SECTION 4

Occupational Health and Safety Act Sections and Schedules 49 - 51

Fall Protection

Fall Protection

#1 Unprotected sides & edges - Fall protection

Fall hazards training program

Fall protection - Residential construction 3M' or more

Fall protection - Roofing work on low-slope roofs

Fall protection - Steep roofs

Falls lead to Fatalities

- **Falls** are the ***leading cause of fatalities*** in the construction industry.
- An average of ***939 fatalities occurred each year***, with the trend on the increase.

That is 3.5 deaths per work day

Prevention

- **Select fall protection systems appropriate for given situations.**
- Use proper construction and installation of safety systems.
- Supervise employees properly.
- Use safe work procedures.
- Train workers in the proper selection, use, and maintenance of fall protection systems.

When is Fall Protection required? (Sec.49 General Protection)

A fall-protection system is needed when an employee works from an unguarded work area that is:

- 3 m or more above water or the nearest permanent safe level,

OR

- Above any surface or object that could cause injury to the employee upon contact, (**i.e. unusual possibility of injury**)

OR

- Above any open top tank, bin, hopper or vat

Note: An unusual possibility of injury is when there is a chance the injury may be worse than an injury from landing on a solid, flat surface.

Responsibility of Employer and Implementing Fall Protection

1. An employer must install an engineering control such as a guardrail.
2. If the use of a guardrail is not reasonably practicable, an employer must ensure that a worker uses a travel restraint system that meets the requirements.

Responsibility of Employer and Implementing Fall Protection

3. If the use of a travel restraint system is not reasonably practicable, an employer must ensure that a worker uses a (fall restraint), personal fall arrest system that meets the requirements.
4. If the use of a personal fall arrest system is not reasonably practicable, an employer must ensure that a worker uses an equally effective fall protection system that meets the requirements of this part.

Less Than 3m (10 feet) fall into….

- **Less than 3 Metres (10 feet)** fall or more, into operating machinery, liquid, hazardous substance, object, and through an opening on a work surface.

Ramps (Sec. 119)

- If less than 20 degrees from the horizontal: non-slip surface or cleats spaced 400 mm apart, and if; 2.24 m or less in width, must have handrails.

Open side perimeter or a balcony

- **3 Metres (10 feet)** fall, because of a perimeter or an open side, balcony

Open side perimeter or a balcony

- **3 Metres (10 feet)** fall, because of a perimeter or an open side, balcony

3 Metres (10 feet) Roof Form work

3 Metres (10 feet) scaffold platform or other work platform

When is Fall Protection required? (Sec. 139)

Recognize the Hazards…

Is This a Fall Hazard?

YES

Workers could fall while climbing on the shoring structure to set it up and remove it.

Ladders and lifts must be provided.

Any Fall Hazard Here?

YES

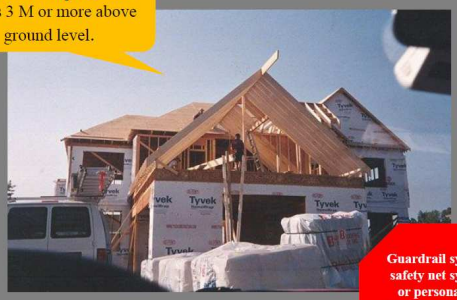
Workers are exposed to a fall hazard greater than 3 M, while working near stairwell opening.

Workers must be protected from falls /holes

Is This a Fall Hazard?

YES

Unprotected open-sided floors 3 M or more above ground level.



Guardrail systems, safety net systems or personal fall arrest systems are required.

Any Fall Hazard Here?

YES

Workers are installing a new metal roof without fall protection.

NOTE: Remember that ladders must at least 900 millimetres above the landing or floor the landing area & must have a clear space of at least 150 millimetres behind every rung

Is This a Fall Hazard?

YES

The photo shows a midrail and toeboard are missing on an open-sided floor of a building.

This could expose workers to a 3.5 M (12 ft) fall.

Toeboards are required to protect workers below from falling objects.

Can You Identify the Fall Hazard?

YES

Lack of fall protection for workers on fabricated frame scaffolds.

Planks appear to be overloaded and there is no safe access for workers.

The workers are exposed to a 35-foot fall hazard from a scaffold while stacking blocks prior to overhand bricklaying operations.

Can You Identify the Fall Hazard?

YES

Ladder to work platform is not of sufficient length.

It must extend 1M (3feet) above the working surface.

Is This a Fall Hazard?

YES

Worker is working off of the top of a step ladder.

The top of a stepladder shall not be used as a step.

Can You Identify the Fall Hazards?

YES

A worker is working from a carpenters' scaffold that has no guardrail, extends too far beyond either end, and is not wide enough.

The worker inside of the window is not provided with fall protection as there is no standard guardrail for the window.

The worker also does not have proper access to the scaffold.

The worker working below is exposed to the struck-by hazards of tools and equipment falling from the employees working above.

NOTE: A competent person must supervise as scaffolds are erected, moved and taken apart.

Any Fall Hazard Here?

YES

Workers working on balcony of structure exposed to fall hazard due to unprotected side/edge.

Is This a Fall Hazard?

YES

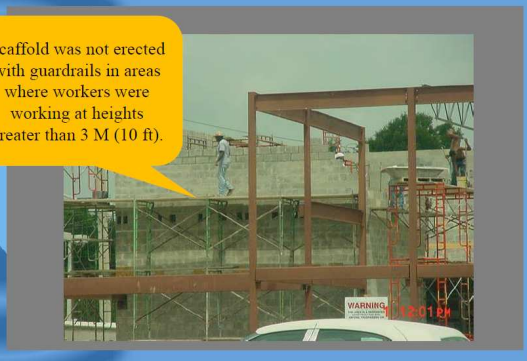
Worker working on an 8:12 pitch roof with only the lifeline tied to his waist as fall protection.

Employer must provide full body harnesses.

Is This a Fall Hazard?

YES

Scaffold was not erected with guardrails in areas where workers were working at heights greater than 3 M (10 ft).



Definitions

"Guardrail system" means a barrier erected to prevent employees from falling to lower levels.

Guardrail Systems

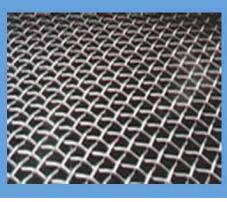
- Top rail, midrail, and toe board
- Top rail 0.9 -1.07 metres
- Midrails halfway between top rail and platform
- Toe board 127 millimetres high; 6mm from floor

Guardrail Systems Strength

- The guardrail is secured so that it cannot move in any direction if it is struck or any point on it comes into contact with a worker, materials or equipment.

Wire Mesh Utilized by FP

- Fabricated of wire at least 1.6 millimetres in diameter, and
- Spaced to reject a ball 40 millimetres in diameter.



Covers

- Withstand twice expected load
- Secured
- Marked with **'HOLE'** or **'COVER'**

Holes and Skylights

- Protect from: falling through, tripping or stepping into, and objects falling through

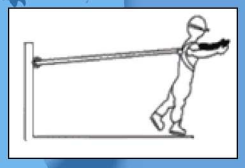
Written Fall Protection Rescue Plan

- Use of guard rails had been proven to be infeasible and a fall arrest system or safety net system have been selected
- The written plan should also demonstrate that the preferred fall protection, guard rails, is impossible or it creates a greater hazard, especially when working over water. Sec. 51(2)

Fall Protection Systems (FPS)

What are the 5 FPS ?

How do you calculate Travel Restraint?



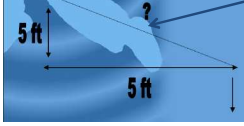
$A^n + B^n = C^n$

$5^n + 5^n = C^n$

$25 + 25 = C^n$

$50 = C$ Square root

= 7.0 ft



What are Controlled Zones? Sec. 50(4)

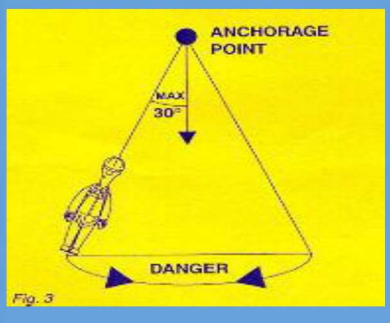
- At least 2 M (6.5 feet) from leading edge, **no greater than 3/12 slope**
- Connected at ends to guardrail or wall
- Flagged or marked at least every six feet
- Hand rail high is recommended
- 200 pound breaking strength

Fall Restricting System

- Reduce a worker's free fall distance to 1.2 metres or less. (0.6 typically)
- Inspected before each use
- Is only appropriate for specific circumstances

- Is best utilized when anchored over head

30 degrees from the vertical



Personal Fall Arrest Systems PFAS

Limiting an Employee's Free Fall Sec. 29.2

- An employer and a contractor must ensure that a fall-arresting system limits free falls to the shortest distance possible, which distance cannot exceed 1.8 m (8 kN/ 1800 lbs-f), and the total fall distance must be less than the distance from the work area to the next lower level, water or obstruction below.

Personal Fall Arrest Systems (PFAS)

210 lb person

6 foot free fall

How much arresting force is generated?

2500-2700 lbs

Personal Fall Arrest Systems PFAS

How much arresting force can we take physically?

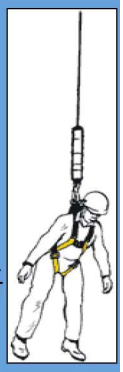
1800 lbs

Free Fall Distance

"Free fall distance" means the vertical displacement of the fall arrest attachment point on the employee's body belt or body harness between onset of the fall and just before the system begins to apply force to arrest the fall.

Total Fall Distance

	AVG	MIN
• 6 ft Lanyard	**6 ft**	6FT
• 3.5-4 ft deceleration	**3.5-4 ft**	3.5FT
• 2 ft Lifeline stretch or harness chaff	**2 ft**	1 FT
• 5 ft below lifeline	**5 ft**	5 FT
• Total: **16.5-17 ft** to lower level		15.5 FT



ADVATEK SYSTEMS INC SUGGETS 19 ft FALL DISTANCE BEFORE USING PFAS. TO ENSURE NO IMPACT WITH THE FLOOR BELOW

Personal Fall Arrest Systems PFAS

What is the maximum possible free fall distance while using a 6 foot lanyard, if anchored at foot level?

12 feet + 5 feet =17 feet

Additional Requirements PFAS

- Inspected prior to each use
- Not attached to guardrail systems
- At hoist areas, allow movement to edge only

Personal Fall Arrest Systems PFAS

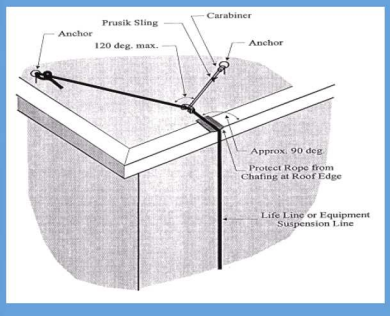
Each PFAS consists of 4 components:

1. Anchor Point
2. Connector
3. Harness
4. Rescue

Anchorage

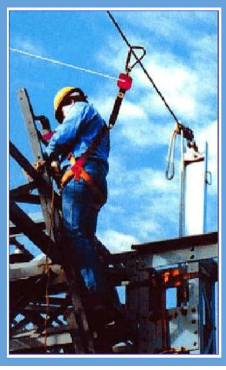
"Anchorage" means a secure point of attachment for lifelines, lanyards or deceleration devices.

Anchorage Temporary/Permanent



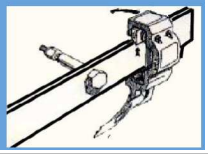
Anchorage

- As part of a complete personal fall arrest system which maintains a safety factor of at least two; and
- Under the supervision of a qualified person.



Permanent Anchorage (29(2)(1)(c)

- A anchor is capable of safely withstanding the impact forces applied to it and has a minimum breaking strength per attached worker **of 22.2kn (5000 lbs)** or
- Is designed, installed and used in accordance with the manufacturer's specifications, or specifications certified by a professional engineer



Connector

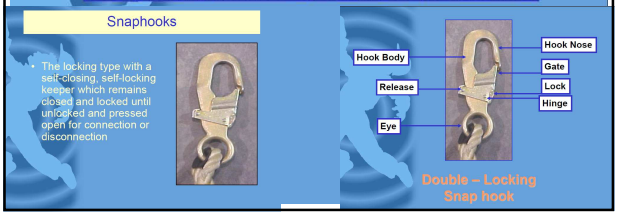
- Used to couple (connect) parts of the personal fall arrest system

Connector

- Buckle or d-ring sewn into a body belt or body harness

Snaphooks

- The non-locking type with a self-closing keeper which remains closed until pressed open for connection or disconnection.
- ***The use of a non-locking snaphook as part of personal fall arrest systems and positioning device systems is prohibited.***



Snaphooks

- Unless the snaphook is a locking type and designed for the following connections, snaphooks shall not be engaged:
  - Directly to webbing, rope, or wire rope
  - To each other
  - To a d-ring to which another snaphook or other connector is attached
  - To a horizontal lifeline

Lanyard

- Cannot be made of natural fiber rope
- Must be protected against damage by cuts or abrasions
- Each employee must be provided a separate lanyard
- Lanyards must have a minimum breaking strength of 5,000 pounds

Deceleration Distance

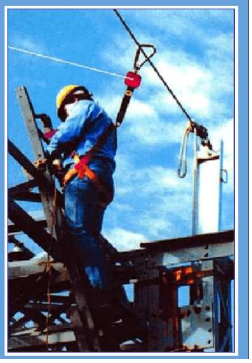
"Deceleration distance" means the additional vertical distance a falling employee travels, excluding lifeline elongation and free fall distance, before stopping, from the point at which the deceleration device begins to operate.

Additional Requirements PFAS

- PFAS used only for fall protection
- If subject to impact loading, examined by CP
- Prompt rescue provided

Horizontal Lifelines

- Horizontal lifelines shall be designed, designed by a Professional Engineer (PE)
- Devices used to connect to a horizontal lifeline which could become vertical must be capable of locking in both directions on the lifeline.



Horizontal Lifelines

- Devices used to connect to a horizontal lifeline which could become **vertical** must be capable of locking in both directions on the lifeline.

HORIZONTAL LIFE LINE.

IS THIS SAFE?

DO YOU THINK THIS WAS DESINGED BY A PROFESSIONAL ENGINEER?

Safety Nets

- Personal safety net must be installed within at least 4.6 m below the work area
- ***Certified*** by employers CP
- Extends sufficiently from outer edge
- Competent person must inspect and test the installation of the safety net before it is put in service.
- Objects removed and have PE Doc on site
- Border rope strength of 5,000 pounds

Training

- For each employee who might be exposed to falls
- Trained by competent person
- Covers fall hazards in work area
- Covers procedures for FPS to be used

NUMBERS TO REMEMBER ON FALL PROTECTION

- Guardrail height 0.90m to 1.07m (must have top & mid rails & posts)
- Using a PFAS the best fall distance is 4.7m (15.5ft)
- Using a PFAS the average fall distance is 16.5ft – 17ft
- Fall restriction limits falls to 0.6m (2ft)
- Human body is prone to injury after 1800lbs of force
- Near holes or openings fall protection starts at 0m
- Order of preference for Fall Protection
  - Guard Rails
  - Travel Restraint
  - Fall Restriction
  - Personal Fall Arrest System
  - Other (safety nets, spotters)