



Lunch Box Safety Talks ***Safety Over Sandwiches***

Fall Protection Strategies - Preventing the Fall

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Safety Made Simple, LLC***

Outline – Fall Protection

Passive Fall Prevention

Fall Restraint

Fall Arrest

Equipment Inspection/Maintenance

Fall Hazard Analysis

Evaluate the workplace for fall hazards and plan accordingly:

Evaluate:

- Work Environment
- Work Areas
- Activities where fall hazards exist

Action Requirements for Fall Hazards

- 4 foot – General Industry
- 6 foot – Construction
- 10 foot – Scaffolding
- 5 Foot – Maritime
- 15 Foot – Steel Erection

Applicable General Industry Standards

1910.21	Definitions
1910.22	General requirements
1910.23	Ladders
1910.24	Steps bolts and manhole steps
1910.25	Stairways
1910.27	Scaffold and rope descent systems
1910.28	Duty to have fall protection and falling object protection
1910.29	Fall protection systems and falling object protection – criteria and practices
1910.30	Training requirements



Applicable Construction Industry Standards

1926 Subpart M – Fall Protection

1926.500 – Scope, Application, Definitions

1926.501 – Duty to Have Fall Protection

1926.502 – Fall Protection Systems, Criteria, Practices

1926.503 – Training Requirements



Hierarchy of Fall Protection

Passive Fall Prevention

ADDRESSING THE
HAZARD



Passive Fall Protection

Best example – Guardrail

Once a guardrail is installed it doesn't need to be altered to prevent access to the leading edge.

Leading Edge - A leading edge is any unprotected edge of a platform, floor, or other construction point where the elevation between the next level or the ground is greater than six feet (4 ft general industry).

Passive Fall Prevention

Prevents a fall

4 foot – General Industry “The Forty-Eight Inch Rule”



Guardrails

Top-rails must be 42 inches above the walking/working surface

- 200 lbs. of force in any direction

Intermediate rails 21 inches

- 150 lbs. of force in any direction

Toeboard - minimum vertical height of 3.5 inches where falling object hazards exist





Floors Openings and Holes

Floor Opening - An opening measuring 12 inches or more in its least dimension, in any floor, platform, pavement, or yard through which persons may fall; such as a hatchway, stair or ladder opening, pit, or large manhole.



Floor Openings

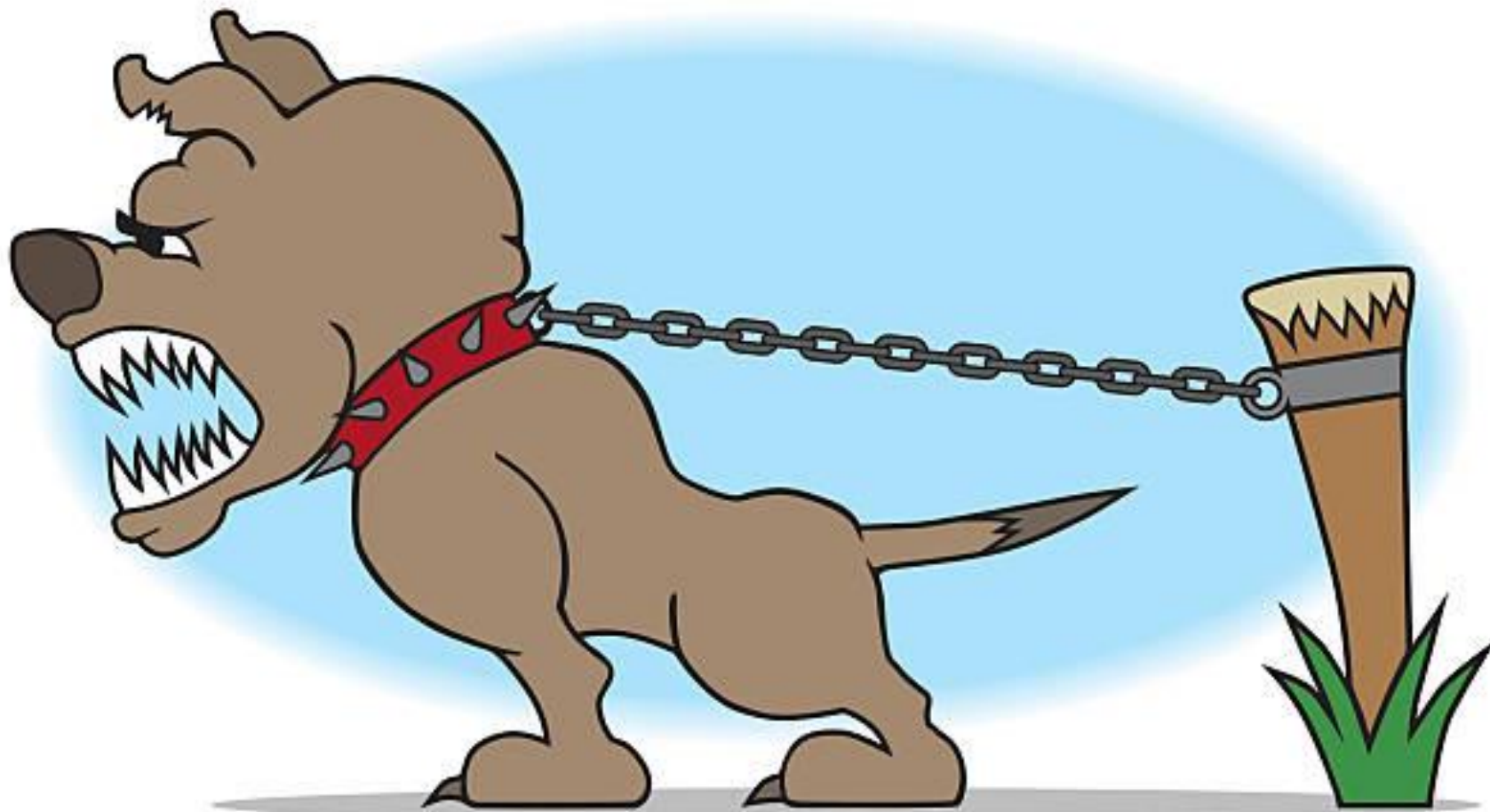
Need to be guarded:

- Standard Railing – Permanent or temporary
- Hinged floor opening cover
- Manhole cover



Restraint

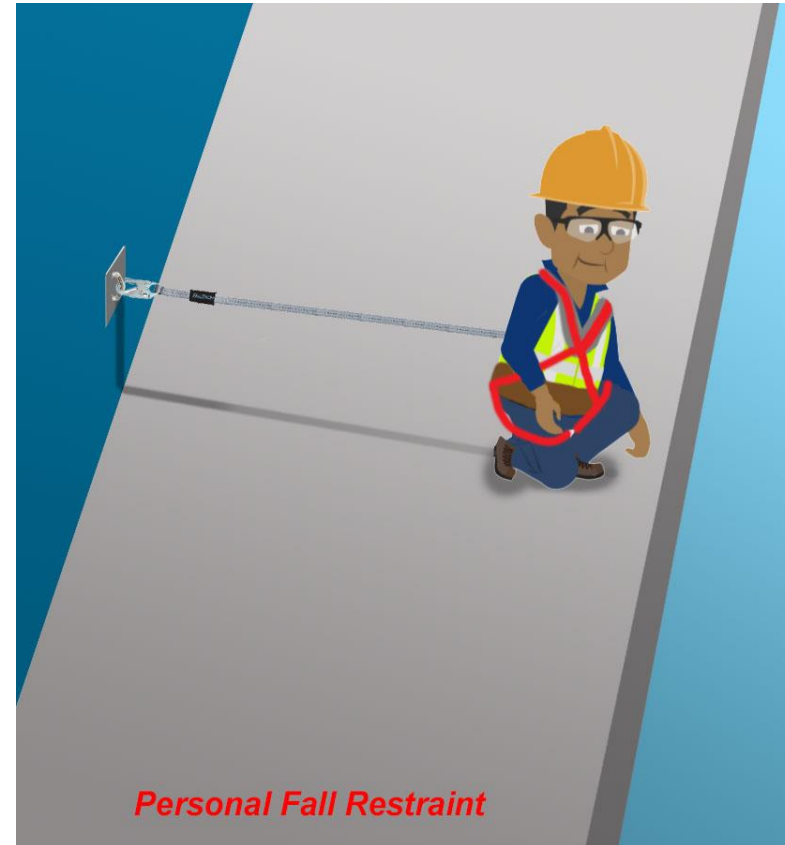
ELIMINATE FALL
POTENTIAL



Fall Restraint

A tie off system that “restrains” the employee from falling

Does not allow the worker to access the fall hazard



ABC's of Fall Restraint

Anchorage/Anchorage Connector

- 1,000 lbs.. (ANSI Z359) static load per person

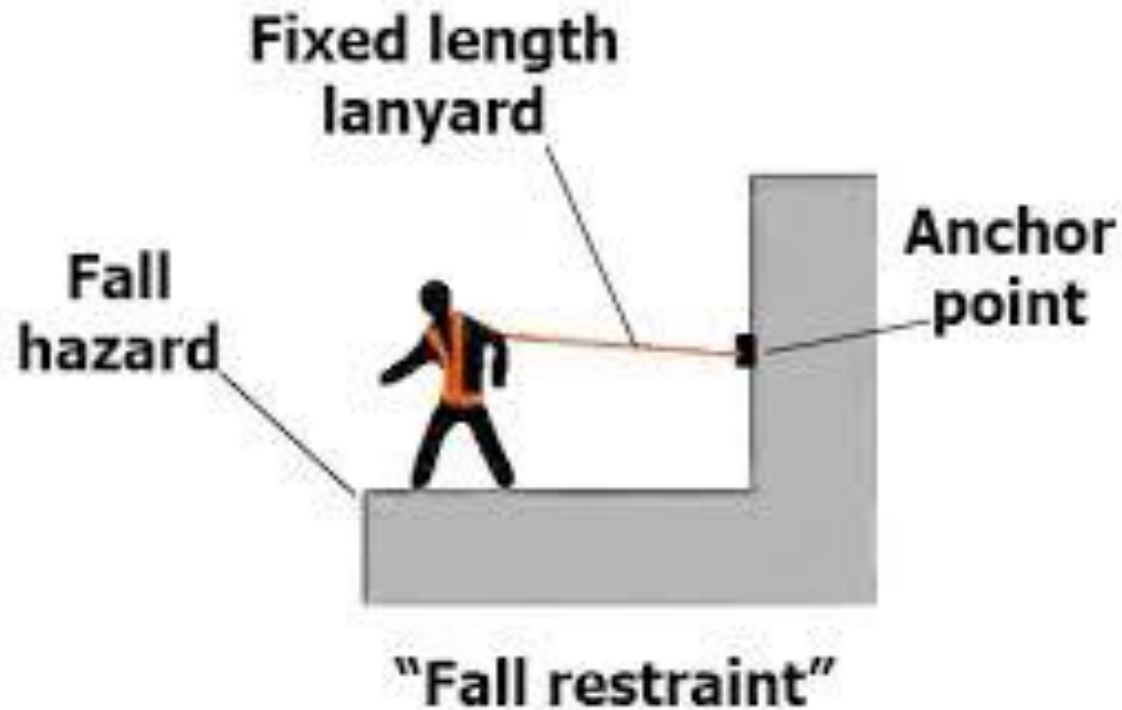
Body Wear

Connector

- Adjustable Length Lanyard Preferred



Fall Restraint



Must keep person's center of gravity from crossing the leading edge

Fall Restraint Benefits

Does not allow a person to be exposed to a fall

Anchorage point requirements of 1,000 lbs. (ANSI 359)

No fall, no rescue!

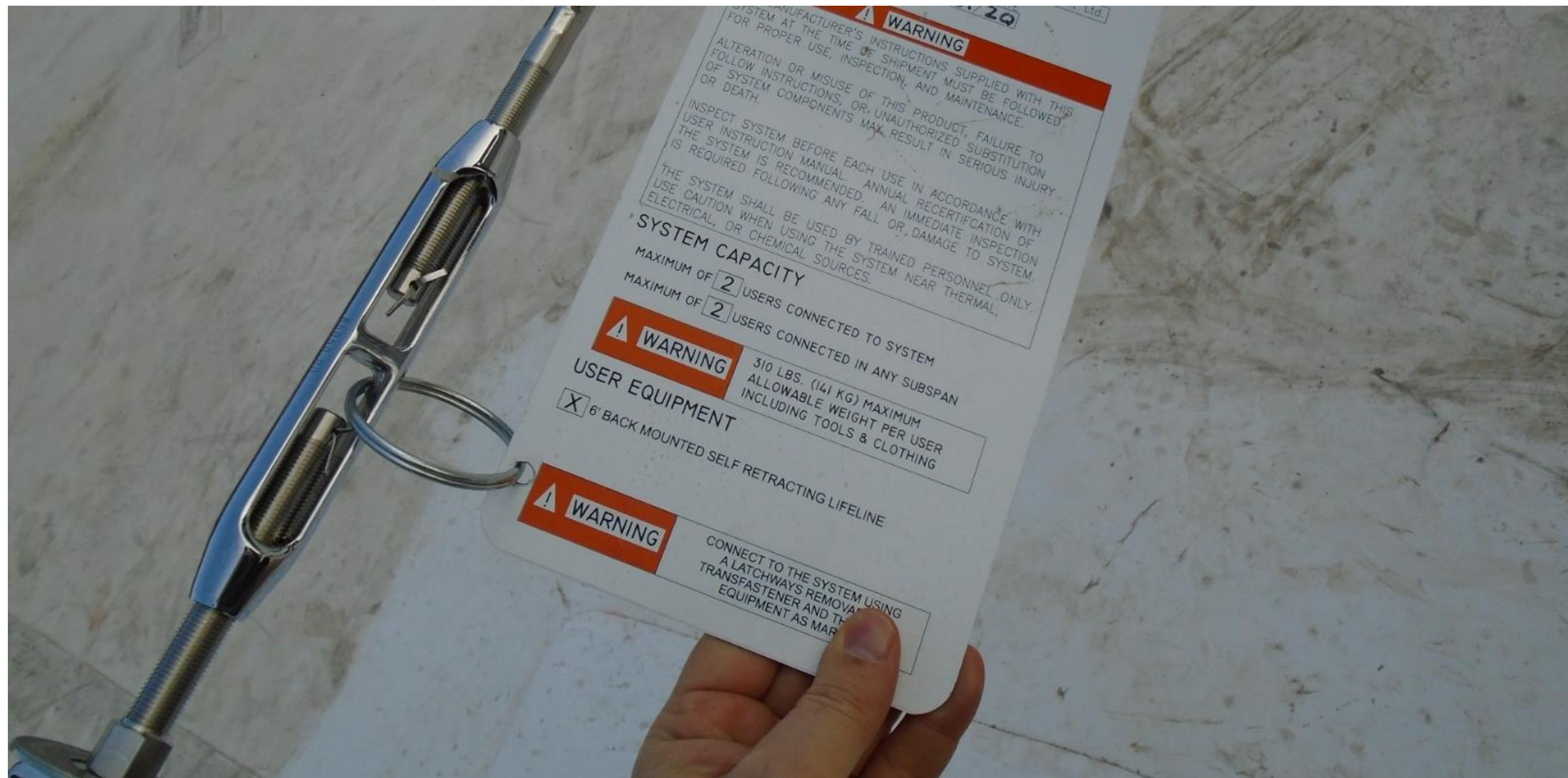












Personal Fall Arrest Systems

PREVENTING FALL
RELATED INJURIES
AND FATALITIES

Personal Fall Arrest System(PFAS)

Designed to stop a fall once it has already begun

Bring an employee to a complete stop and limit deceleration distance:

- 3.5 feet with a traditional energy absorbing lanyard
- 24 inches for Self- Retracting Lifeline



Arresting Forces



Personal fall arrest systems must limit arresting forces to 1800 lbs. when used with a body harness



Energy (shock) absorbing mechanisms should be used for fall arrest



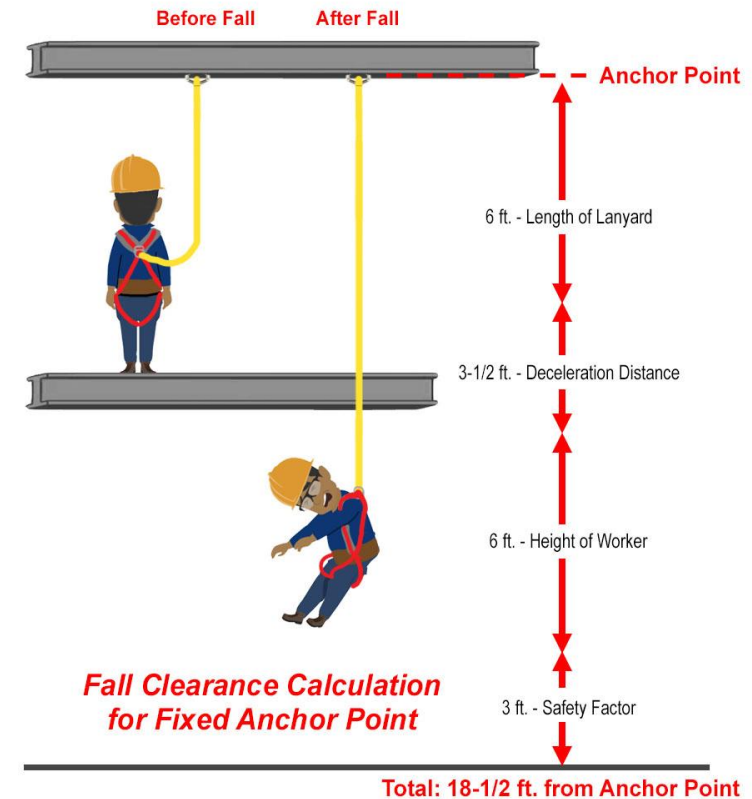
Free Fall Distance

Distance a body falls before the fall arrest system activates

Must not exceed 6 feet or contact w/lower level or obstruction

Up to 6 ft. lanyard

Less than 2 feet
SRL



ABCs of Personal Fall Arrest

Anchorage

Body Wear

Connector



Personal Fall Arrest System

Activates upon a fall

Stops Fall

May prevent serious injury



Anchorage

OSHA – “Anchorages used for attachment of personal fall arrest equipment shall be capable of supporting at least 5,000 pounds per employee attached, or shall be designed, installed and used as follows:

- as part of a complete personal fall arrest system which maintains a safety factor of two.
- Under the supervision of a qualified person.”
- Often referred to as “certified anchor points” or “engineered systems.”

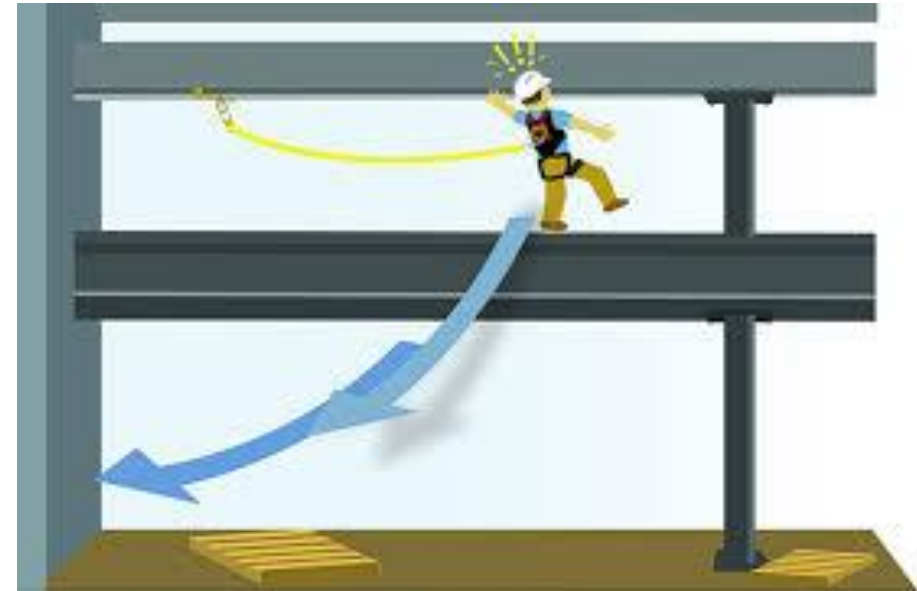


5,000 lb. Full
Size Truck

Anchorage - Swing Fall Hazard

When possible, choose an anchor point above the head

If not positioned overhead a pendulum effect will occur



Body Wear

Disperses forces of fall arrest over the chest, thighs, pelvis and shoulders

Connected to anchorage by a lanyard (Dorsal D-Ring)

D-ring tensile strength of 5,000 lbs.



TYPES OF HARNESSSES

DBI-SALA™ harnesses are available in different types, with various features, depending on their intended use.



MULTI-PURPOSE HARNESS

This type typically includes extra attachment points which allow work in a variety of situations. The belt and pad provide additional back lumbar support, positioning rings and tool carrying options.



WORK POSITIONING HARNESS

These harnesses have positioning D-rings located on the hips for use with pole straps or work positioning lanyards, which allow hands-free operation. Harnesses of this kind may include integral waist belts.



LADDER CLIMBING HARNESS

Harnesses with a frontal attachment point, for connection to permanent ladder safety systems.



DESCENT CONTROL HARNESS

These harnesses typically have frontal attachment points for use with descent control devices.



CONFINED ENTRY/RETRIEVAL HARNESS

One attachment point located on each shoulder strap facilitates upright retrieval from confined spaces.

Harness – D-Ring Locations

Back – Fall
Arrest/Restraint

Frontal – Ladder
Climbing/Descent Control

Shoulder – CSE
Entry/Rescue/Retrieval

Hips - Positioning



Connectors

Energy (shock) absorbing

Self retracting lifelines (SRL)

All must have double action locking hooks w/tensile strength of 5,000 lbs.



Connectors



Do not connect two snap hooks together (roll out)

Be aware of sharp edges. Guard sharp edges with a protective materials.

Never use two lanyards attached to a dorsal d-ring in place of a dual legged lanyard.

Why Use an Energy Absorbing Lanyard?

Forces= $W \times D$

Body Weight ---(W)

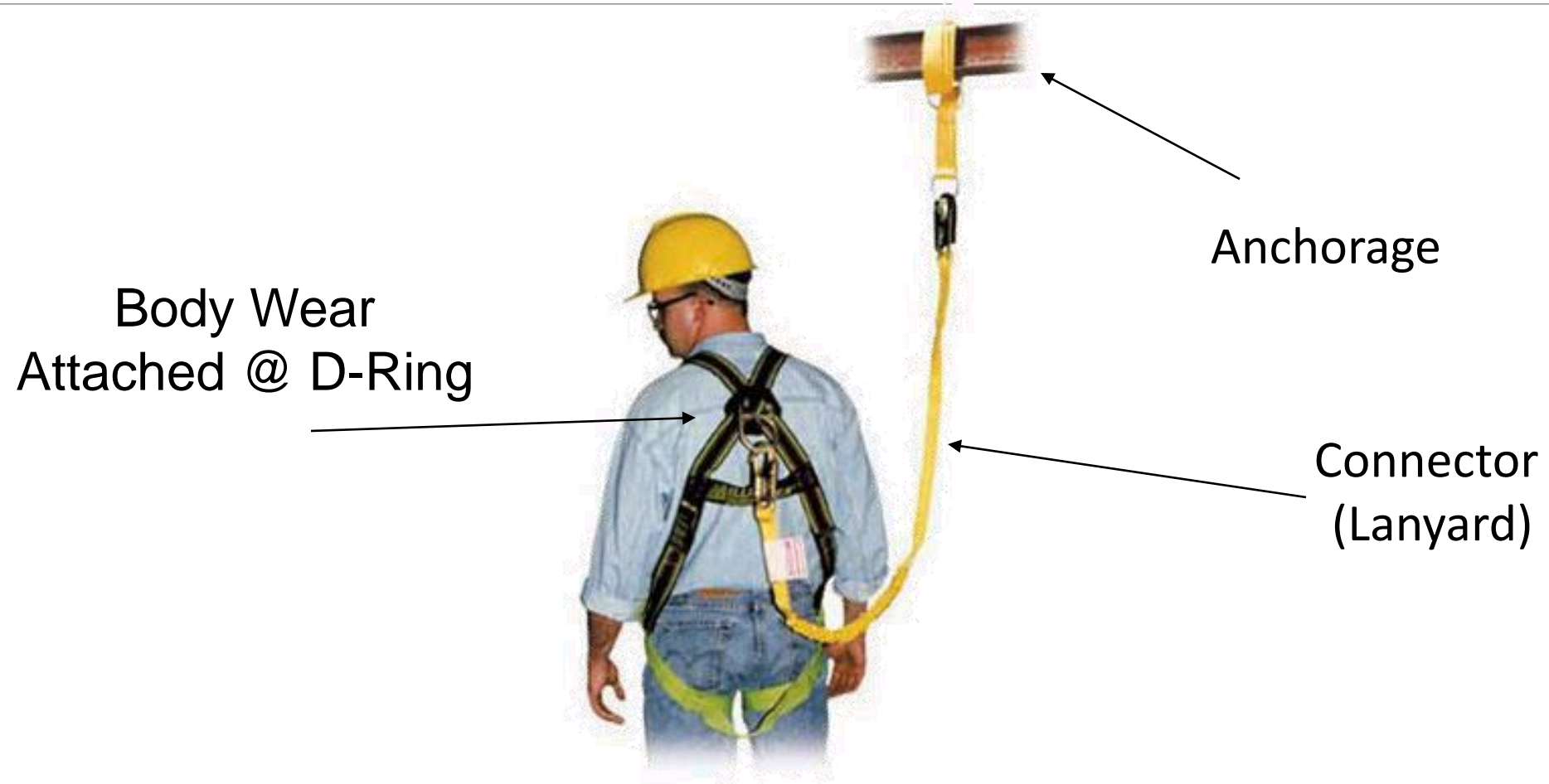
Free Fall Distance---(D)

- Example: A 220 lb. worker falling 6 feet can generate fall forces of 1,320 lbs. across the worker's body.
- Without adequate deceleration or energy absorbers this could cause serious injuries.

· **Shock absorbing web lanyard with 220 pound steel weight**

Distance of Drop	Average Force	Extension
3 feet	820 pounds	21 inches
4 feet	810 pounds	22 inches
5 feet	822 pounds	28 inches
6 feet	872 pounds	33 inches
7 feet	877 pounds	38 inches
9 feet	1315 pounds	41 inches
10 feet	1654 pounds	42 inches
11.5 feet	2332 pounds	42 inches

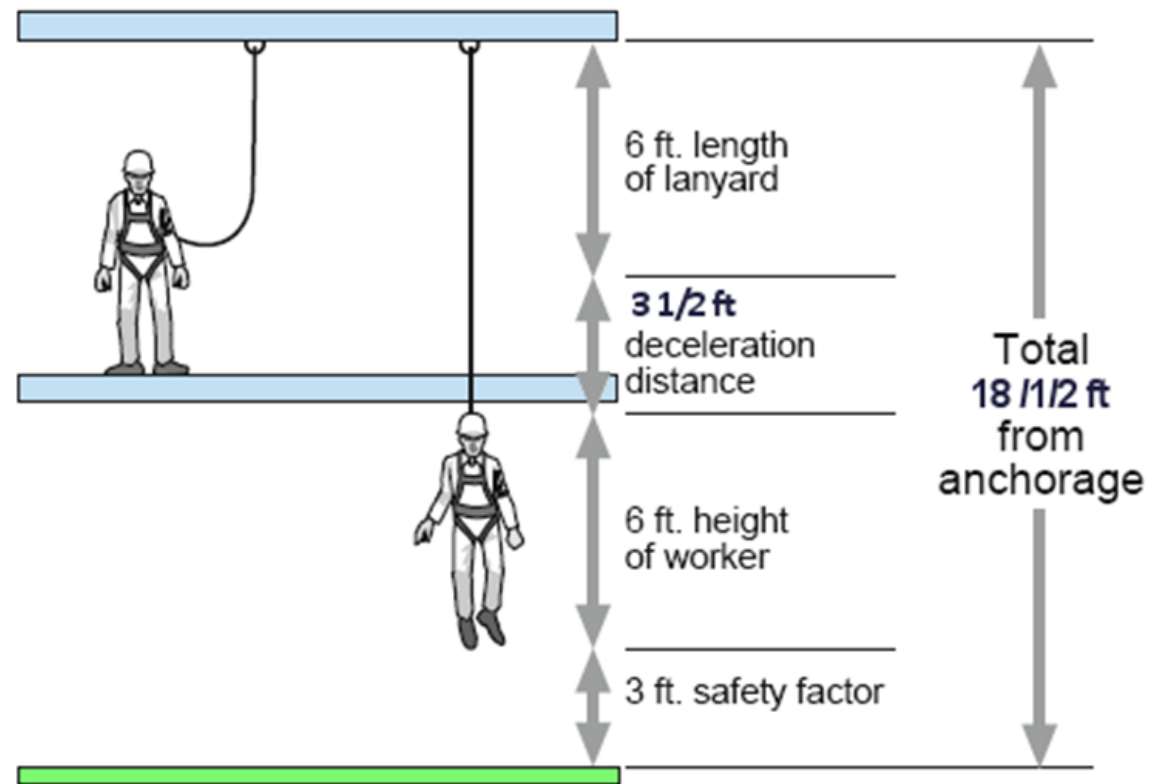
Fall Arrest System



Calculating Required Clearance/Total Fall Distance

Free Fall Distance	= 6 ft.
<u>+ Deceleration Distance</u>	<u>= 3.5 ft.</u>
= Total Fall Distance	= 9.5 ft.
+ Height of the Worker	= 6 ft.
<u>+ Safety Factor</u>	<u>= 3 ft.</u>
= Required Clearance	= 18.5 ft.

Assume: 6 foot energy absorbing lanyard anchored above the head



How to determine total fall distance with a shock-absorbing lanyard.

Vertical Lifeline

Travel Freely

Automatically
locks to arrest a
fall

Example: Rope
Grab



Horizontal Lifeline

Rated for pre-determined number of persons

Used accessing rolling stock (i.e. railcars, tops of tankers, etc.)





Horizontal Lifelines

Rigid or Flexible

Attach prior to stepping on to car or climbing ladder

Tug and walk technique

Retract when not in use (stress on retraction springs)

Fall Protection Requirements:

Crane Basket – fall Arrest/Restraint

Boom Articulating Lift –Fall Restraint

Scissor Lifts – Not required unless railing is removed

Scaffolding – 10 foot requirement



Fixed Ladder Fall Protection

Fixed Ladder Fall Protection

Final rule phased in requirements to equip fixed ladders, which extend over 24 feet, with ladder safety or personal fall arrest systems.

The rule prohibits the use of cages as a means of fall protection after the 20-year phase in period (2036).

OSHA does not believe cages or wells prevent workers from falling from fixed ladders or protect them from injury if a fall occurs.



Fixed Ladders

Ladder safety system

- Designed to reduce the possibility of falling from a ladder. The system consists of a:
 - Carrier
 - Safety Sleeve
 - Lanyard connector
 - Body Harness

Personal Fall Arrest System (OSHA)

- A system an employer uses to provide protection from falling or to safely arrest an employee's fall if one occurs.



Ladder Safety Systems

Must allow employee to climb up and down using both hands and not require employee to continuously hold, push or pull any part of the system while climbing.

Connection between the carrier and lifeline and point of attachment to body harness does not exceed 9 inches.

Ladder safety systems and their support systems must be capable of withstanding without failure, a drop test consisting of an 18-inch drop of a 500 lb. weight.



Phase-In Periods for Fixed Ladders (Past)

Phase 1 – November 19, 2018

- Employers must ensure that each fixed ladder over 24 feet in height, installed before this date is equipped with a personal fall arrest system, ladder safety system, cage or well.
- All newly installed fixed ladders >24 feet and replacement ladders after this date must be equipped with ladder safety or personal fall arrest systems.
 - Cages will no longer be accepted as a means of fall protection after this date.



Phase-In Period for Fixed Ladders (Future)

Phase II – November 18, 2036

- On and after this deadline, all fixed ladders >24 feet in height must be equipped with personal fall arrest or ladder safety systems.



Ladder Landing Platforms

In the definition, OSHA added the term walking-working surface and defines it as, “Any horizontal or vertical surface on or through which an employee walks, works, or gains access to a work area or workplace location.”

Related to platforms, under the revised standard, employers are required to:

- Ensure each employee is protected from falling into a ladderway floor hole or ladderway platform hole by a guardrail system and toeboards erected on all exposed sides, except at the entrance to the hole where a self-closing gate or an offset must be used. OSHA 1910.28(b)(3)(iv).



Emergency Use Ladders

1910.23 (a) The employer must ensure that each ladder meets the requirements of this section. This section covers all ladders, except when the ladder is:

- Used in emergency operations such as firefighting, rescue, and tactical law enforcement operations.
- Suggested compliance actions:
 - Label emergency use ladders “Emergency Use Only”
 - Train employees – appropriate use of emergency ladders

Frequently Asked Questions

Would climbing a fixed ladder in a full body harness and using double lanyards to tie off and maintain 100% connection to the fixed ladder be in compliance with the fall protection requirements in §1910.28(b)(9) if the ladder meets the standard's requirements for anchorages?

A double lanyard system that consists of a body harness, lanyards and an anchorage meets the definition of personal fall arrest system in the final rule, provided those components meet all of the applicable requirements in §1910.140(c) and (d). For example, the lanyards must have a minimum breaking strength of 5,000 pounds and anchorages (the fixed ladder in this instance) used to attach to the personal fall arrest systems must be capable of supporting at least 5,000 pounds for each employee attached.



Frequently Asked Questions

To determine whether a fixed ladder extends more than 24 feet above a lower level, is the measurement done from the ground level/lower level to the fixed ladder or from where the ladder starts to the top of it?

For purposes of §1910.28(b)(9), the employer must measure the distance from the ground/lower level to the top of the fixed ladder. If that distance exceeds 24 feet, regardless of the length of the ladder, the employer must equip the fixed ladder with fall protection.

Frequently Asked Questions

If a personal fall arrest system or ladder safety system is required on one section of a fixed ladder, are all sections required to have a personal fall arrest system or ladder safety system even if those other sections are less than 24 ft. in length?

Whether an employer must equip a fixed ladder or ladder sections with fall protection depends on the height the ladder extends above a lower level, and thus the distance a worker on the ladder could fall, not the length of the particular ladder section. Section 1910.28(b)(9)(i) requires that employers equip fixed ladders with personal fall arrest or ladder safety systems if the ladder extends more than 24 feet above a lower level.

For example, if a multiple section or side-step ladder extends more than 24 feet above the ground, the employer must equip the entire ladder with personal fall arrest or ladder safety systems. Although the length of each section of the ladder may be less than 24 feet, a worker on that ladder could fall more than 24 feet. OSHA also notes that §1910.28(b)(9)(ii)(A) requires that employers must ensure that a fixed ladder equipped with a personal fall arrest or ladder safety system on more than one section provides protection for the entire vertical distance of the ladder, including all ladder sections.

Rescue

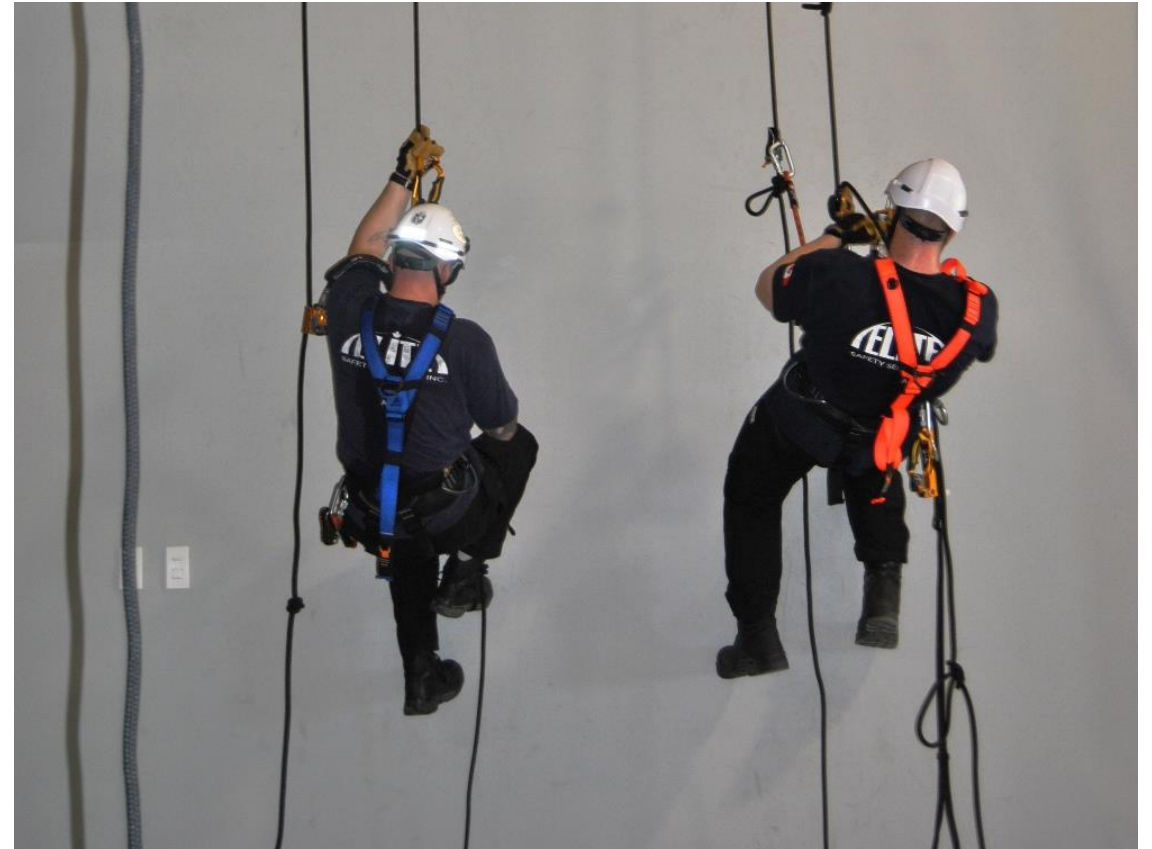
ESTABLISH A PLAN

Rescue

Employer shall provide **prompt** rescue of employees in the event of a fall or ensure that employees are able to rescue themselves.

- In-house equipment
- In-house rescue team
- Local first responders

According to ANSI “Prompt” = 6 minutes for rescue/subject contact



The Importance of Prompt Rescue



Orthostatic Intolerance – Development of symptoms such as light-headedness, heart palpitations, poor concentration, fatigue, nausea, headache and occasional fainting while standing upright.



Result of blood accumulating in the veins of the legs.



Also known as venous pooling and typically occurs due to the force of gravity and lack of movement.

Orthostatic Intolerance

Severe venous pooling will cause fainting.

Orthostatic intolerance requires the legs to remain relaxed, straight, tight and below head level.

Muscle contraction causes pressure on the veins pumping blood back to the heart and brain.



Suspension Trauma

Death called by orthostatic intolerance.

Can occur when a worker falls while wearing a body harness.

Worker is in an upright position with the legs dangling.

Harness straps put pressure on the leg veins reducing blood flow back to the heart.

Suspension Trauma

1

Blood pools in the legs.

2

Without muscle contraction in the legs, blood flow to the heart will slow and the person will lose consciousness.

3

Prolonged suspension can cause serious injury or even death in as little as thirty minutes.

Rescue

Trauma Straps

Descent Systems

Ladders

Aerial Lifts

Crane Basket

Ropes/Retrieval Systems

First Responders

Coworker – Never Work Alone!



Inspection

CARING FOR AND
INSPECTING
EQUIPMENT

Inspections

Before each use inspect lanyards, SRL and body wear:

- Cuts
- Frays
- Damage
- Cracks
- Burns
- Impact indicator





Inspections

Annually by a competent person (ANSI Z359)



Inspections

Personal fall protection systems and components subjected to impact loading should be taken out of service until:

- Inspected by a competent person
- Determined to be undamaged and suitable for use

If equipment is not useable, make it unusable.



Inspection

SRL

According to manufacturer frequency requirements

Annual Competent

Maintenance

Clean	Do not use	Air	Store	Damage
Clean body harness with water and mild soap solution	Do not use bleach or bleach solutions	Air Dry	Store body harness in a cool, dry, clean environment, out of direct sunlight	Many factors can damage a harness: <ul style="list-style-type: none">•Chemicals•Extreme heat•Sunlight

Training Requirements



Train employees on:

Nature of hazards in the work area

The correct procedures for maintaining, erecting and inspecting fall protection systems



Document all training:

Name of employee trained

Date

Signature of person who conducted the training

Test (Recommended)

Retraining

Required when:

- Changes in the workplace
- Changes in the types of fall protection systems or equipment used
- Determined that the employee does not have requisite understanding or skills



Thank you for the opportunity to promote safety!

Questions?

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