

Fall Protection and Prevention Training Construction & Safety Professionals



INTRODUCTION

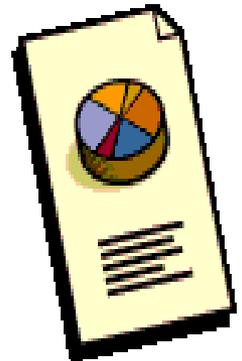
- ***Falls are the leading cause of work related injuries and fatalities***
- ***Approximately 3 workers are fatally injured every work day in the US, over 300,000 injuries annually***
- ***Account for 14 % of all fatalities at work places***
- ***More than half of fall fatalities occurred in the construction industry***
- ***Most cited violation by OSHA***
- ***Fall accidents can be prevented***



CONUS FATAL OCCUPATIONAL INJURIES (BLS)



<u>Type of exposure</u>	<u>2002</u>	<u>2003</u>
• 1. Highway incidents	1,373	1,350
• 2. Homicide	609	631
• 3. Falls to lower level	638	601
• 4. Struck by object	505	530
• 5. Non highway, farm/industrial	323	347
• 6. Contact w/electric current	289	246
• 7. Caught in or crushed in collapsing material	231	237
• 8. Fires and explosion	165	198



HOW LONG DOES IT TAKE TO FALL?



Height
(feet)

Time
(seconds)

4

0.5

16

1.0

36

1.5

64

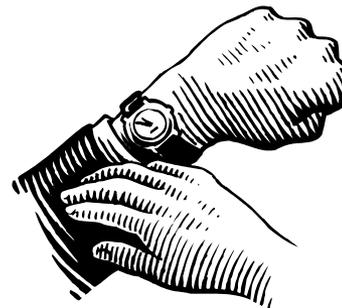
2.0

100

2.5

144

3.0



Applicable References Regulations/Standards



Special Note* New Em-385 places all Fall Protection related requirements in Section 21**

• Contractors shall comply with:

- EM 385-1-1 Safety and Health Requirements Manual**
- UFGS Section 013526, Governmental Safety Requirements**
- 29 CFR 1926.500 (Subpart M) -- FP in Construction**
- ANSI Z359-2007**

• Navy Civilian personnel comply with:

- NAVFACINST 5100.23G**
- 29 CFR PART 1910 –Occupational Safety and Health Standards-General Industry**
- 29 CFR 1960 Basic Program Elements for Federal Employees OSH Programs**

**Contractor always comply w/most stringent requirement
EM-385-1-1 Paragraph 4. General (a)**

FALL RELATED HAZARDS



Working/walking on, close or near:

- **Unprotected side or edge**
- **Ladders and stairways, access ways**
- **Roof or floor openings, holes and skylights**
- **Ramps and runways, access-ways**
- **Improper selection, rigging, use, inspection and maintenance of fall protection systems**
- **Unsafe work practices**
- **Unstable surfaces**
- **Scaffolds, formwork and re-bar assembly**
- **Excavation and dangerous equipment**



FALL PROTECTION SECTION 21



The fall protection threshold height requirement is 6 ft for ALL WORK covered by this manual, unless specified differently below, whether performed by Government or Contractor work forces, to include steel erection activities, systems-engineered activities (prefabricated) metal buildings, residential (wood) construction and scaffolding work.



Fall-hazard Prevention and Control



Preferred order of control measures

- ***Elimination*** - removing the hazard from work place
 - *Building roof trusses on the ground*
- ***Prevention (traditional)*** - same level barriers –isolate and separate fall hazards from work areas by erecting guardrails, walls, covers, restraints.
- ***Work Platforms (movable or stationary)***
 - *Use scaffolds, scissors lifts or aerial lift equipment*

Fall Hazard Prevention and Control (Continued)



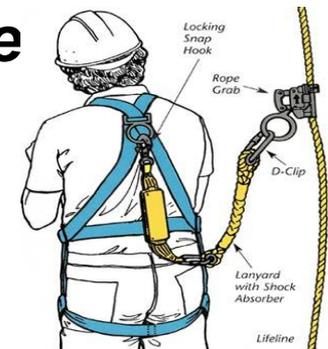
Preferred Order of Control Measures (continued)

• Personal Protective Systems and Equipment

- **Use of fall protection systems, including restraint, positioning or personal fall arrest (i.e., requiring the use of full body harness, lanyard, and lifeline):**

• Administrative Controls:

- **Introduce new work practices that reduce the risk of falling (warning systems, warning lines, audible alarms, signs or training of workers to recognize special hazards.)**



FALL PROTECTION REQUIREMENTS



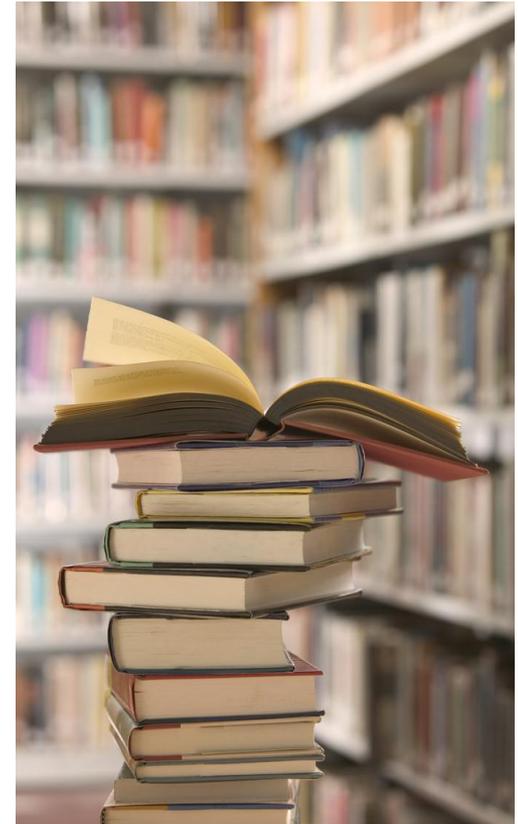
- *Each employee on a walking working surface with unprotected side or edge, shall be protected from falling to lower level by the use of **guardrails, safety nets, personal fall arrest systems or the equivalent***

*–29 CFR 1926 FP in Construction - **6 ft***

*–USACE EM 385 Manual ----- **6 ft & 4ft***

*–29 CFR 1910 General Industry --- **4 ft***

*–29 CFR 1915 Shipyards ----- **5 ft***



TRAINING REQUIREMENTS



• **End user/authorized person training**



- **Hands-on training (A must)**
- **Nature of fall hazards**
- **Correct procedures for erecting, dismantling, maintaining and storing of fall protection equipment**
- **Application limits, free fall distance and total fall distance**
- **Rescue equipment and procedures**
- **Retraining shall be provided as necessary**
- **Contractor shall verify employee training by a written certificate including:**
 - **Name of employee, date of training and signature**

21.B.01 Trained by a competent person for fall protection

ROLES AND RESPONSIBILITIES



- **End User/Authorized Person**

- **A person who is trained and authorized to use FP equipment**

- **Competent person for fall protection:**

- **Qualified in delivering fall protection training to the workers in the safe use of fall protection systems/equipment and fall hazards.**

- **Capable of identifying hazardous and dangerous conditions in the work place**

- **Has the knowledge and experience in the application and use of FP equipment and systems**

- **Has the authority to take prompt corrective measures. (Letter from company)**



ROLES AND RESPONSIBILITIES (continued)



- **Qualified person for fall protection**
 - A person with a recognized degree or professional certificate **and**
 - With extensive knowledge, training and experience in the fall protection and rescue field
 - Who is capable of designing, analyzing, evaluating and specifying fall protection and rescue systems
- **Program Manager**
 - Responsible for developing and managing FP program

FALL PROTECTION PROGRAM

21.C



- *If contractor has personnel working at heights, exposed to fall hazards and using fall protection, they shall develop a*
SITE-SPECIFIC FALL PROTECTION and PREVENTION PLAN
 - a. *Duties and Responsibilities, Identify Competent and Qualified Persons for fall protection and their responsibilities and qualifications.*
 - b. *Description of the project or task performed*
 - c. *Training requirement to include the safe use of Fall Protection*
 - d. *Anticipated hazards and fall hazard prevention and control*
 - e. *Rescue plan and procedures*
 - f. *Design of anchorages/fall arrest and horizontal lifeline systems*
 - (1) *It is realized that the provision for the first person up for establishing anchorages ONLY would be difficult, in this situation, fall protection may not be required. After anchorages are installed, fall protection is required,*

FALL PROTECTION SYSTEMS



FALL PROTECTION SYSTEMS 21.E



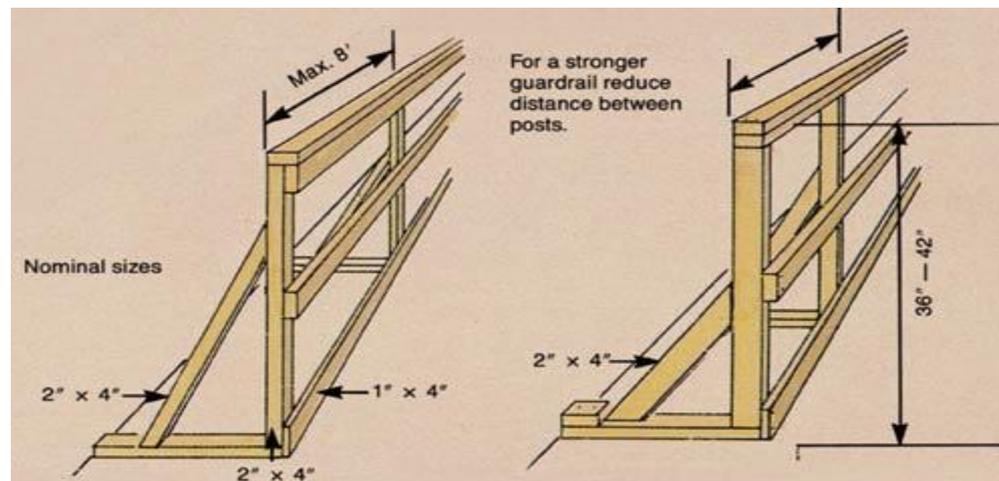
- **Guard rail** 21. E.01**
- **Safety net** 21.G**
- **Personal fall arrest system** 21.H**



**** Conventional Fall Protection System**

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** --- **4 inches high**



Ref: 21.E

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 1/2 in nominal diameter, schedule 40 pipe)
- **Steel cable**
 - ✓ Toprail & midrail (1/4 in steel cable) flagged every 6 ft w/highly visible material

IMPORTANT: Know proper materials!

GUARDRAIL SYSTEM (CONTINUED)

21.E.01

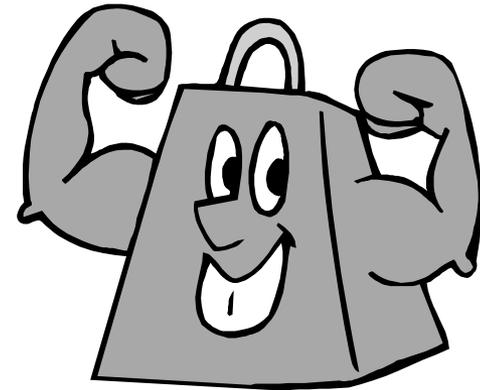


Strength requirements:

–Top rail: Shall withstand a 200 lbs force applied 2 inches from the top in any outward or downward direction

–Mid rail: 150 lbs

–Toe board: 50 lbs



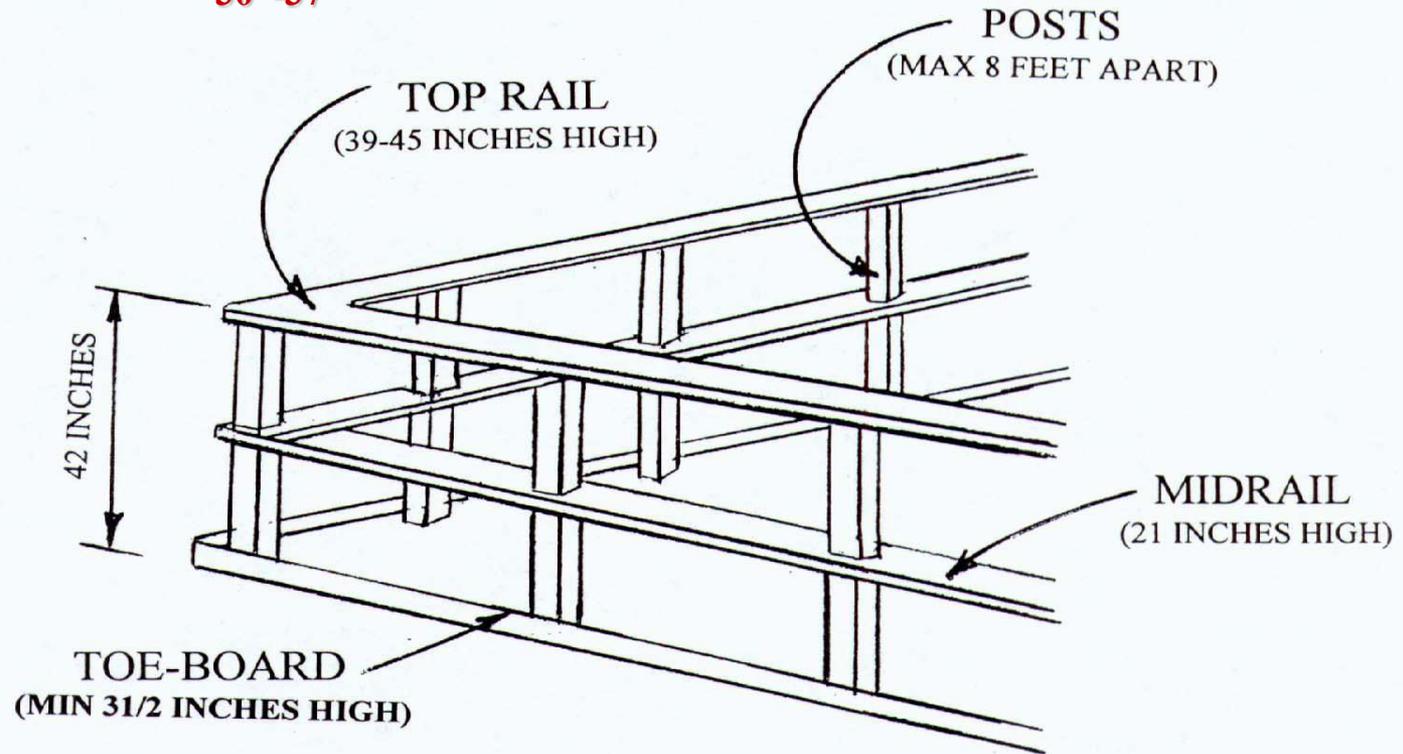
• **Top rails shall not deflect more than 3 inches when a 200 lbs force is applied**

GUARDRAILS (CONTINUED)

	<u>HEIGHT</u>	
	<u>STAIR RAIL</u>	<u>HANDRAIL</u>
29 CFR 1910	30"-34"	30"-34"
EM 385-1-1	Min 36"	30"-34"
OSHA 3124	36"-37"	30"-37"



Ref: 21.E.01



If screen is used, it shall withstand a force of 200 lbs horizontally

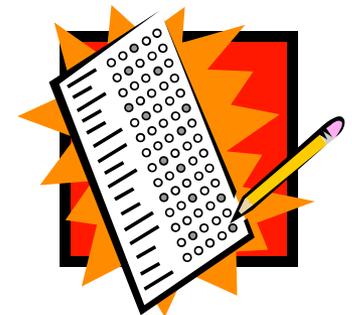
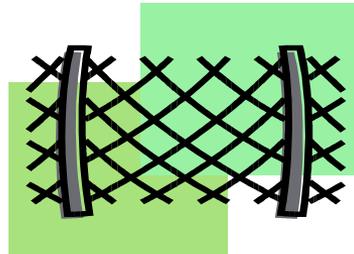


SAFETY NETS

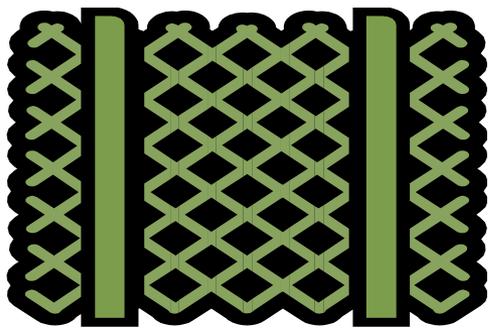
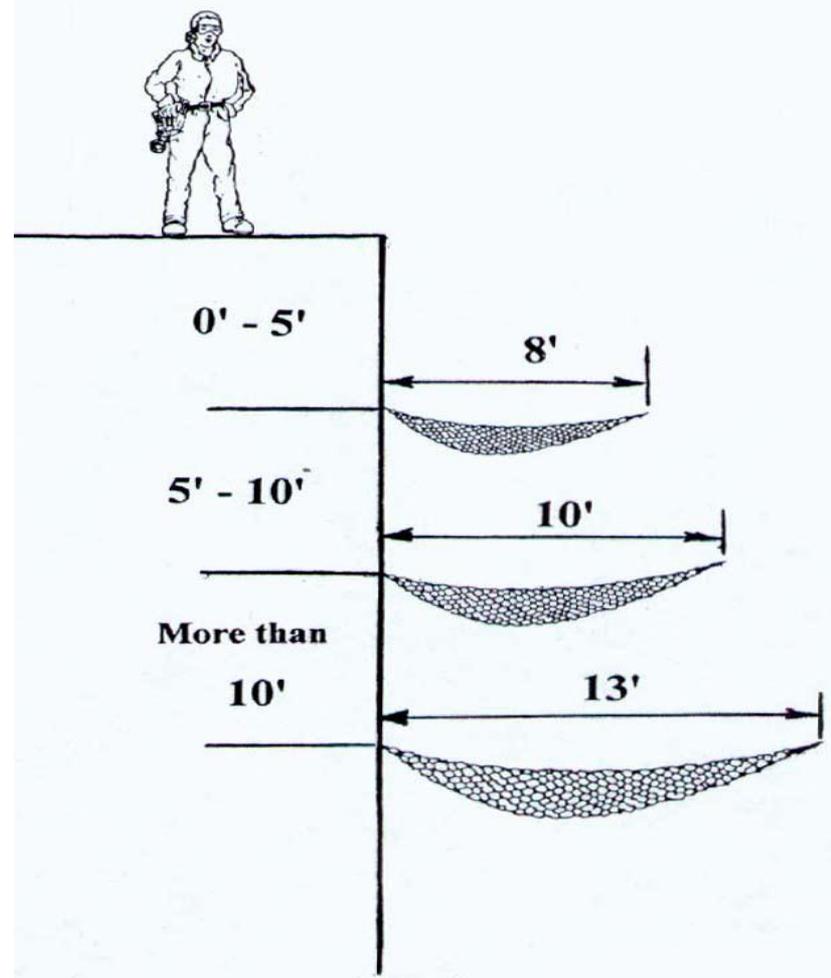


- **Installed as close as practicable under the walking/working surfaces**
- **Minimum breaking strength of 5,000 lbs for the border rope or webbing**
- **Tested and certified by qualified person immediately after installation and at six months intervals w/400 lbs sand bag dropped from the same elevation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

Ref: 21.C.11



SAFETY NETS OUTWARD EXTENSION



SAFETY NETS (CONTINUED) 21.G



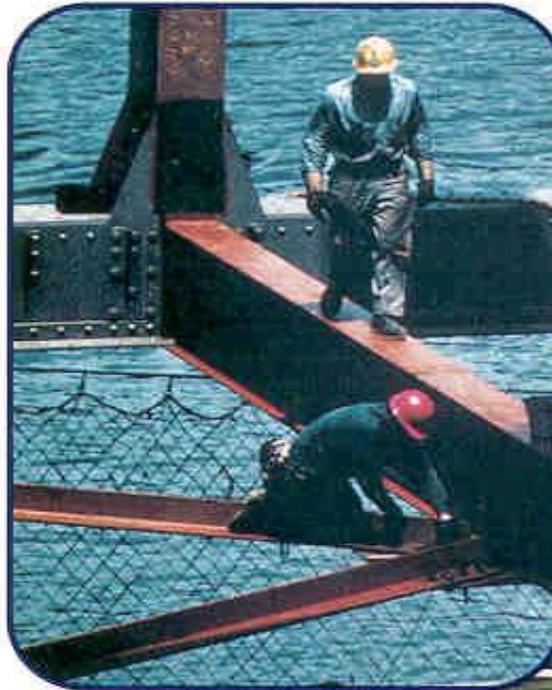
*Shall not be installed lower than **25 ft*** from the working surface*

** 1926 uses 30 ft*

Inspection

EM 385 Requirements:

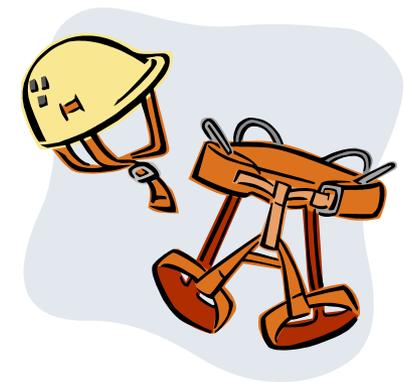
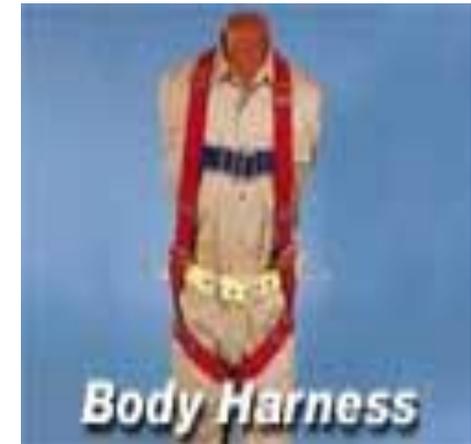
- ✓ *After installation*
- ✓ *At least weekly thereafter*
- ✓ *Following any repair or alteration*
- ✓ *With Documentation*



Personal Fall Arrest System 21.H



- *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*

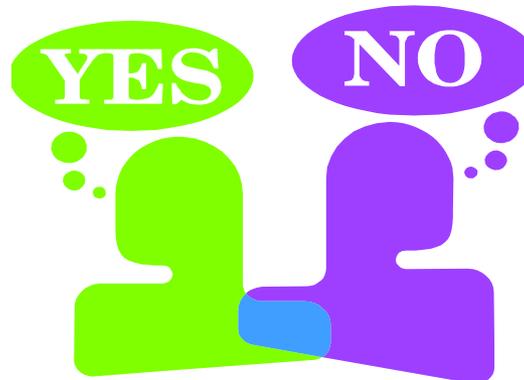


Ref: 21.C

BASIC PERSONAL FALL ARREST SYSTEM COMPONENTS



1. **Anchorage System**
 2. **Connecting Means**
 3. **Body Support (full body harness)**
 4. **Rescue procedures**
- **Body belts are prohibited in a fall arrest system. Used only in work positioning system**
 - **All components of the system has to be compatible**



ANCHORAGE SYSTEM



Anchorage system is a combination of anchorage and anchorage connection

- **Anchorage:**

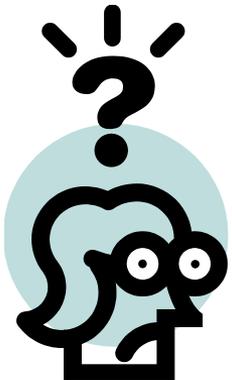
- **Can be a beam, column or any rigid part of structure or equipment**

- **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 the PFAS to an anchorage**

- **Withstands a force of 5,000 lbs**



Ref: 21.C.10

ANCHORAGE SYSTEM (Continued)



- **DO NOT** attach anchorage devices to:
 - *Utility pipes*
 - *Electric conduits*
 - *Ductwork*
 - *Guardrail system*
 - *Unstable points*
 - *Hoists*



ANCHORAGE CONNECTION DEVICES



Trolley



Anchor Strap



Anchor strap



Roof Anchor



Permanent Anchor



Concrete Anchor



Beam Anchor



Roof Anchor

Anchorage Connections Devices (Continued)



Flanged beam clamp



Beam clamp



Personal shuttle



Scaffold Choker

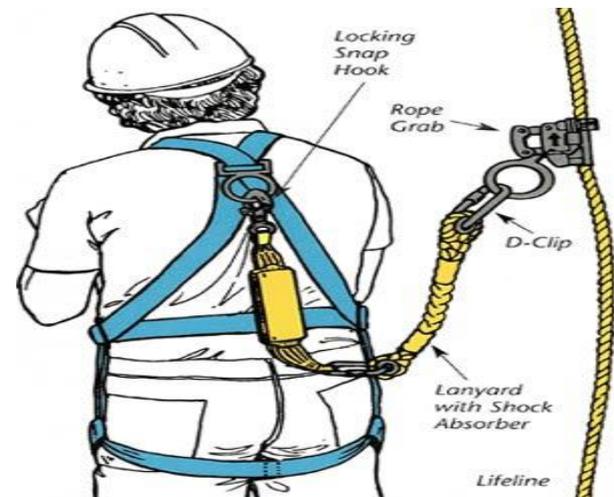
CONNECTING MEANS



Method or subsystem to connect body support to an anchorage

• ***Components of the subsystem may include:***

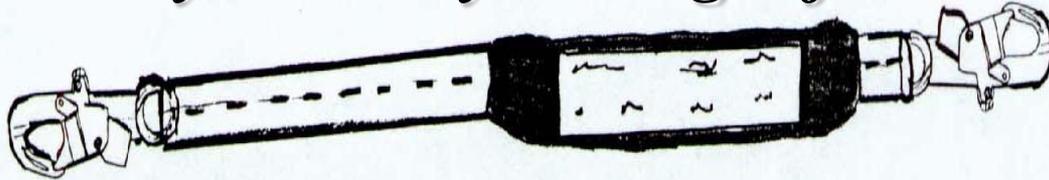
- ***Shock absorbing lanyard including deceleration device (energy absorber) made of rope, strap or webbing with snaphooks or carabiners (use only the locking type)***
- ***Rope grab (fall arrestor) connected to a lifeline or a rope lanyard***
- ***Self retracting lanyard***



CONNECTING MEANS (Continued)



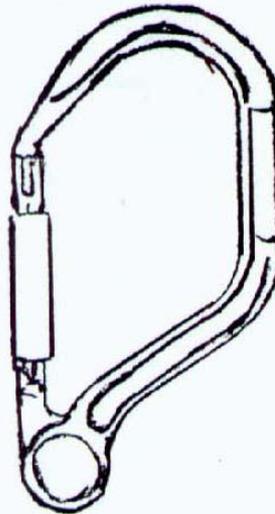
Lanyards vary in length from 2-6 ft



Shock Absorbing Lanyard



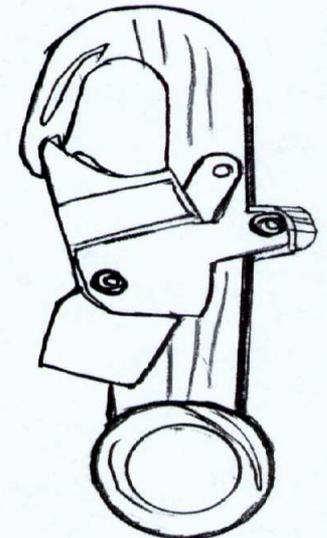
Dual lanyard



Carabiner

Side gate is designed for force of 350 lbs

Non locking Snaphooks and Carabiners are prohibited



Snaphook

CONNECTING MEANS (Continued)



Fall Hazard Alert for Replacement Period and Use of Snaphooks and Carabiners meeting the Requirements of ANSI Z359.1 (1992, R1999) Standard

The American National Standards Institute, ANSI Z359 Committee published new fall protection standards as part of the fall protection code. The new fall protection code became effective November 2007. The code improved the performance of fall protection equipment, specifically increasing the gate strength of snaphooks and carabiners, as part of the updated ANSI Z359.1 Standard.

The gates of the old snaphooks and carabiners, manufactured per ANSI Z359.1 (1992, R1999) Standard were designed to withstand a force of 220 pounds against the face and 350 pounds side loading. The new snaphooks and carabiners gates manufactured per ANSI Z359.1 (2007) Standard are designed to withstand a force of 3,600 pounds force when applied in all directions. These new snaphooks and carabiners are stronger and safer for use. The gates of the old snaphooks and carabiners are the weak link of the fall arrest equipment.

During a fall, the gate of the old snaphook and carabiner might be impacted or loaded beyond its designed strength and disengagement will occur, either due to misuse or the use of incompatible connections as part of the fall arrest system. The gate will fail and disengagement from other connectors will occur.

Snaphooks and carabiners manufactured in accordance with ANSI Z359.1 (1992, R1999) Standard may be used up to 1 January 2011. After this date all snaphooks and carabiners shall meet the requirements of ANSI Z359.1 (2007) Standard and having gate strength of 3,600 pounds.

Safe practices and considerations to be followed when using old snaphooks and carabiners:

Make sure the sizing of the old snaphooks and carabiners is compatible with the attachment points (Dorsal D-ring or anchorage connectors).

When connecting a 6 ft lanyard having an old snaphook or carabiner at each end to an attachment point lower than the D-ring level, the free fall distance will be in excess of 6 feet. Make sure the lanyard is designed and manufactured to limit the maximum arrest force on the body to 1,800 pounds.

Do not attach the old snaphook or carabiner directly to the horizontal lifeline (HLL). Instead, attach a circular ring to the HLL and connect the snaphook to the ring; so that the bearing point of the snaphook will be impacted not the gate.

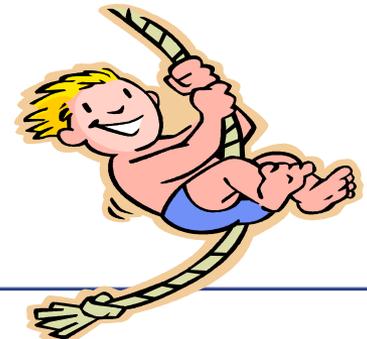
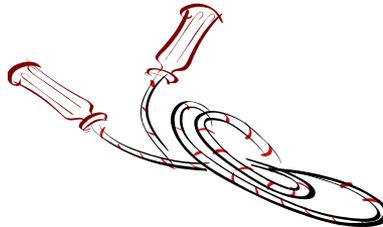
POC is Basil Tominna, P.E., Navy Fall Protection Subject Matter Expert, at DSN 522-3041, COM 619- 532-3041 or Internet basil.tominna@navy.mil.



CONNECTING MEANS (Continued)



- ***Lanyards, snaphooks and carabiners shall have a minimum tensile strength of 5,000 lbs***
- ***Do not tie a lanyard to itself, or tie a snaphook to another snaphook or carabiner, unless permitted by the manufacturer***
- ***Ropes, straps or webbings used in lanyards, lifelines, body harnesses and body belts shall be made of synthetic fibers***
- ***Snaphooks, carabiners and connectors shall be forged steel***

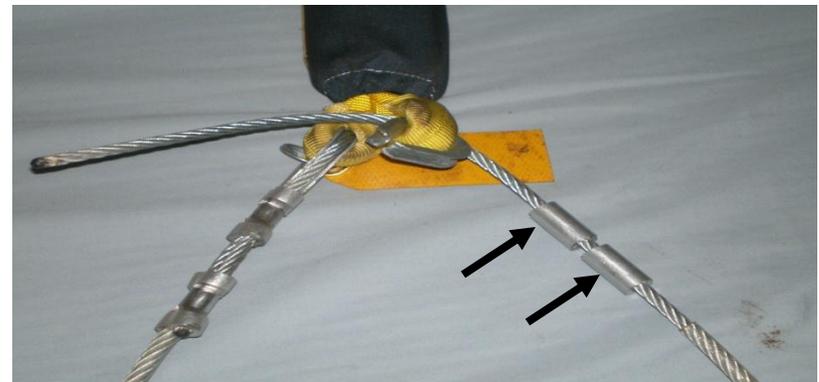


New Equipment with Problems

This is a good example of why we inspect out equipment, new or old, before we use it.



The lanyard was taken from store, new package and never used. You can see where all the connections are crimped – except the 2- for the one lead (see arrow)



CONNECTING MEANS (Continued)



Self Retracting lanyards

21.H (4)c

(SRL)

A deceleration device

✓ *Limit free fall distance to 2 ft*

✓ *SRL shall withstand a tensile load of 3,000 lbs*

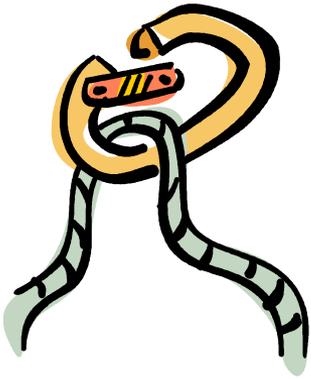
✓ *Inspection performed by the manufacturer*



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 arresting force on the body shall not exceed 1,800 lbs
- Max arresting force when using shock absorbing lanyard is 900 lbs
- Breaking strength of the straps – minimum 5,000 lbs



Body Support (Continued)

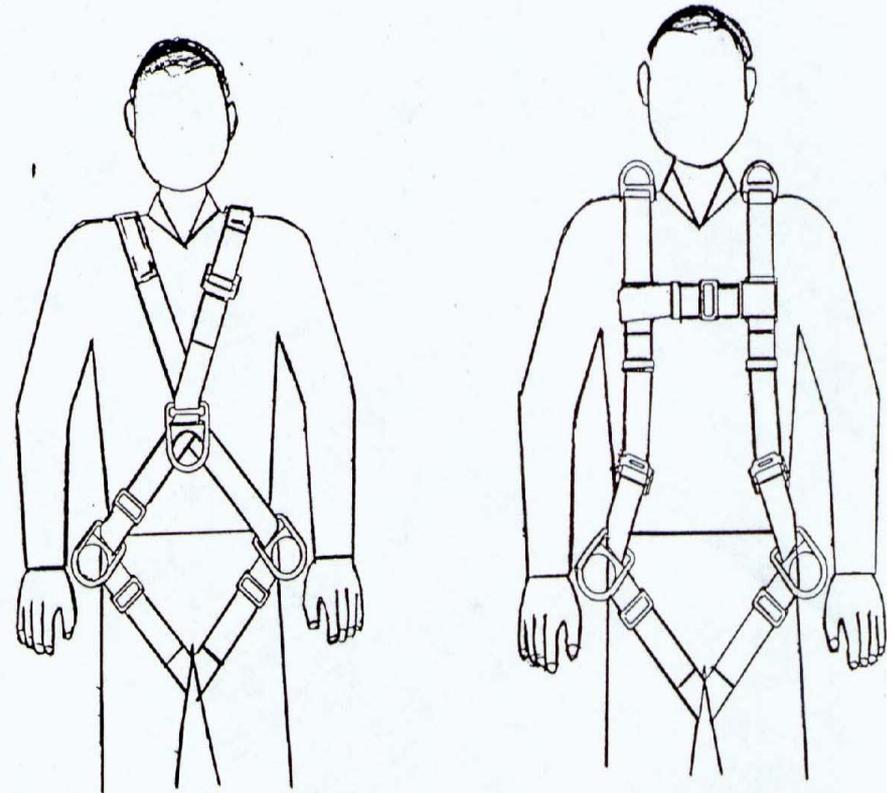


Two styles of harnesses

✓ *Vest style –chest strap*

✓ *Cross-over style*

*All straps must be
Connected properly*



Full Body Harness

Conduct a buddy check

Body Support (Continued)

D-ring attachment to full body harness: (4 locations)

- 1. Dorsal D-ring attachment:** Used for fall arrest, confined space entry and travel restraint system
- 2. Frontal D-ring attachment:** Used for ladder climbing, work positioning, decent control and rescue
- 3. Side D-rings attachment:** Used for work positioning
- 4. Shoulder D-ring attachment:** Used for confined space entry and raising/lowering devices



Different Harness Types



*Body harness
Shall be worn
snugly*

Inspection of Fall Protection Equipment



• **End User**

- *Inspect all components prior to each use*
- *Look for cuts, damaged threads, discoloration, abrasions, deformation, cracks, burn damage, ultraviolet deterioration and/or missing markings and labels*

• **Competent person**

- *Inspect equipment periodically or at least once a year with documentation*
- *(twice a year per EM385)*
- *Any damaged or impacted equipment shall be tagged and removed from service immediately*
- *Industry practice – Replace equipment after 5 years*



Fall Protection Competent Person Checklist

A Complete and Safe Fall Arrest System



Should Include the following:

- ***A written fall protection program***
- ***Anchor point identification and certification***
- ***Fall arrest system design, selection and use***
- ***Training requirements***
- ***Rescue plan and procedures***
- ***Establish inspection, storage, care, and maintenance procedures for FP equipment***



FALL ARREST SYSTEM CONSIDERATIONS



- *Movement of the worker*
- *Existing obstructions in the worker's path*
- *Location and availability of safe anchorages*
- *Total fall distance, free fall distance and available clearance*
- *Swing fall hazards*
- *Compatibility of all components of the system*
- *Impact forces*
- *Rescue/self rescue*

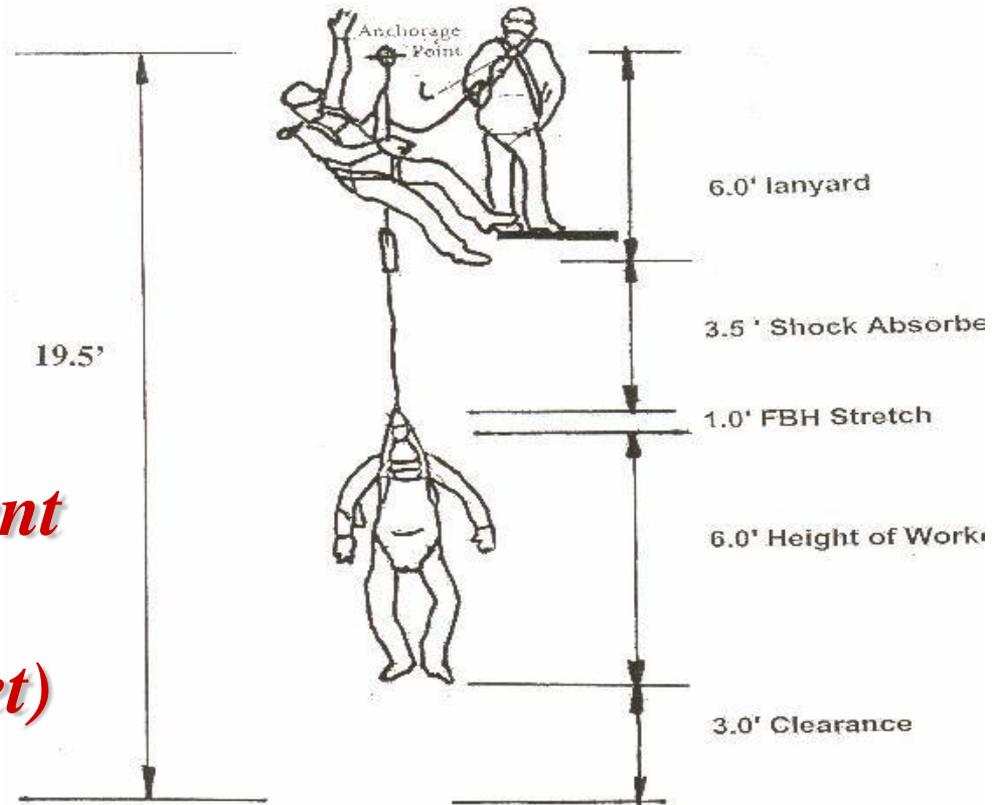


TOTAL FALL DISTANCE CONSIDERATIONS



Always calculate potential fall Distance

Add additional clearance for material, equipment or protruding rebar (varies from 2 to 3 feet)

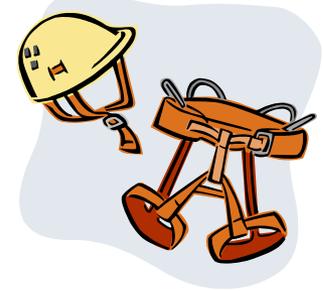


If the total clearance of 18.5-19.5 ft is not available use other systems such as SRL

HARDWARE COMPATIBILITY



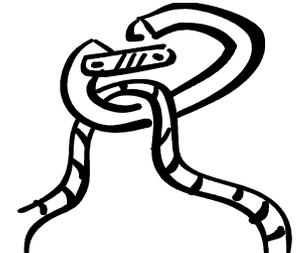
- *Is the relationship between components (**snaphook** and **D-ring**)*
- *Snaphook shall be sized so that the gate and keeper is protected and should not be opened by the D-ring itself*
- **Roll-out** (traditional): *a non locking snaphook rotates, and the gate is pressed open and disengagement occurs*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



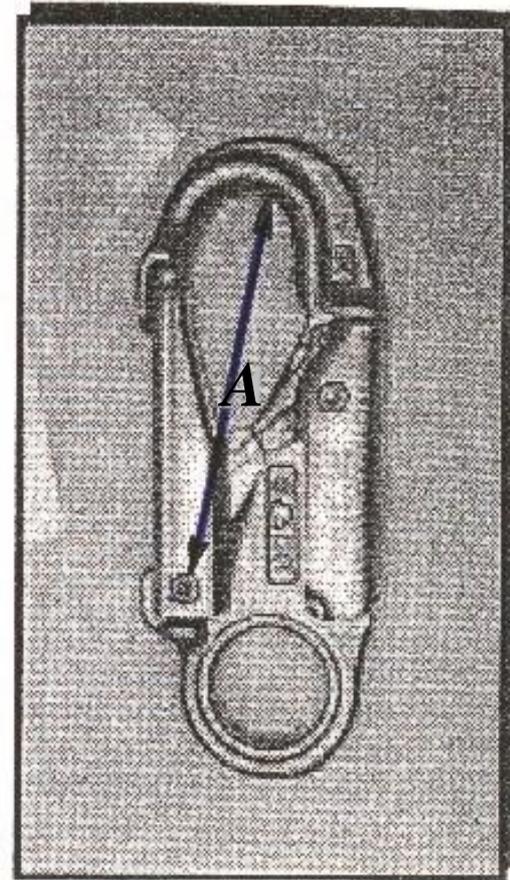
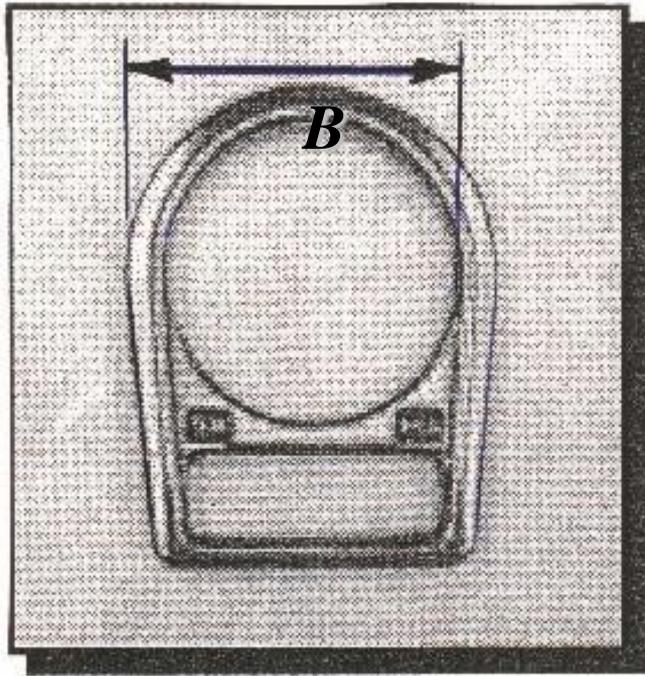
Hardware Compatibility (Continued)



- **Using locking snaphooks does not assure compatibility**
- **Compatibility is achieved when:**
 - **Two dimensions of the D-ring and snaphook should be compared:**
 - **Snaphook:** Dimension from the bearing point inside the nose to the pivot point
 - **D-ring:** The dimension from outer edge to the inner edge of the opposite side
- **The snaphook dimension must be less than the D-ring measurement**



Hardware Compatibility (Continued)



***Dimension “A” must be less than “B”
So that the snaphook will self correct in the event of a fall***

100% FALL PROTECTION

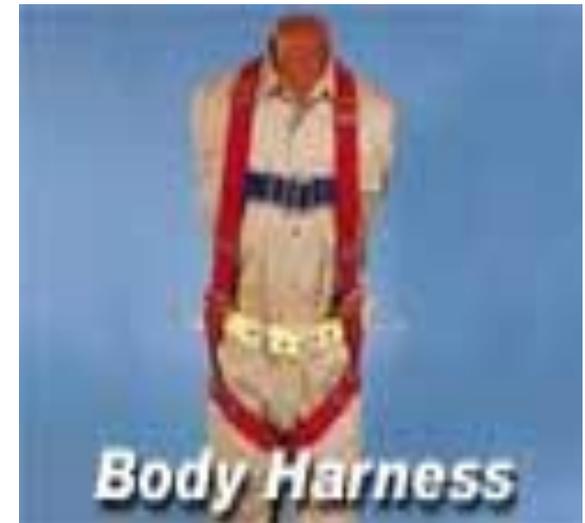


QUESTION?

An employee is using a personal fall protection system (harness). What means can they use to insure 100% fall protection?



See 21.H.05(4)b





Other Fall Protection Systems



OTHER FALL PROTECTION SYSTEMS



- *Horizontal and vertical lifeline*
- *Ladder climbing devices*
- *Work positioning and travel restraint systems*
- *Warning line system*
- *Aerial lift equipment/work platforms and staging*
- *Scaffolding Systems*
- *Raising/lowering devices (Equipment)*
- *Covers*
- *Monitoring system*
- *Fall protection plan*
- *Controlled access zone*

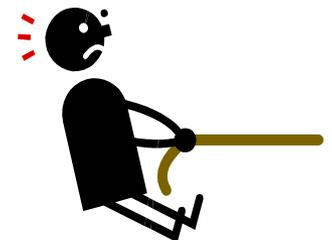


See Pages 5 – 8 for definitions of these systems

HORIZONTAL LIFELINE



- ***A fall arrest system (FA) that uses flexible wire, rope or synthetic cable, spanned horizontally between two end anchorages, may include in-line energy absorber or lifeline tensioner and turnbuckles***
- ***HLL shall be designed installed and used under the supervision of a qualified person as part of a complete FA 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***



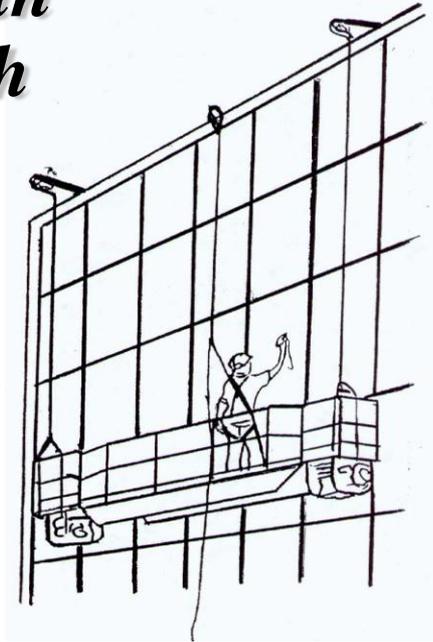
VERTICAL LIFELINE



➤ *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 or 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

FALL PROTECTION QUESTION



Which of the following is TRUE about lifelines?

- a. Multiple employees can be attached to the same vertical lifeline is acceptable to the contractor's competent person.
- b. Each employee must be attached to a separate vertical lifeline
- c. Lifeline can be designed to the actual working loads
- d. Horizontal lifelines never require locking devices
- e. None of the above answers is true

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 (i.e. rebar assembly, towers or poles)***
- ***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***
- ***Body belts are allowed in work positioning system***
- ***When using body belt the point of attachment shall be located on the sides or on the front***



RESCUE PLANS AND PROCEDURES

21.M (ANSI Z359.2)



- *Fallen employee must be promptly rescued unless they can rescue themselves*
- *Written rescue and evacuation plan and procedures shall be prepared and maintained when the end user is working at height and using FP equipment*
- *Authorized rescuers shall be trained accordingly*
- *Anchorage for rescue shall be identified and selected*



Why do the anchorages for rescue have to be Identified/selected?

NEW FALL PROTECTION PROGRAM 21.C.



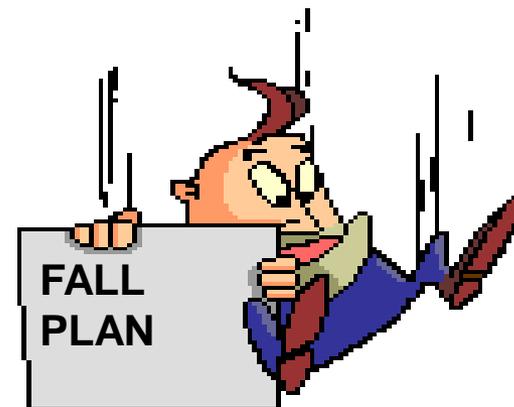
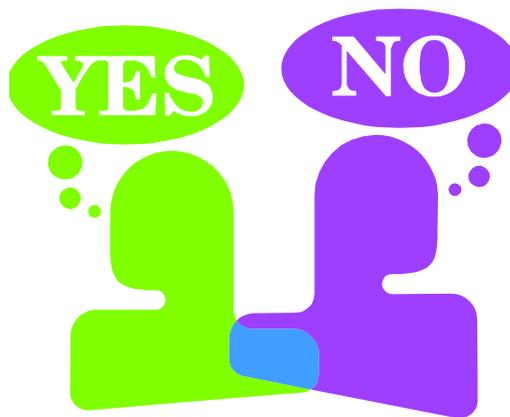
If Contractor has personnel working at heights , exposed to fall hazards and using fall protection equipment , he shall develop A Site-Specific Fall Protection and Prevention Plan. *Covers all employees exposed to fall hazards and updates as conditions change, at least every 6 months*

- a. Duties and responsibilities. Identify Competent and Qualified Persons for fall protection and their responsibilities and qualifications;**
- b. Description of the project or task performed;**
- c. Training requirements to include the safe use of fall protection equipment;**
- d. Anticipated hazards and fall hazard prevention and control;**
- e. Rescue plan and procedures;**
- f. Design of anchorages/fall arrest and horizontal lifeline systems:
(1) It is realized that the provision of fall protection for the first person up for establishing anchorages ONLY would be difficult. In this situation, fall protection may not be required. After anchorages are installed, fall protection is required.
(2) The contractor shall identify all locations where anchorages need to be established, and detail in the Plan/AHA how work will be performed safely.**
- g. Inspection, maintenance and storage of fall protection equipment;**
- h. Incident investigation procedures;**
- i. Evaluation of program effectiveness and,**
- j. Inspection and oversight methods employed.**

Site-Specific Fall Protection and Prevention Program VS. Fall Protection Plan



Fall Protection Program **required** by Em-385 and specifications 013526



Fall Protection Plan allowed by OSHA but not acceptable to Navy.

CONTROLLED ACCESS ZONE



Allowed by OSHA not by Navy

Reference 1926, Subpart "M" Definitions

An area in which work may take place without the use of guardrail, PFAS, or safety net system and access to the zone is strictly controlled.



Example: Metal deck installation, pre-cast Concrete decking, floor/deck form placement

Fall Protection Issues

- **USACE Manual EM 385-1-1 enforcement**
 - **FAR Clause 52-236-13 enforced on all DoD construction and demolition projects**

- **Residential Construction**
 - **EM 385-1-1 does not differentiate between residential and non residential construction but OSHA does.**
 - **(Residential Roofing)**

- **EM 385 threshold height for providing fall protection to **steel erectors** and scaffolds is 6 feet; this height is different from OSHA requirements**
- **(OSHA and COE differences)**

FALL PROTECTION ISSUES (Continued)



- **Anchorage strength requirements for:**
 - **Fall arrest system – 5,000 lbs**
 - **Work positioning system 3,000 lbs**
 - **Travel restraint – 3,000 lbs**
 - **Rescue – 3,000 lbs**
- **During any phase of construction**



Fall Protection must be provided.

FALL PROTECTION ISSUES (Continued)



- ***Snaphooks and carabiners, steel vs. aluminum – use steel***
- ***Cages are allowed by OSHA but OSHA does not “approve” any systems***
- ***Subcontractors training –make sure subcontractors personnel exposed to fall hazards are trained***
- ***Third party certification- is highly recommended***
- ***Maximum wind velocity for a worker to work on roofs and other elevated surfaces shall not exceed 40 mph***

SELECTION OF SAFE ANCHORAGES



- ***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 IMPACT OF SHEAR FORCES AND BENDING MOMENTS AT THE SUPPORTS***
- ***WHEN SELECTING ANCHORAGE LOCATION CONSIDER THE HAZARD OF SWING FALL EFFECT***
- ***THE CLOSER THE TIE OFF POINT IS TO THE SUPPORT, THE GREATER THE IMPACT FORCE***

SELECTION OF SAFE ANCHORAGES (Continued)



- **ANCHOR STRAP IS THE MOST FAVORABLE WAY TO TIE OFF TO A BEAM**
- **WHEN INSTALLING ROOF ANCHORS, THE NUMBER OF NAILS SHALL COMPLY WITH BUILDING CODE REQUIREMENTS**
- **ACCESSIBILITY, LOCATION AND EASE OF TYING OFF SHOULD ALWAYS BE TAKEN INTO CONSIDERATION WHEN SELECTING ANCHORAGES**



Selection of Safe Anchorages (Continued)



- ***REFRAIN FROM USING WELDING AS AN ANCHORAGE CONNECTION UNLESS THE WELDING IS PERFORMED BY A CERTIFIED WELDER***
- ***CONSIDER THE EXPOSURE OF ANCHORAGE CONNECTORS TO SHARP EDGES, ABRASIVE SURFACES AND PHYSICAL HAZARDS SUCH AS HEAT, ELECTRICAL AND CHEMICAL SOURCES***
- ***WHEN ASSISTED RESCUE IS PLANNED, ADDITIONAL ANCHORAGE FOR RESCUE SHOULD BE SELECTED OR IDENTIFIED***



FALL PREVENTION DESIGNS



Fall Protection and Prevention Considerations for New Buildings and Facilities

- ***FEAD Personnel reviewing 100 % plan submittal should point out and provide comments if FP is not incorporated in the design of buildings and facilities***





TYPES OF FALL PROTECTION TO USE?

IAW Specification Section 013529 Safety and Occupational Health Requirements section 1.7.1 (e) a Fall Protection and Prevention (FP & P) Plan prepared and signed by a qualified person for fall protection which is site specific and addresses all fall hazards in the work place and different phases of construction shall be accepted as part of the Accident Prevention Plan (APP) and kept on the job site for the duration of the project.

TYPE OF FALL PROTECTION										
MEANS ALLOWED FOR PROVIDING FALL PROTECTION										
TYPE OF WORK & SITUATION	Conventional Fall Protection				Position Device	Fence or Barricade	Fall Protect Plan (F)	Warning Line(1)	Control Access(2)	Safety Monitor(3)
	Guardrails	Safe Net	PFAS	Covers						
Unprotected Sides/Edges	✓	✓	✓			✓				
Leading Edge Work and Roofs	✓	✓	✓		✓		✓ (1)	✓ (1 & 2)		
Hoist Area	✓									
Holes and Openings	✓			✓		✓				
Formwork & Reinforcing	✓	✓	✓		✓					
Ramps/Runways & Walkways(4)	✓									
Excavations Pits, Shafts, Wells	✓			✓		✓				
On/Above Dangerous Equipment	✓	✓								
Overhead Bricklaying	✓	✓								
Low Slope Roof	✓	✓	✓					✓ (1 & 2)	✓ (1 & 2)	
Steep Roof	✓	✓	✓							
PreCast Erection	✓	✓	✓				✓ (1)		✓ (1 & 2)	
Steel Erection	✓	✓	✓							
Residential	✓	✓	✓				✓ (1)			
Wall Openings	✓	✓				✓				
Sheet piles, h-piles, cofferdams	✓	✓	✓							

(F) Only if proven infeasible to use a conventional system (OSHA Only)

(1) Warning Line- 6 feet from edge. No employees outside line.

(2) Outside warning line, must have conventional fall protection system.

(3) Safety Monitor NOT ALLOWED in lieu of any fall protection system

(4) Fall Protection required if workers exposed to falls over FOUR FEET

**See Student Resources Binder Section E
Page number 4 for this data base**