

# Fall Protection

29 CFR 1910.66 Appendix C

29 CFR 1926 Subpart M

# Duty to Have Fall Protection

- Provide fall protection systems which meet the criteria of 1926 and 1910
- Make fall protection an integral part of projects.
- Walking/Working Surfaces on which employees will work must have the strength and structural integrity to support the employees.

# Unprotected Sides and Edges

- Use guardrail systems, safety net systems or personal fall arrest systems to protect employees on walking/working surfaces (vertical or horizontal) with an unprotected side or edge with a fall hazard of 6 feet or more on construction sites
- General Industry 1910 - 4 feet or more

# Leading Edges

- When it is infeasible or creates a greater hazard to use guardrail systems, safety net systems or personal fall arrest systems when constructing a leading edge 6 feet or more above lower levels, develop and implement a fall protection plan which meets 1926.502 (k).
  - OSHA considers a fall protection measure to be infeasible when the employer establishes that application of that measure is either functionally unworkable or would prevent the performance of required work.

# Holes

- Protect employees from falling through holes (including skylights) more than 4/6 feet above lower levels by personal fall arrest systems, covers, or guardrail systems.
- Cover holes (including skylights) to prevent employees from falling in or through them, and also for objects falling through the holes.
- Label the hole cover as a hole cover.

# Form Work and Reinforcing Steel Construction Sites

- Use fall arrest systems, safety net systems or positioning device systems to protect employees from fall hazards 6 feet or more to lower levels.

# Ramps, Runways, and Other Walkways

- Use guardrail systems to protect employees on ramps, runways, and other walkways from falling 4/6 feet or more to a lower level.

# Excavations

- Use guardrails, fences, or barricades to protect employees from falling 6 feet or more when excavations are not easily seen due to plant growth or visual barriers.
- Use guardrails, fences, barricades or covers at the edge of a well, pit, shaft and similar excavation 6 feet or more in depth to protect employees from fall hazards.



# Dangerous Equipment

- Protect employees less than 4 /6 feet above dangerous equipment from falling into or onto the dangerous equipment by guardrail systems or by equipment guards.
- Protect employees more than 4 / 6 feet above dangerous equipment from fall hazards by guardrail systems, personal fall arrest systems, or safety net systems.

# Precast Concrete Erection

- Protect employees engaged in the erection of precast concrete members (such as panels, columns, beams) and related operations 6 feet or more above lower levels by guardrail systems, safety net systems, or personal fall arrest systems unless paragraph (b) of 1926.501 provides for an alternative fall protection measure.
- **Exception:** When the employer can demonstrate that it is infeasible or creates a greater hazard to use these systems, the employer must develop and implement a plan meeting the requirements of paragraph (k) of 1926.502.

# Wall Openings

- Protect employees working on, at, or above wall openings (including those with chutes attached) where the outside bottom edge of the opening is 6 feet or more above the next level and the inside bottom edge is less than 39 inches above the walking/working surface must be protected by a guardrail system, safety net system, or personal fall arrest system.

# Walking/Working Surfaces Not Addressed

- Protect employees on any walking/working surface 4 / 6 feet or more above lower level by a guardrail system, safety net system, or personal fall arrest system, except as provided in 1926.500 (a)(2) and 1926.501 (b)(1)-(14).

# Protection from Falling Objects

- Where falling objects are a hazard, employees must wear a hard hat and the employer must implement one of the following:
  - Erect toe boards, screens, or guardrail systems to prevent objects from falling from higher levels;  
or

The background of the slide is a solid orange-brown color with a pattern of faint, stylized autumn leaves in various shades of brown and orange. The leaves are scattered across the page, creating a seasonal theme.

# **Fall Protection Systems Criteria and Practices**

# General

- Fall protection systems required by this part must meet the applicable provisions of 1926.502 / 1910.66
- Provide and install fall protection systems for an employee before that employee is exposed to the fall hazard.

# Guardrail Systems

- Install midrails, screens, mesh, intermediate vertical members or equivalent between the top edge of the guard rail system and walking/working surface when there is no wall or parapet wall at least 21 inches high.
- Install midrails (when used) midway between the top edge and walking/working surface.



# Guardrail Systems

- Ensure that the guard rail system is capable of withstanding (without failure) at least 200 pounds applied within 2 inches of top edge in any outward or downward direction at any point along the top edge.
- Ensure that the top edge of the guard rail must not deflect to a height less than 39 inches above the walking/working surface when the 200 pound test load is applied in a downward direction.
  - The guard rail system meets this requirement if selected and constructed in accordance with Appendix B of 29 CFR 1926 Subpart M.

# Guardrail Systems

- Ensure that mid-rails, screens, mesh, and intermediate vertical members are able to withstand a force of 150 pounds applied in any downward or outward direction.
- Check the surfaces of guard rail systems to make sure they will not cause punctures or lacerations or snag clothing.
- Check the ends of all top-rails to ensure they do not overhang the terminal posts unless the overhang poses no projection hazard.

# Guardrail Systems

- Do not use steel or plastic banding as top or mid-rails.
- Ensure that top-rails and mid-rails are at least one quarter inch nominal diameter to prevent cuts or lacerations.
- Flag wire rope used for top-rails at no more than 6 feet intervals for high visibility.

# Guardrail Systems

- Use chains, gates, or removable guardrail sections at access areas at hoisting areas when hoisting is not taking place.
- Erect guard rail systems, when used at holes, at all unprotected sides or edges.

# Personal Fall Arrest System

A Personal Fall Arrest System is comprised of three (3) key components:

- **Anchorage connector;**
- **Body wear;**
- **And Connecting device.**

# Understand Your Fall Arrest System

A Personal Fall Arrest System is comprised of three (3) key components – anchorage connector; body wear; and connecting device.

## Remember: A, B, & C

**A = Anchorage/Anchorage Connector**

**B = Body Wear**

**C = Connecting Device**



# A = Anchorage/Anchorage Connector

**Anchorage:** Commonly referred to as a tie-off point (Ex: I-beam, rebar, scaffolding, lifeline, etc.)

- Must be high enough for a worker to avoid contact with a lower level should a fall occur.
- Anchorages must be capable of supporting 5,000 pounds (22kN) of force per worker.
- Careful consideration should be given to selecting a proper anchorage for ultimate safety.
- The anchorage should be easily accessible.

# The Importance of Anchorages

Carefully planned and selected anchorages are crucial. Should a fall occur, the worker will be suspended from the anchorage, their life depending on its strength. An anchorage, for example, could be an I-beam, while a cross-arm strap, or choker, wrapped around this beam and permitting attachment is the anchorage connector.

- Anchorage Connectors are designed as the intermediary device for securing a connecting device to an anchorage.
- The anchorage connector should be positioned to avoid a “swing fall.”



- Examples of Permanent Anchorage Connectors



“Photos/Illustrations/Information courtesy of Miller® Fall Protection”

# ■ Examples of Temporary Anchorage Connectors



# Temporary Horizontal Lifeline Systems



“Photos/Illustrations/Information courtesy of Miller® Fall Protection”

# Leading Edge Anchorage Connector



# Beam Anchorages



# B = Body Wear

**Body Wear:** The personal protective equipment worn by the worker  
(Ex: full-body harness)

- Only form of body wear acceptable for fall arrest is the full-body harness.
- Should be selected based on work to be performed and the work environment.
- Side and front D-rings are for positioning only.

## Incorrect Harness Fit

### Premium Harness



**Chest strap positioned incorrectly. Should be located at mid-chest to keep shoulder straps snug. Leg straps are too loose.**

# Incorrect Harness Fit

**Chest strap positioned too high and too loose. Leg straps are positioned improperly.**



# Correct Harness Fit

- Chest and Leg Straps Offer a Snug Fit





# C = Connecting Devices



While focus is given to anchorage connectors and body wear (full-body harnesses) components, the connecting device (a shock-absorbing lanyard or self-retracting lifeline) between these two components actually bears the greatest fall forces during a fall.

# C = Connecting Devices

- **Shock-Absorbing Lanyard or Self-Retracting Lifeline? Think About It!** - Always know your fall distance and select proper equipment to meet the fall clearance.
- **Remember... UNDER 18 1/2 ft. (5.6m)**
  - always use a Self-Retracting Lifeline.**OVER 18 1/2 ft. (5.6m)**
  - a Shock-Absorbing Lanyard or Self-Retracting Lifeline can be used.

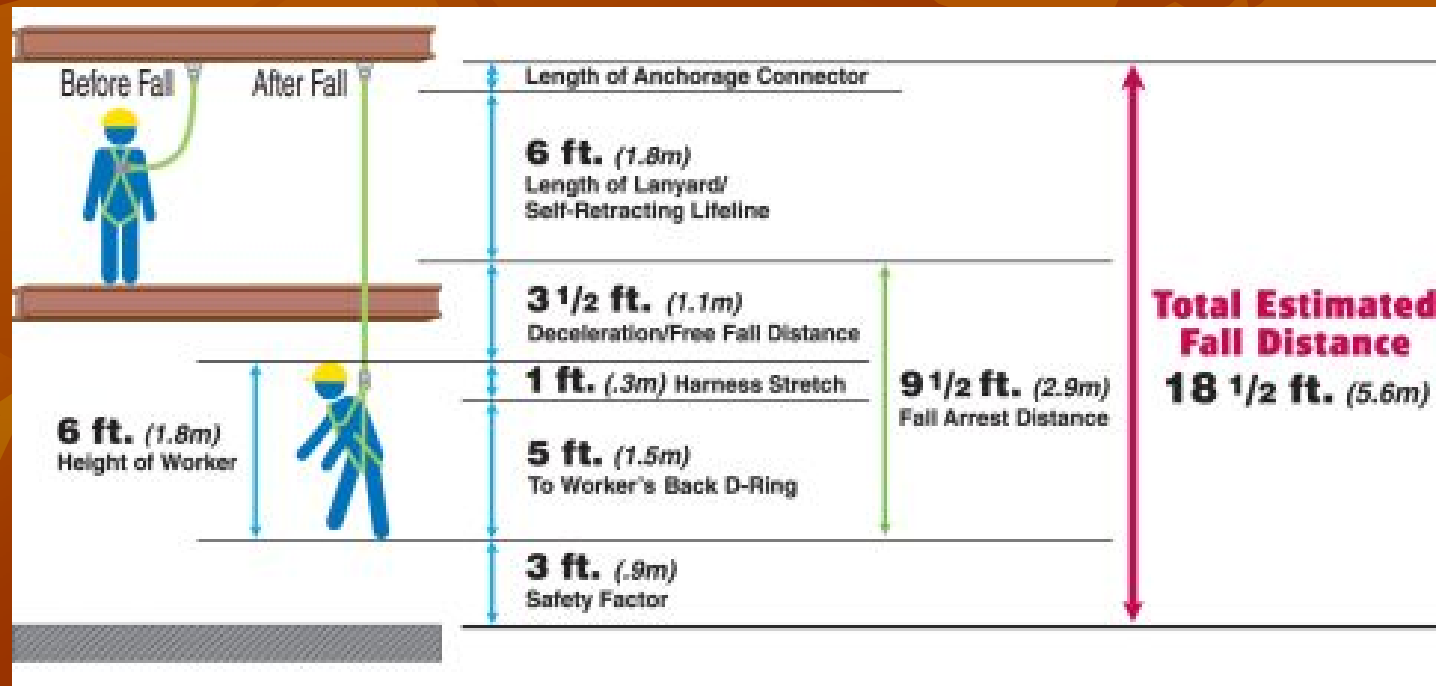
# Calculating Fall Clearance

## Select the Proper Fall Protection Equipment

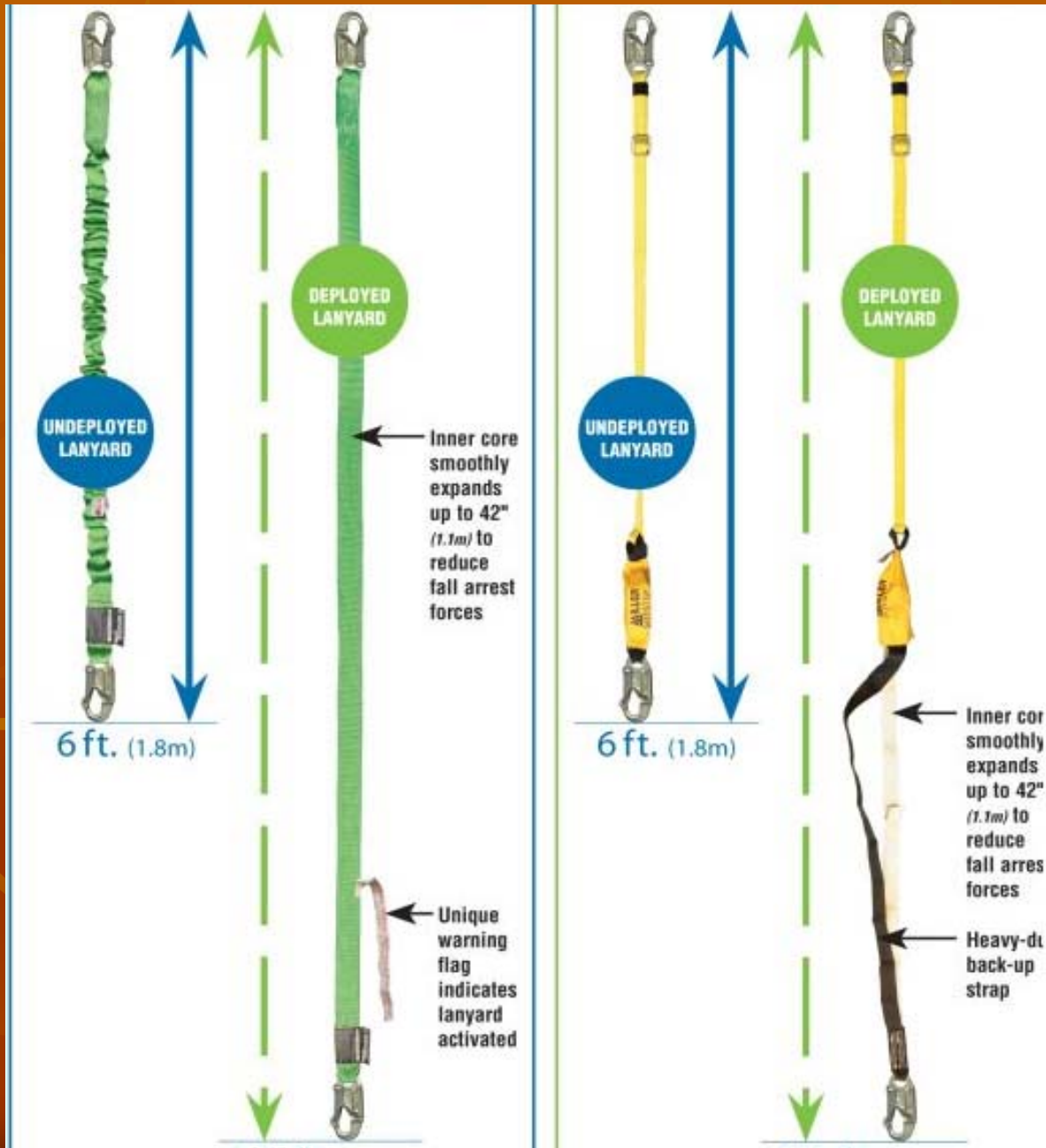
### Shock-Absorbing Lanyard or Self-Retracting Lifeline?

- Always know your fall distance and select proper equipment to meet the fall clearance.

*Illustration: 6 ft. (1.8m) Shock-Absorbing Lanyard with D-Bolt Anchorage Connector*



# Shock-Absorbing Lanyards - Before and After Deployment



# Self-Retracting Lifelines (SRL)

## Also a Connecting Device

- Self-retracting lifelines (SRLs) (fall limiter, personal fall limiter, yo-yo, seatbelt, etc.) are viable alternative connecting devices to shock-absorbing lanyards.

# Self-Retracting Lifelines (SRL)

## Also a Connecting Device

- While traditional six-foot (1.8m) shock absorbing lanyards allow for up to 6 ft. (1.8m) of free-fall distance prior to activating, and another 3-1/2 ft. (1.1m) of deceleration distance prior to arresting a fall, self-retracting lifelines require less than 2 ft. (609mm) to arrest free falls.
- With shorter activation distance and shorter overall arresting distance, self-retracting lifelines reduce the risk of hitting the ground or any obstructions at a lower level.
- In addition, they allow for easier rescue in the event of a fall.
- Available with working capacities ranging from 9 ft. (2.7m) to 175 ft. (54m), self-retracting lifelines should always be used when fall clearance is less than 18-1/2 ft. (5.6m).

# Self-Retracting Lifelines (SRL)

- **FALL LIMITERS** Lightweight, web retractables that require less fall clearance, offer greater mobility and prevent tripping hazards
- **SELF-RETRACTING LIFELINES (SRLs)** Durable and dependable heavy-duty retractables available with webbing or cable



# Fall Arrest System Swing Fall Hazard

- **(Shock-Absorbing Lanyards or Self-Retracting Lifelines)** If involved in a fall while using a shock-absorbing lanyard or self-retracting lifeline, and with an anchorage point that is not positioned directly overhead, a swing fall or pendulum effect will occur. Striking an object while swinging can lead to serious injury.
- Since self-retracting lifelines allow for greater horizontal and vertical mobility than standard six foot shock-absorbing lanyards, extra care should be taken to reduce swing falls.
- **Whether using shock-absorbing lanyards or self-retracting lifelines, it is very important to position your anchorage point directly overhead whenever possible to minimize swing falls.**



# Fall Protection Equipment Selection Considerations

To select the appropriate lanyard for a specific application, consider the following factors:

- The type of work being performed and the specific conditions of the work environment, including the presence of moisture, dirt, oil, grease, acids and electrical hazards, as well as the ambient temperature. For example, steel cable lanyards are particularly strong, heat resistant and durable; however, they are not suitable for use around high-voltage sources because they readily conduct electricity.

# Fall Protection Equipment Selection Considerations

- The compatibility of system components. A personal fall arrest system should be designed and tested as a complete system. Components produced by different manufacturers may not be interchangeable.

# Fall Protection Plan

- This option is available to employees engaged in leading edge work, precast concrete erection work, or residential construction work who can demonstrate conventional fall protection equipment is infeasible or creates a greater hazard.

# Fall Protection Plan

- The plan must conform to the following provisions:
  - The plan must be prepared by a qualified person, job site specific and maintained up to date.
  - Any changes to the plan must be reviewed by the qualified person.
  - A copy of the plan (including approved changes) must be maintained at the job site.

# Fall Protection Plan

- The implementation of the plan must be under competent person supervision.
- The plan must document the specific reason why each conventional fall protection system is infeasible or why its use would create greater hazards.
- The plan must include a written discussion of other measures that will be taken to reduce or eliminate fall hazards for workers not protected by conventional fall protection systems.

# Fall Protection Plan

- The plan must identify all areas where conventional fall protection cannot be used.
  - These locations must be classified as controlled access zones and the employer must comply with paragraph (g) on controlled access zones.
- Where no other alternative measure has been implemented, the employer must use a safety monitoring system that conforms with paragraph (h) on safety monitoring systems.

# Fall Protection Plan

- The plan must identify those employees (by name or other method of I.D.) who are authorized to work in controlled access zones.
- If an employee falls or some other related serious accident occurs, the employer must investigate the fall or incident to determine if changes to the plan are needed.
  - If changes are needed, the employer must implement them to ensure similar types of falls or incidents do not reoccur.

# Training Requirements

- Training Program - Provide each employee exposed to fall hazards with a training program which enables employees to recognize hazards and procedures to be followed to minimize these hazards.





**Questions?**