued) Fall protection procedures

Fall hazard Survey (identical to Navy requirements)

- Survey and identify fall hazards and prepare survey report
- Conducted either by a Competent Person or Qualified Person
- Identify any environmental hazards affecting the installation and use of FP equipment
- Conduct hazard assessment and establish risk factors

ANSI Z359.2: FP Requirements (continued)
Fall protection procedures

Written Fall protection procedures (Navy uses the term Fall Protection & Prevention Plan)

- Prepared and modified by a competent person or qualified person
- Shall include:
  - ⇨ Training requirements and qualifications
  - ⇨ Identification of anchorages
  - ⇨ Clearance requirements
  - ⇨ Setup and use procedures of the system
  - ⇨ Limitation on use of the system

ANSI Z359.2: FP Requirements (continued)

- Comparison between the Navy and ANSI standard regarding the hierarchy of controls

Navy		ANSI Z359.2
Hierarchy of Controls	---	Fall Protection Hierarchy
• Elimination	---	Elimination or Substitution
• Prevention	---	Passive Fall Protection
• Engineering Controls	---	Fall Restraint
• Administrative Controls	--	Fall arrest
• Personal Protective Systems/Equipment	---	Administrative Controls

ANSI Z359.2: FP Requirements (continued)

Requirements for new buildings and facilities

- Guidelines for Architects and Engineers to provide safe design to eliminate, prevent or control fall hazards early in the planning and design stage
- To protect personnel conducting maintenance work while working at heights and exposed to fall hazards
- More economical

ANSI Z359.2: FP Requirements (continued)

Anchorages

- The standard classify anchorages as follows:
  - Certified anchorages: Are anchorages identified, designed, selected and used under the supervision of qualified person - with documentation/certification
  - Non Certified Anchorages: Are anchorages that a competent person can judge to be capable of supporting the predetermined forces that incorporate energy absorber

ANSI Z359.2: FP Requirements (continued)
Anchorages (Continued)

Anchorage Strength requirements for various fall protection systems

Certified vs. Non-Certified Anchorages

Anchorages	Non-Certified	Certified
Fall arrest	5,000 lb	2 x Max Arrest Force
Work positioning	3,000 lb	2 x Foreseeable Force
Travel restraint	1,000 lb	2 x Foreseeable Force
Rescue	3,000 lb	5 x Foreseeable Force
HLL	N/A	2 x Maximum Tension in the line

- For HLL, a competent person shall not select anchorages – Prohibits the use of home made HLL
- Travel restraint anchorage strength of 1,000 lbs is less than OSHA requirement of 3,000 lbs

ANSI Z359.2: FP Requirements (continued)

Selection of safe anchorages (Hard points)

- Anchorage location should be as high as possible to minimize the free fall distance
- Do not tie off to a hole in a beam. A hole is a weak link
- Consider the impact force and bending moment at the supports
- When selecting anchorage location consider the hazard of swing fall effect

ANSI Z359.2: FP Requirements (continued)

Selection of safe anchorages

- The closer the tie off point is to the support, the impact force on that support is greater
- Consider the exposure of anchorage connectors to sharp edges, abrasive surfaces and physical hazards such as heat, electrical and chemical sources
- Consider the free fall distance, total fall distance and available clearance

ANSI Z359.2: FP Requirements (continued)

Selection of safe anchorages (Continued)

- When selecting anchorages, accessibility, location and ease of tying off should be taken into consideration
- If assisted rescue is required, additional anchorage for rescue should be selected
- Always specify the number of personnel attached to the anchorage

ANSI Z359.2: FP Requirements (continued)

Selection of safe anchorages (continued)

- Concrete slabs can only withstand minimum loading under tension. When tying off to concrete ceiling above, make sure the anchorage can withstand the fall arrest force
- Compatibility between the anchorage and anchorage
- Welding the anchorage connector to the anchorage shall be performed by a certified welder

Post installed Anchors In concrete, Masonry and Natural Stone Structures

Types and load transfer mechanism

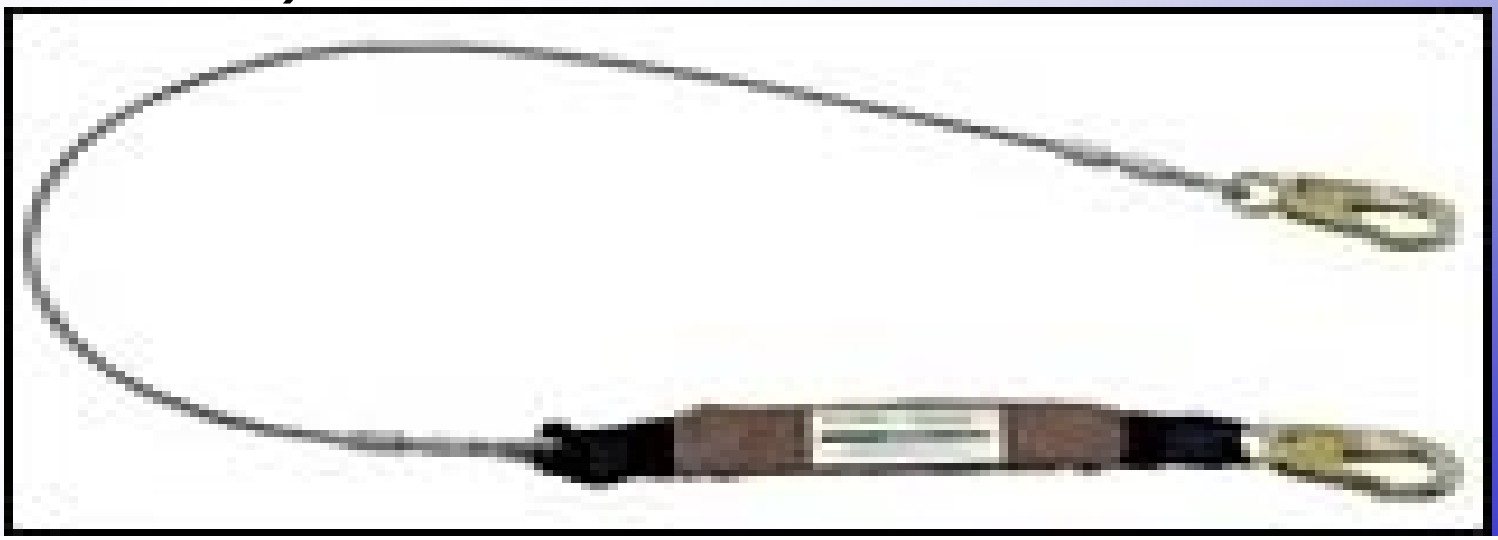
- Friction (Micro-keying)
- Keying (Undercut)
- Adhesion (Bonding)
  - ✓Concrete adhesive anchors
- Combination

FA systems is characterized by low static loads and very infrequent high dynamic loads

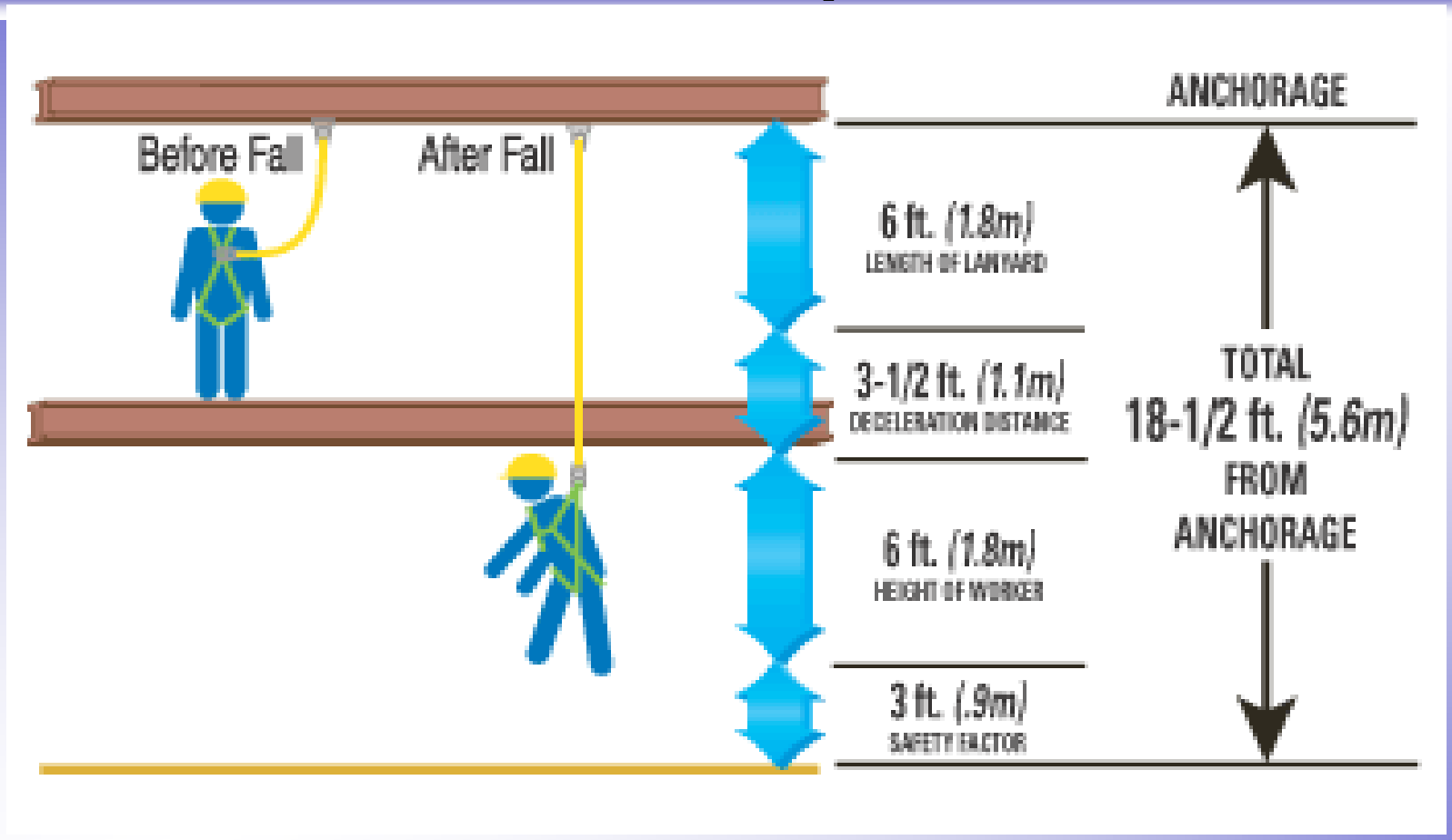
ANSI Z359.2: FP Requirements (continued)

- The maximum free fall distance of 6 feet can be exceeded, only if the maximum arrest force on the body of 1,800 lbs is not exceeded
- Used w/anchorages (tie off points) that are lower than the dorsal D-ring (i.e. tying off at the feet level)

Dual shock absorbing lanyard



Free Fall Distance, Total Fall Distance and Clearance Requirements



If clearance is not available use other equipment such as self retracting lanyard to minimize the free fall distance and the total fall distance

ANSI Z359.2: FP Requirements (continued)

- The standard does not address trigger heights where fall protection is provided (i.e. 4, 5 or 6 ft, etc.). These heights are prescribed by laws or regulations such as OSHA

ANSI Z359.2: FP Requirements (continued)

- Rope Access

  This is a new system, widely used in Europe, Australia and Canada. The system uses two ropes/lines attached from above overhead anchorage allowing the worker to ascend and descend to a work location. The first rope/line is attached to the Dorsal D ring (used for fall arrest as a safety line) and the second line is attached to the front D ring for ascending and descending to a work location.

- The system is used for window washing, bridge and dam inspections

ANSI Z359.2: FP Requirements (continued)

ANSI Z359.2: FP Requirements (continued)

Inspection, Maintenance and Storage of FP and Rescue Equipment

- The standard provides detailed information how to inspect, maintain and store the equipment
- Inspection requirements are similar to OSHA
- Shall be consistent with manufacturers instructions

ANSI Z359.2: FP Requirements (continued)

- Rescue procedures
  - Prepare written rescue procedures (Rescue Plan)
    - ✓ Provisions for prompt rescue, self rescue or assisted rescue shall be provided
  - Summoning rescue services
  - In-house rescue services shall be established
    - ✓ Train in house personnel to perform rescue duties
  - Need to identify anchorages for rescue
- Incident investigations
- Evaluating program effectiveness (every 2 years)

ANSI Z359.3: Safety Requirements for Positioning & Travel Restraint Systems

- This standard establishes minimum requirements for equipment used in work positioning and travel restraint systems.
- The standard is directed for the manufacturers of equipment
- Work Positioning: If fall hazard is present, positioning system must be used in conjunction with fall arrest system

ANSI Z359.3: Safety Requirements for Positioning & Travel Restraint Systems (continued)

- Travel restraint
  - shall only be used on walking working surfaces with a slope between 0 and 18.4 degrees (4 vertical to 12 horizontal)
  - If the slope is greater than 18.4 degrees use fall arrest or other system
  - The terms: restraint, fall restraint and travel restraint are the same

ANSI Z359.4: Safety Requirements for Assisted Rescue and Self Rescue systems, Subsystems and Components (New Standard)

- The standard establishes minimum design requirements for:
  - Rescue Equipment
  - Performance and test criteria
  - Markings, qualifications and instructions applicable to rescue
  - Training, use and maintenance
  - The standard is directed for the manufacturers of equipment

ANSI Z359.4: Safety Requirements for Assisted Rescue and Self Rescue systems, Subsystems and Components (continued)

- Equipment addressed in the standard:
  - Full Body Harnesses [Must meet ANSI Z359.1 having attachment element (Dorsal D-ring) designated for rescue]
  - Evacuation Harness (used for rescue only)
  - Descent Control Devices (manual and automatic controlled)

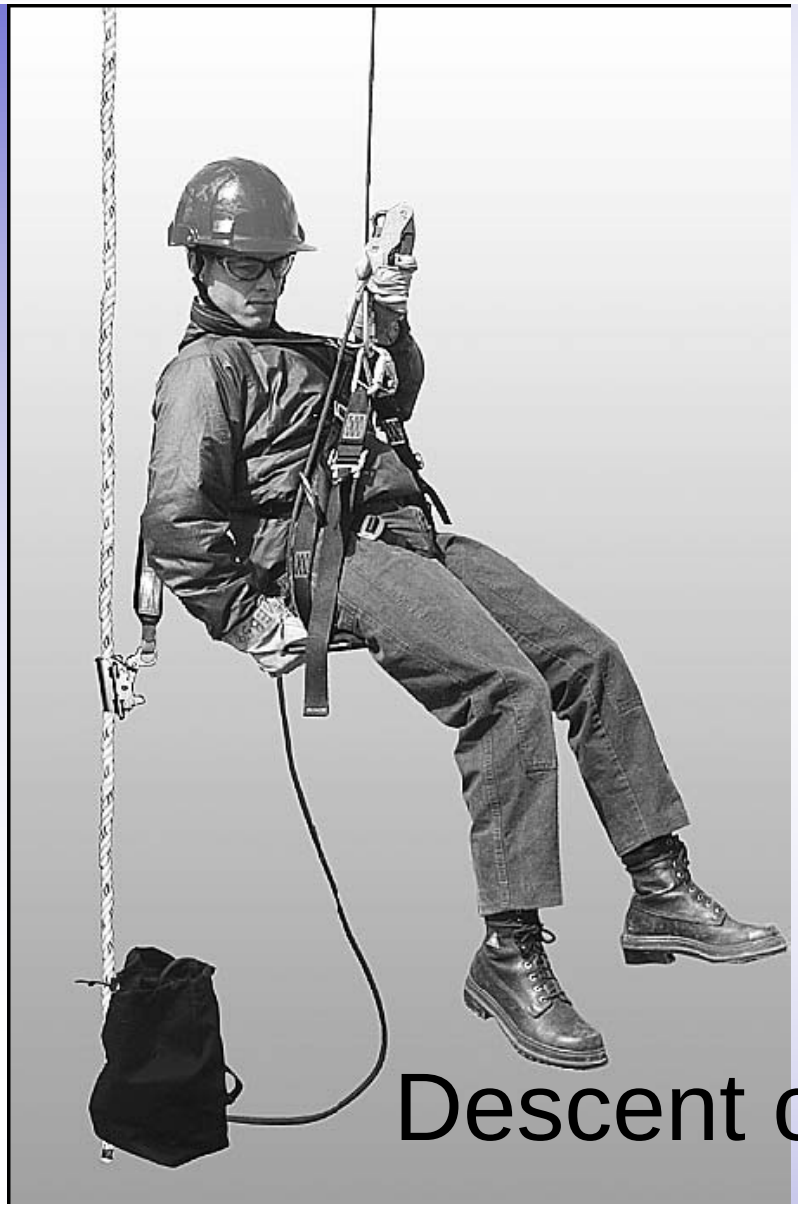
ANSI Z359.4: Safety Requirements for Assisted Rescue and Self Rescue systems, Subsystems and Components (continued)

- Rescue Lanyards and Anchorage Connectors for Rescue (must meet ANSI Z359.1)
- Synthetic Rope Tackle Block
- Self Retracting Lanyard Component with Integral Rescue Capability
- Personnel Hoists/Winches (manually operated or powered)

ANSI Z359.4: Safety Requirements for Assisted Rescue and Self Rescue systems, Subsystems and Components (continued)

<u>Full Body harness</u> having attachment element (Dorsal D ring) designated for rescue

ANSI Z359.4: Safety Requirements for Assisted Rescue and Self Rescue systems, Subsystems and Components (continued)



Descent control devices

ANSI Z359.4: Safety Requirements for Assisted Rescue and Self Rescue systems, Subsystems and Components (continued)

Rescue lanyard/w anchorage connector for rescue

Synthetic Rope Tackle Block

ANSI Z359.4: Safety Requirements for Assisted Rescue and Self Rescue systems, Subsystems and Components (continued)

Self retracting lanyards w/rescue capability

ANSI Z359.4: Safety Requirements for Assisted Rescue and Self Rescue systems, Subsystems and Components (continued)

Self retracting lanyard w/winches for rescue

New ANSI Projects in Progress

ANSI Z359.5	Safety Requirements for PFAS
ANSI Z359.6	Design Specifications for Active FP Systems
ANSI Z359.7	Requirements for Third-Party and Self-Certification for PFAS (horizontal and vertical)
ANSI Z359.8	Requirements for Rope Access
ANSI Z359.9	Not selected
ANSI Z359.10	Not selected
ANSI Z359.11	Requirements for Full Body Harness for PFAS
ANSI Z359.12	Safety Requirements for Connecting Components for PFAS

New ANSI Projects

ANSI Z359.13	Requirements for Lanyards and Energy Absorbers
ANSI Z359.14	Requirements for Self-Retracting Devices for PFAS
ANSI Z359.15	Requirements for Vertical Lifelines for PFAS
ANSI Z359.16	Safety requirements for Fall Arresters for PFAS
ANSI Z359.17	Requirements for Horizontal Lifelines for PFAS
ANSI Z359.18	Requirements for Anchorage Connectors for PFAS

How to acquire FP Information

- Navy Fall Protection Guide for Ashore Facilities:

http://www.safetycenter.navy.mil/osh/downloads/AshoreFallProtectionGuide.pdf

- OSHA Web Site: http://www.osha.gov/
- ANSI Web Page: http://www.ansi.org
- Fall Protection Handbook: by Dr. Nigel Ellis

  Call ASSE, Phone: (847) 699-2929
- For FP Videos:

  http://www.msanorthamerica.com/fallProtectionVideos.html

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Questions?

Comments?

Thanks for your participation