



OSHA Fall Protection Standards

(Including 2017 Updates)

Georgia Institute of Technology
Facilities Design & Construction
Friday March 13, 2020

Learning Objectives

- **Fall Protection**
 - Why
 - Regulations
 - OSHA/ANSI Standards
 - System Requirements

Innovative Engineering, Inc.



- **Scott L. Weiland PE**
 - **BSCCE University of Michigan**
 - **Graduate Studies:**
 - San Jose State University
 - Georgia Institute of Technology
 - **Articles:**
 - Structure Magazine – Building Façade Inspection Part I & II
 - Georgia Engineer – Building façade Inspection Part I & II
 - AIA Design Equilibrium – Building Façade Inspection
 - BOMA Georgia Insight magazine - Falling Building Façade Closes Atlanta Streets



Innovative Engineering, Inc.



- **James T. Boatright PE**
 - **BSCE, Virginia Military Institute**
 - **Professional Engineer (PE)**
 - **OSHA/ANSI**
 - **Qualified Fall Protection Engineer**
 - **Competent Person Trainer**
 - **ICRI Board Member**



Lunch Atop a Skyscraper



1932



2011

Fall Protection

OSHA – Employer Requirements



1970

- **Worker Rights**

- Right to a safe and healthful workplace
- Right to know about hazardous chemicals
- Right to information about injuries and illnesses in your workplace
- Right to complain or request hazard correction from employer
- Right to training
- Right to hazard exposure and medical records
- Right to file a complaint with OSHA
- Right to participate in an OSHA inspection
- Right to be free from retaliation for exercising safety and health rights

OSHA Standards

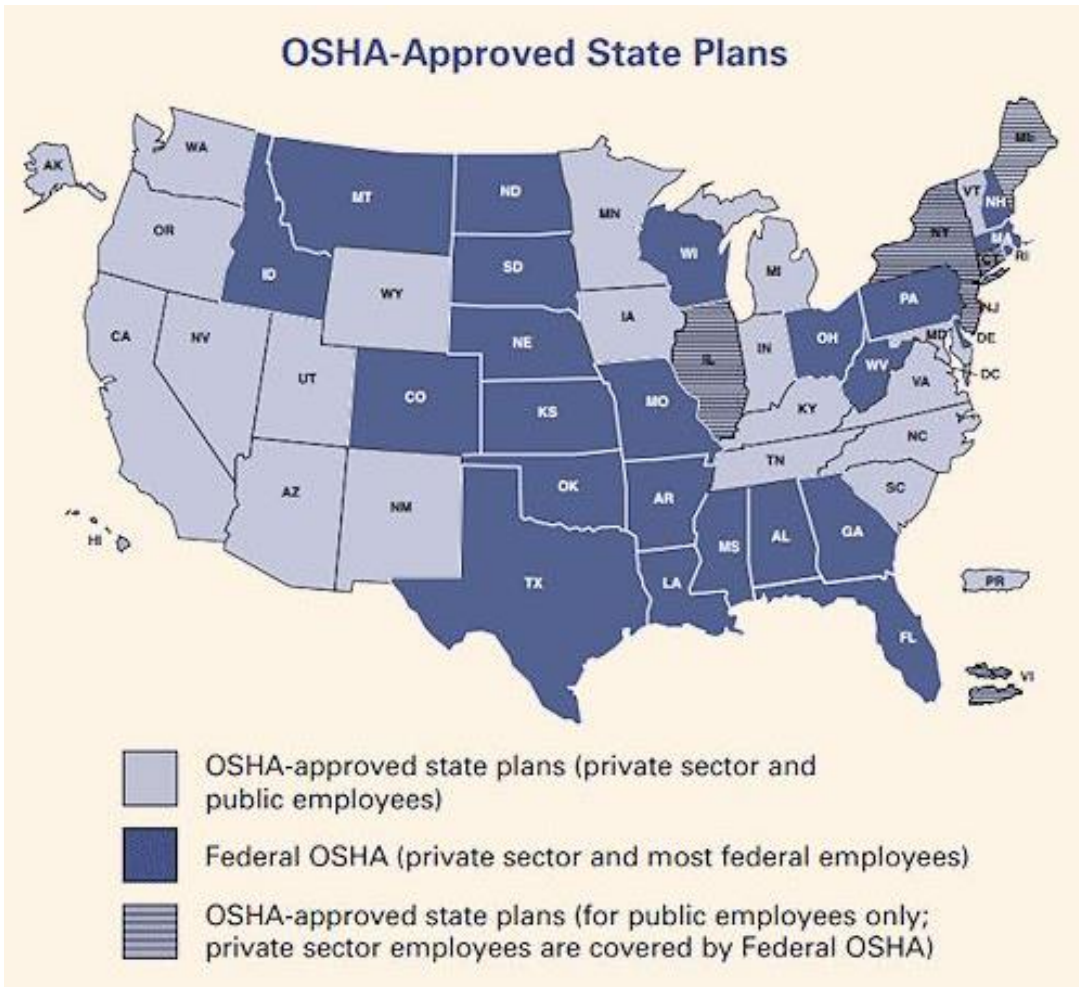


OSHA 1910 – General Industry



OSHA 1926 – Construction

Worker Coverage



- **Who is covered?**

- Private Workers
- State & Local Government Workers Covered by Approved State Plan
- Federal Workers Covered by a Federal Agency program

- **Who is not?**

- **State & Local Government Workers**
- Self-Employed
- Immediate Family Members of Farm Employers
- Workplace Hazards Regulated by Another Federal Agency

2017 OSHA Update

• Updates

- Fall Protection Options
- Align with 29 CFR Part 1926 Construction
- Ladders
- Rope Descent Systems (RDS)
- Scaffolding
- Connection Equipment
- Falling Objects
- Outdoor Advertising/Billboards
- Low Slope Roofs
- Training & Retraining

• Timeline

- **January 17th, 2017** – New rules become effective.
- **May 17th, 2017** – Fall Hazard Training
- **November 20th, 2017** – Rope Descent System (RDS) anchors inspected & certified
- **November 19th, 2018**
 - New Ladders >24 ft Personal Fall Arrest or Ladder Safety System
 - Existing Ladders > 24 ft Cage, Well, Personal Fall Arrest or Ladder Safety System
- **November 18th, 2036** All ladders > 24 ft Personal Fall Arrest or Ladder safety System

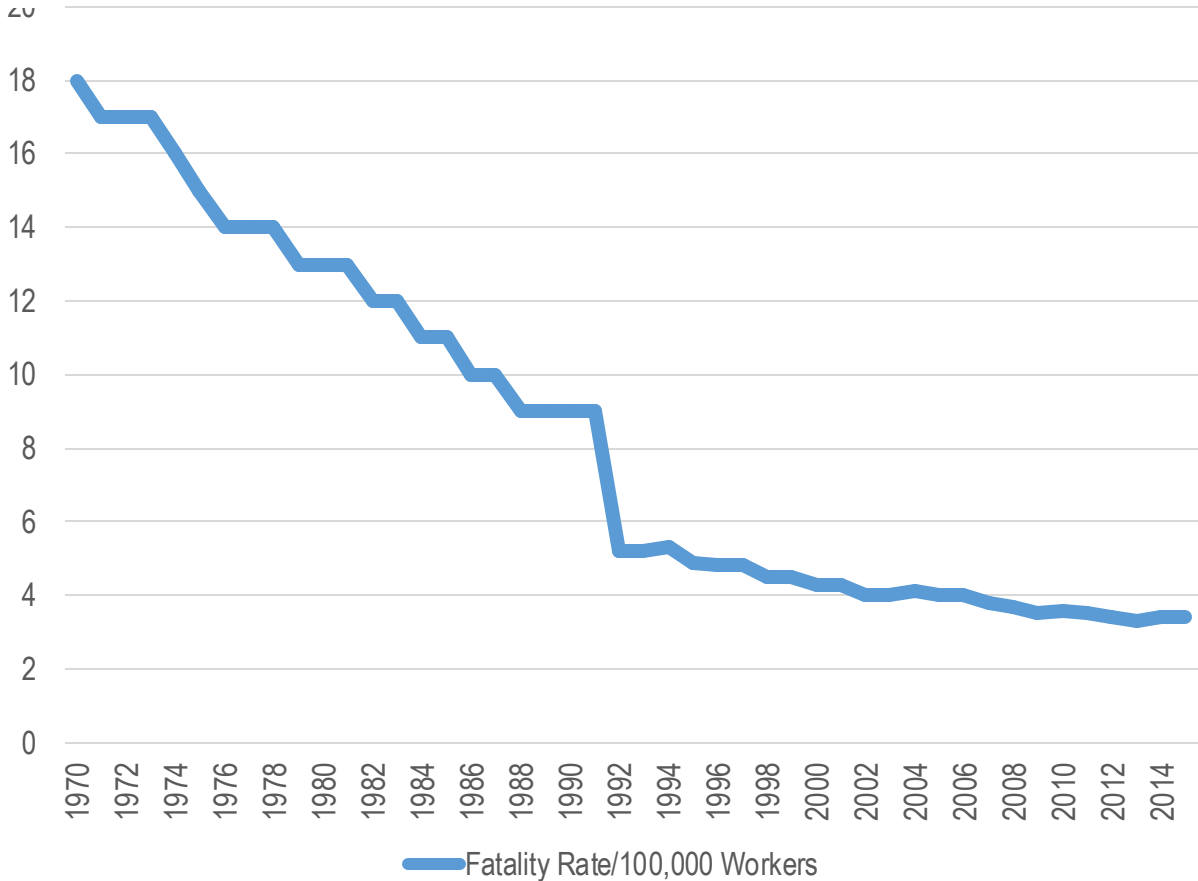
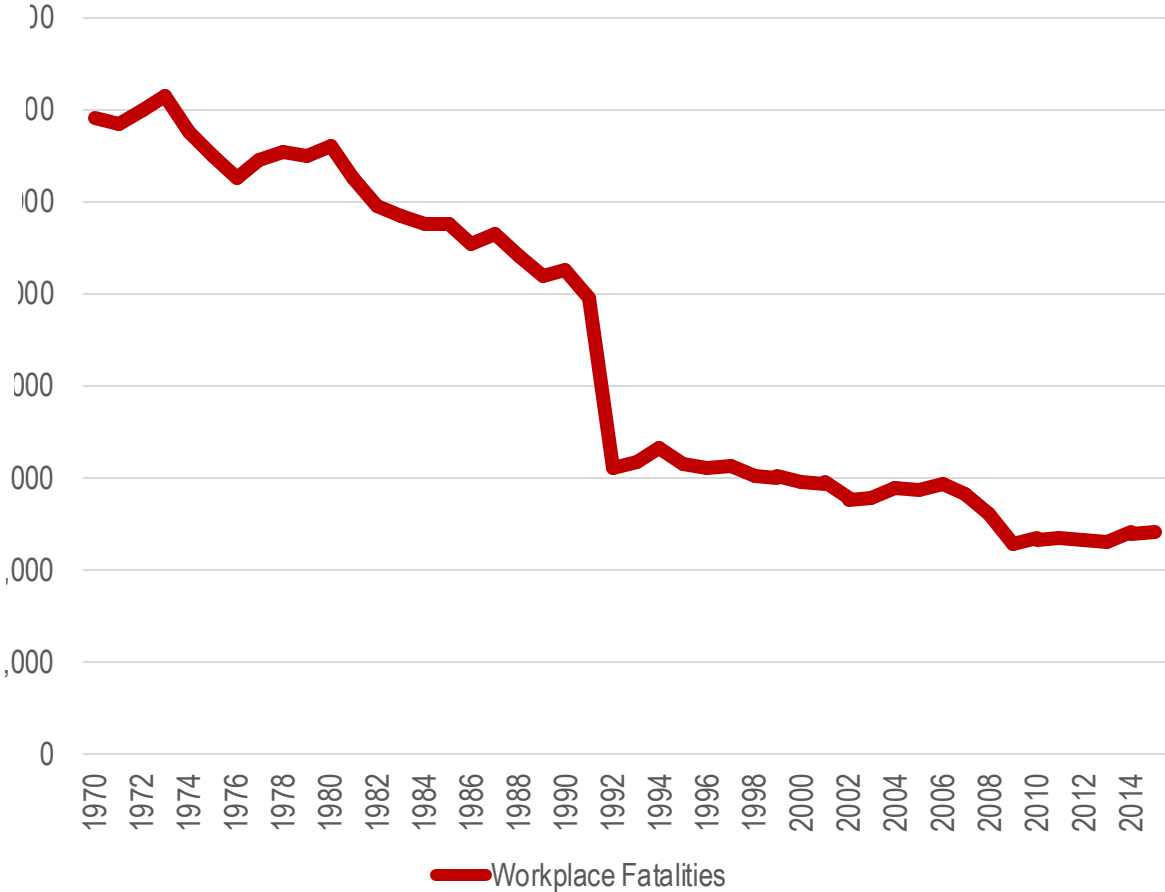
Other Standards

- **IBC**
 - Design load
 - Test Load & Duration
- **ANSI/ASSE Z359 Fall Protection Standards (Voluntary)**
- **IWCA I14.1 Window Cleaning Safety (Withdrawn)**
- **ASME A120.1 Safety Requirements for Powered Platforms and Traveling Ladders and Gantries for Building Maintenance**



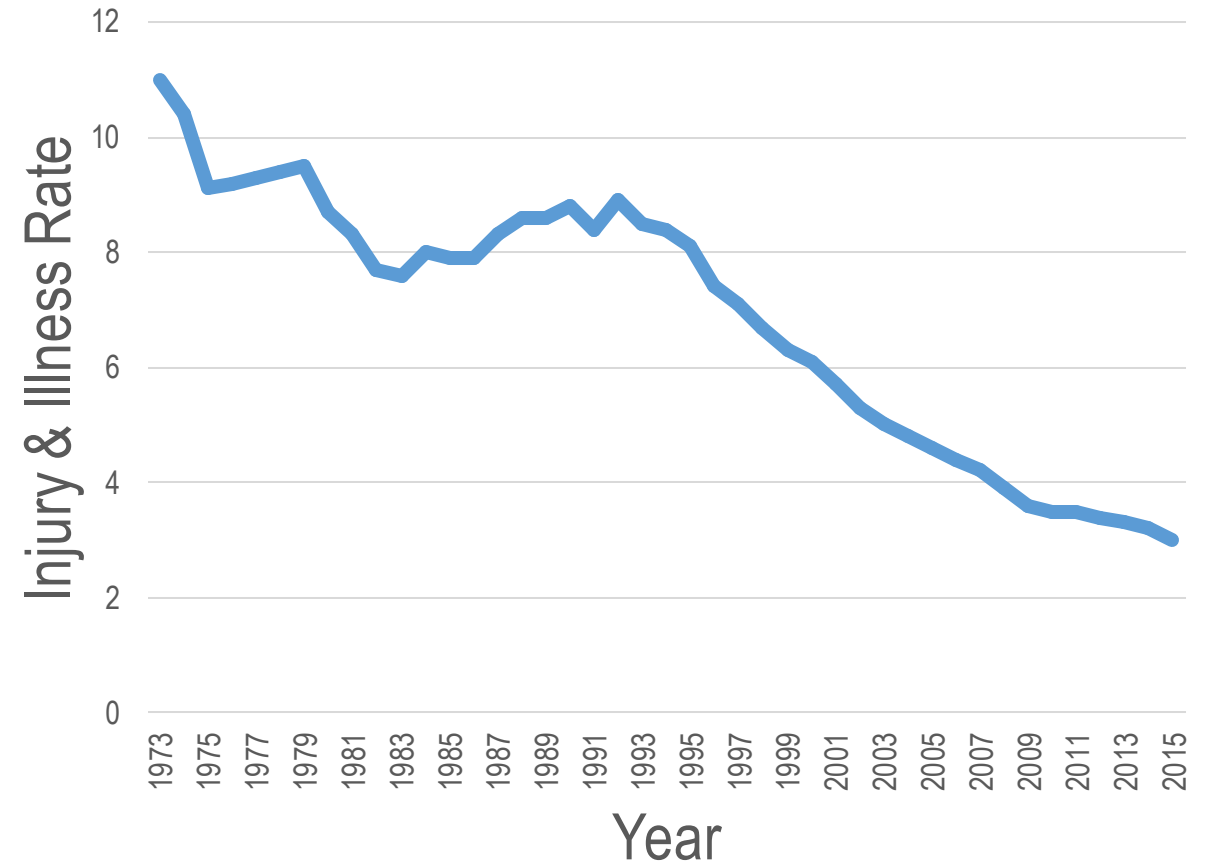
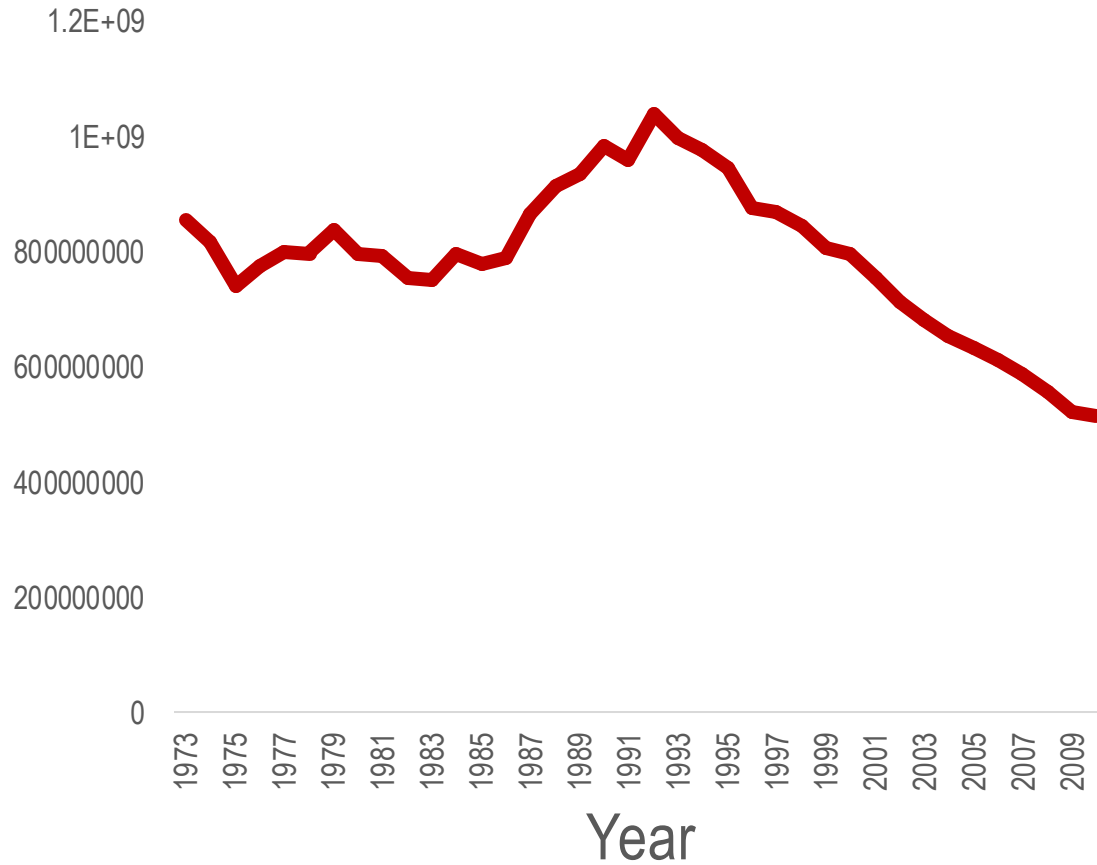
Worker Fatality Statistics

Workplace Fatalities

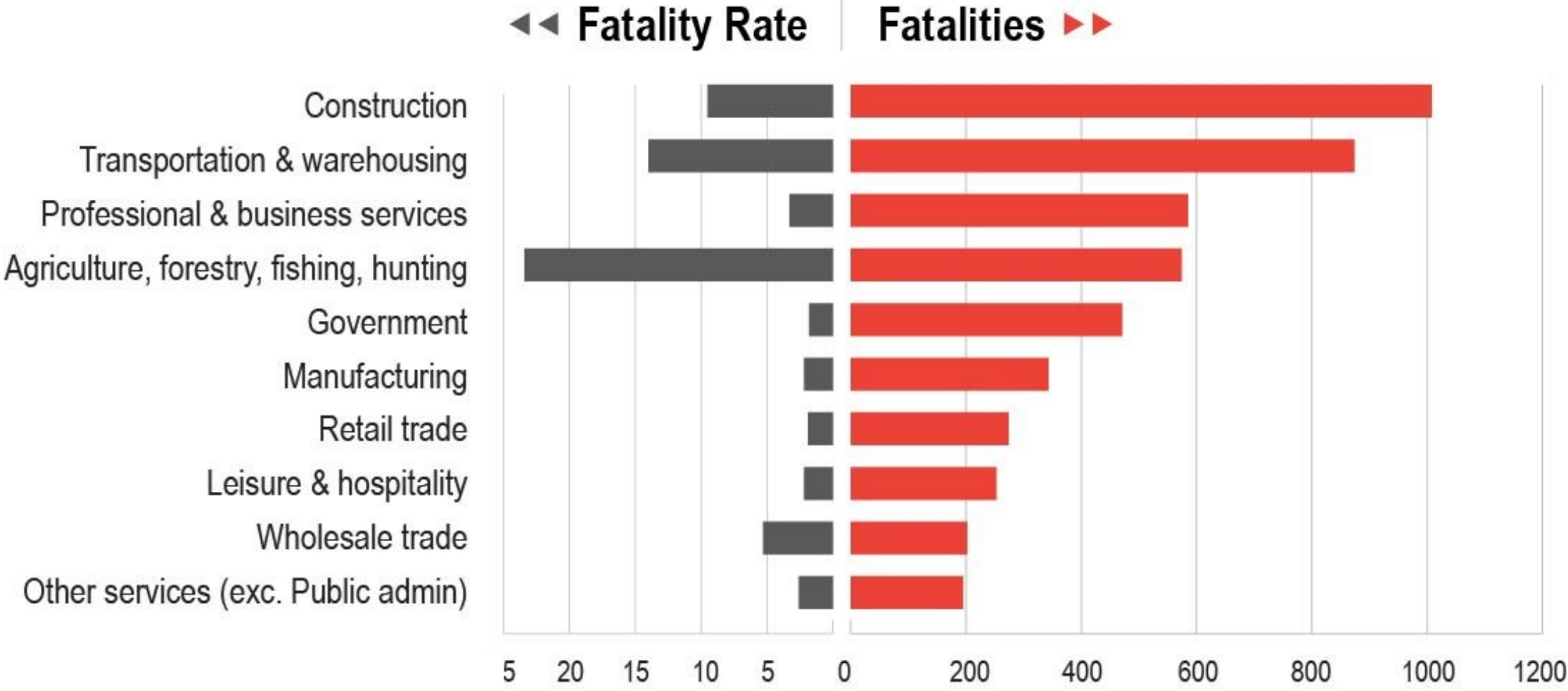


Workplace Injury & Illness Statistics

Injury & Illness Cases



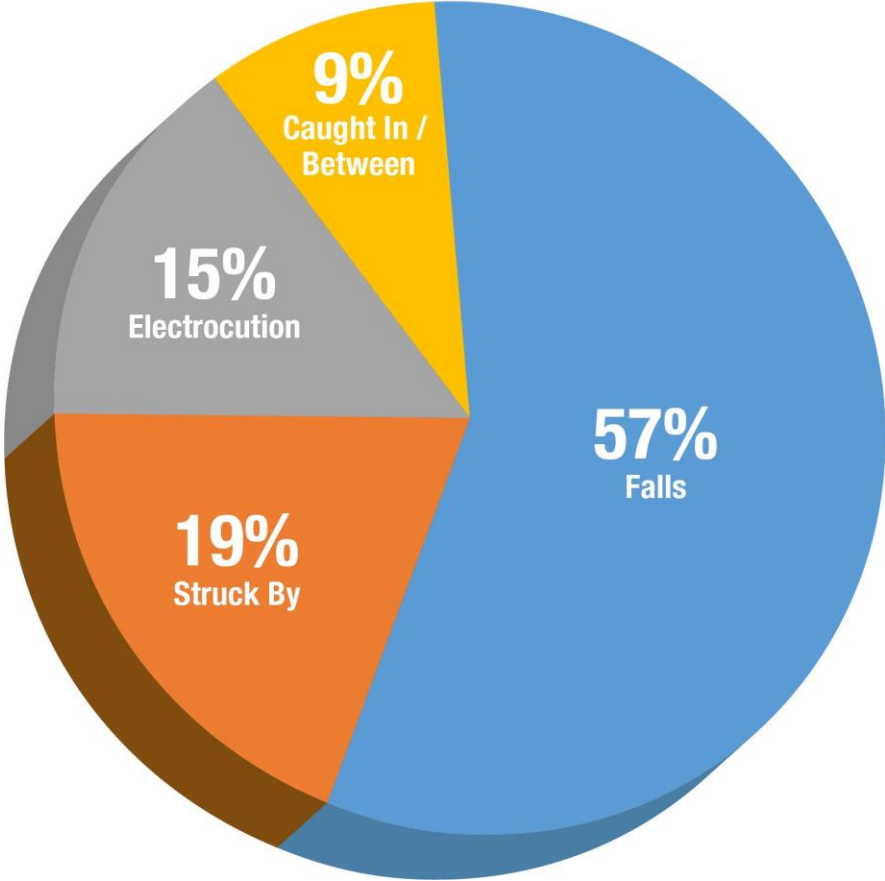
2018 Fatal Work Injuries by Industry Sector



Construction Fatal Four



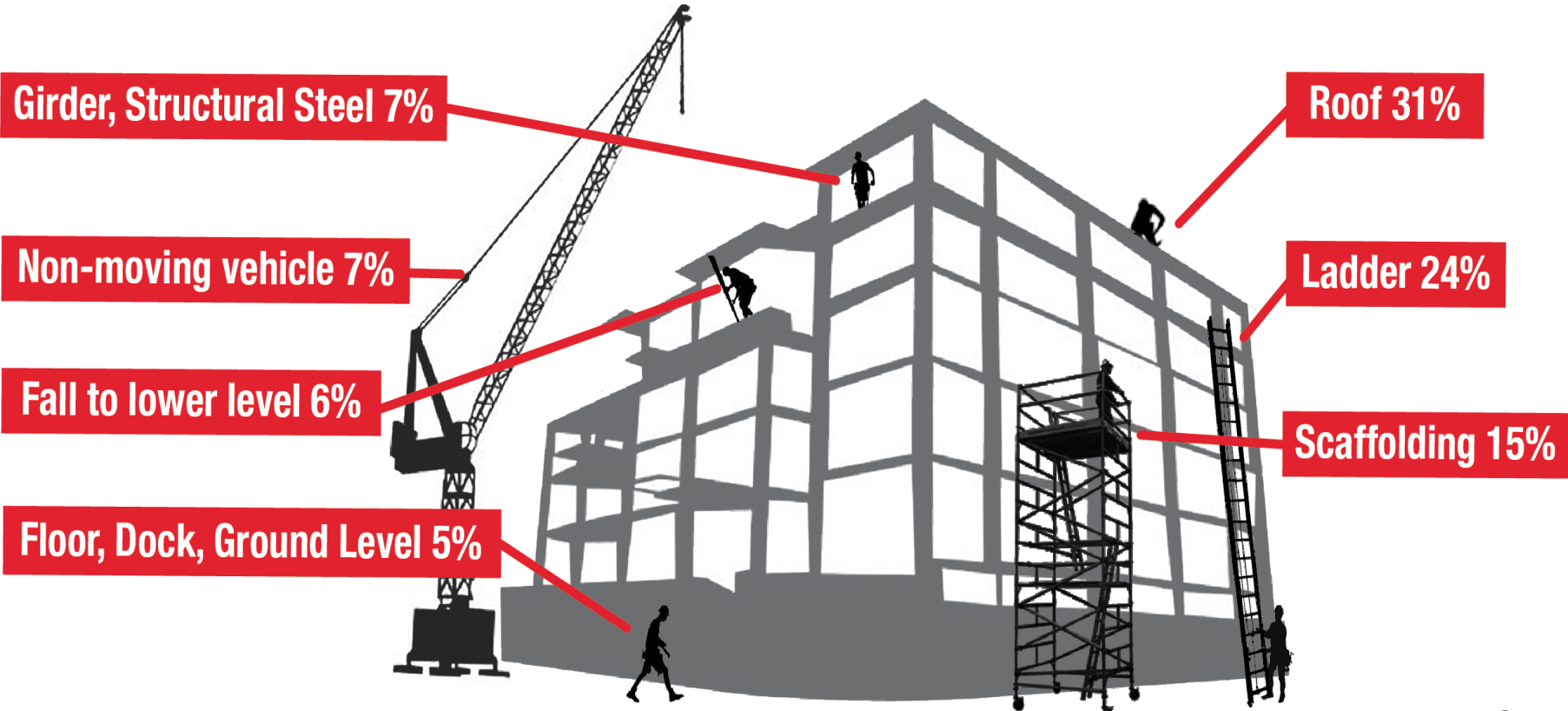
Fatalities



Death from Falls

DEATH FROM FALLS (BY LOCATION)

Total = 891 deaths (2008-2010)



Managed Fall Protection Program

- **Policy**
- **Program**
 - Responsibilities
 - Training
 - Hazard Survey
 - Hazard Elimination & Control
 - Rescue
 - Incident Investigation
 - Program Evaluation



Policy Makers

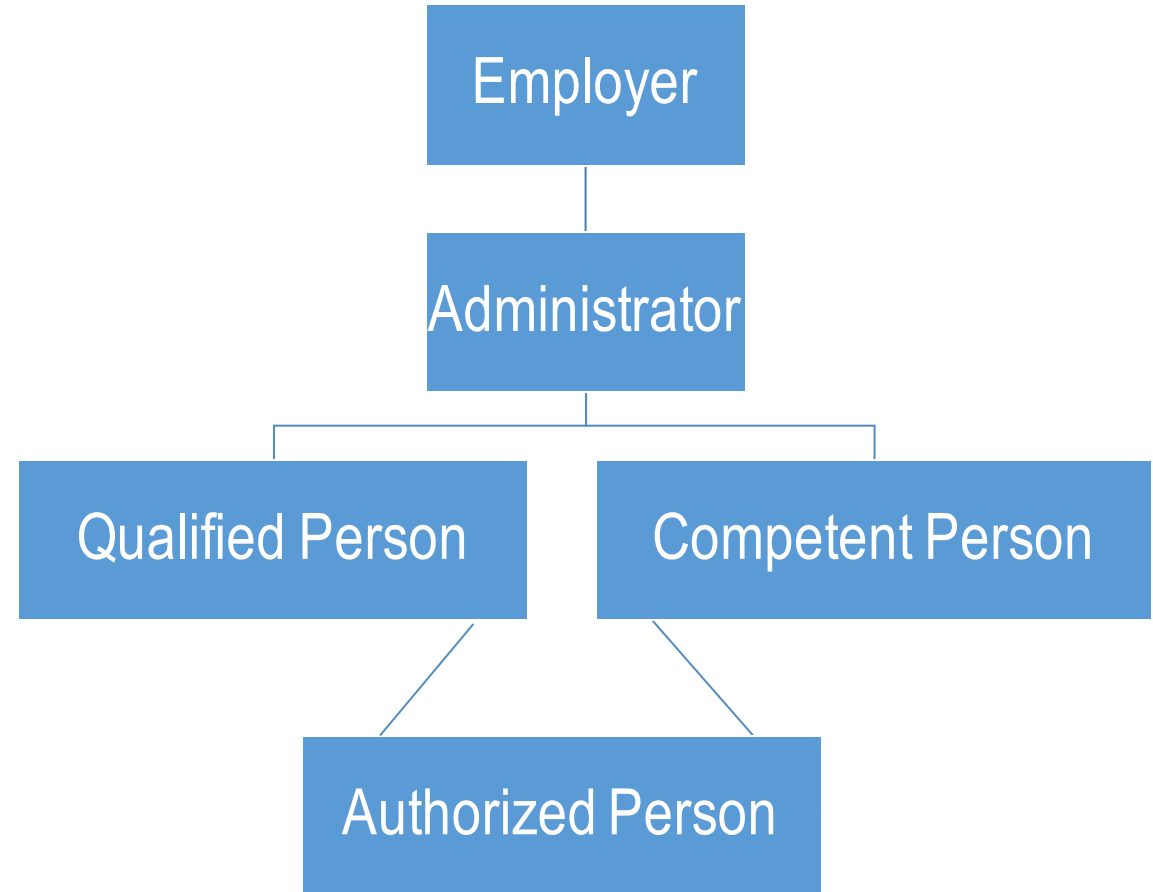
Responsibilities - Owner

- Hazards to own employees
- Hazards to other employees not created by tenant or contractor
- **Disclosure of known hazards**
 - Asbestos
 - Mold
 - Lead
- **Permanent fall protection & davits**
- **Architect/Engineer – Safe Design**



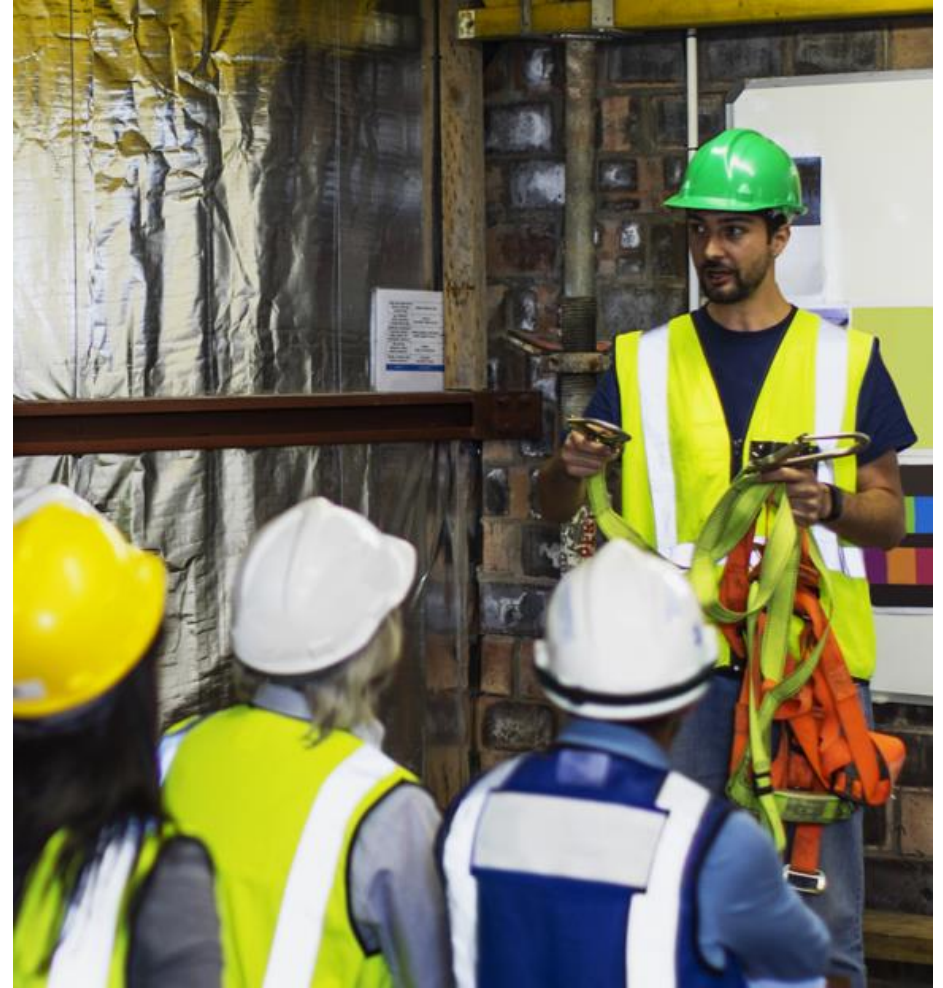
Responsibilities

- **Employer**
- **Program Administrator**
- **Qualified Person**
- **Competent Person**
- **Authorized Person**
- **Competent Rescuer**
- **Authorized Rescuer**
- **Trainer**



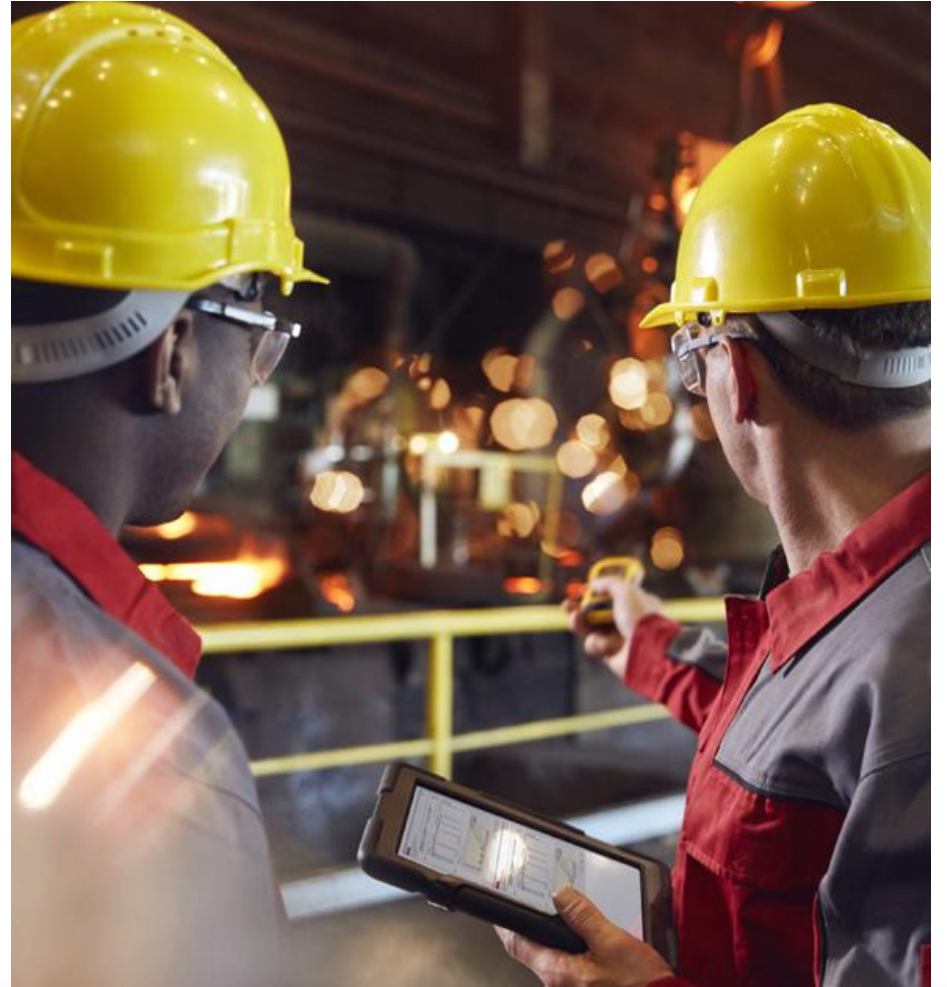
Training

- Nature of Fall Hazards
- Fall Protection Options
- Procedures for installing, inspecting, using, disassembling, storing, and maintaining equipment.
- Limitations and Capabilities of Equipment.
- Employees Role
- Retraining



Fall Hazard Survey

- **Unprotected**
 - Sides or Edges
 - Floor or Roof Openings
 - Wall Openings
- **Triggers**
- **100% Coverage**
- **Fall Clearance**
 - Vertical
 - Swing



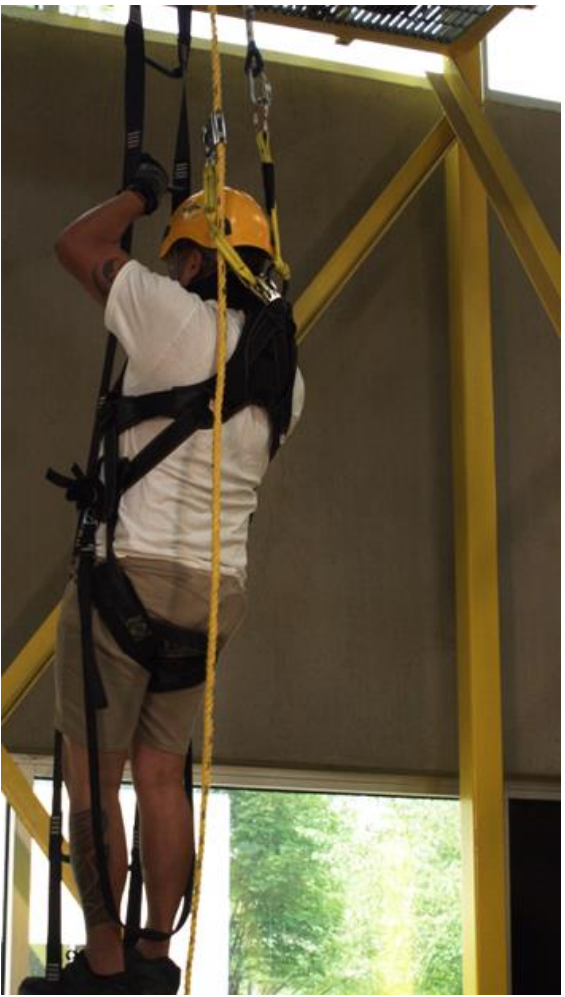
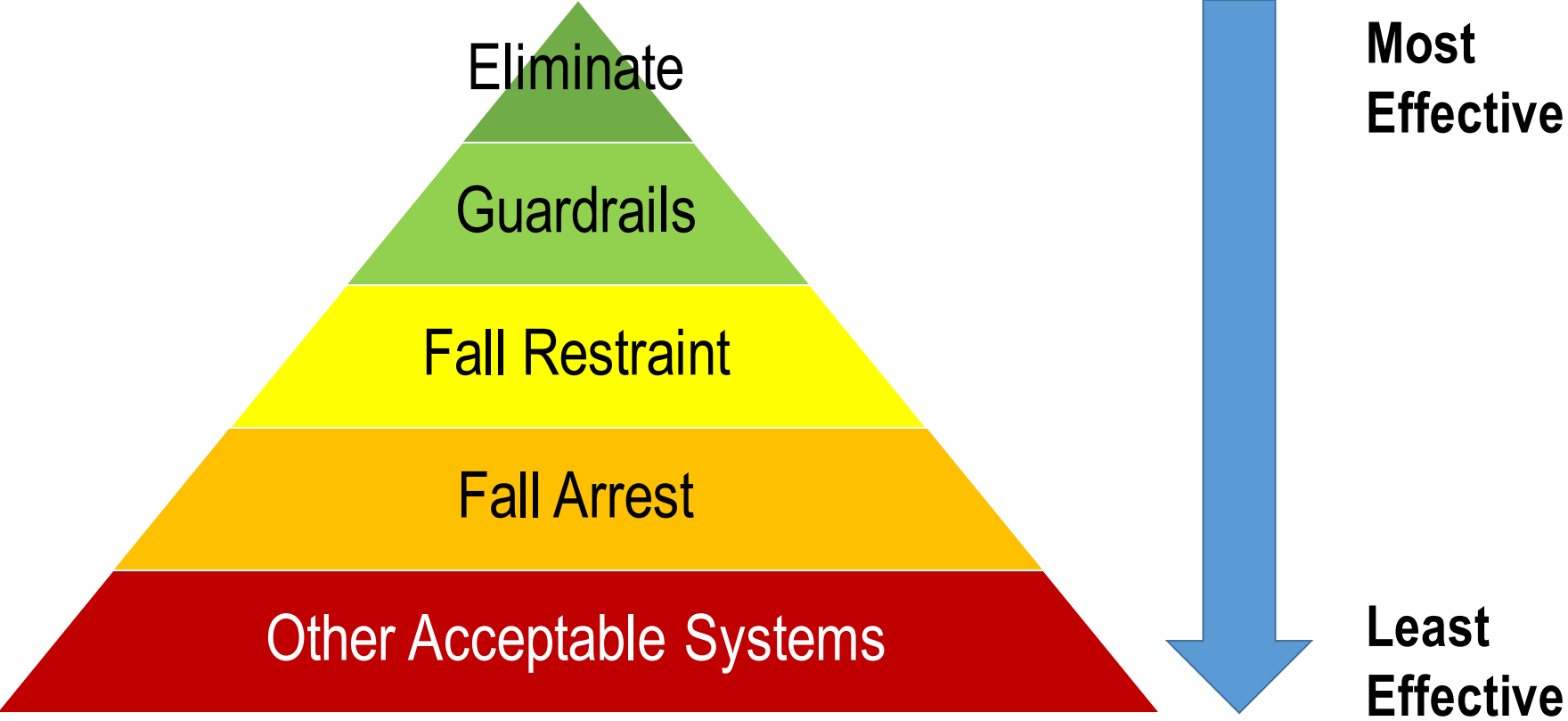
Hazard Analysis - Fall Protection Trigger Heights

Walking/Working Surface	General Industry	Construction
Aerial Lifts	All	All
Dangerous Equipment	All	All
Fixed Ladders	24 ft.	24 ft.
Holes (Including Skylights)	All	All
Scaffolds (Supported or Suspended)	10 ft.	10 ft.
Steel Erection (General)	n/a	15 ft.
Steel Erection (Connectors, Controlled Decking Zone)	n/a	2 Stories or 30 ft.
Unprotected Edge	4 ft.	6 ft.
Wall Opening	4 ft.	6 ft.

Note: Above table is not all inclusive.

Fall Protection

Hazard Elimination & Control



Fall Protection - Eliminate



Window Washing



Light Bulbs

Fall Protection - Eliminate



Ground Supported Equipment



Interstitial Space

Fall Protection - Prevent



Parapet

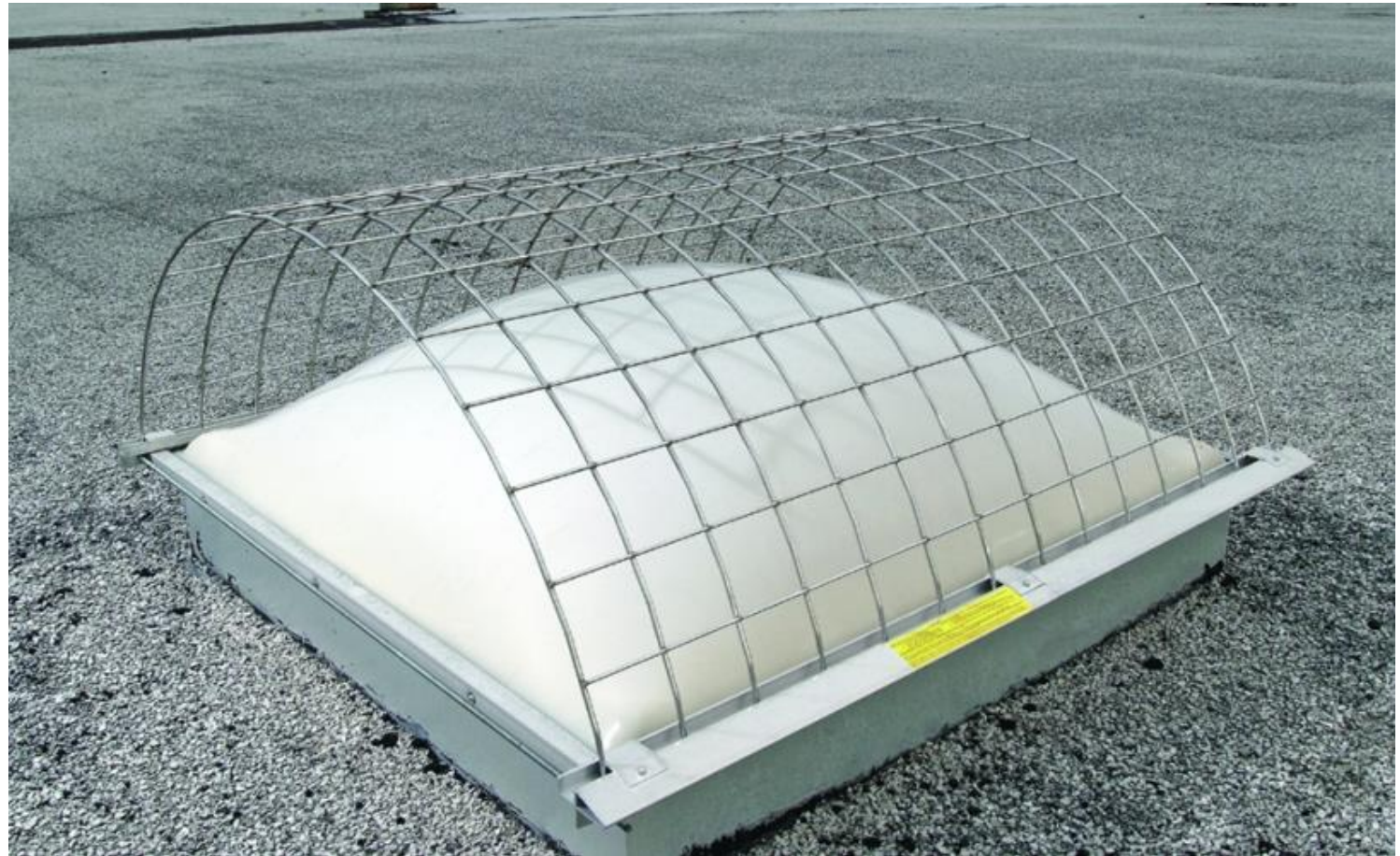


Portable Guardrail

Fall Protection - Prevent



Cover



Skylight

Fall Protection – Prevent/Control

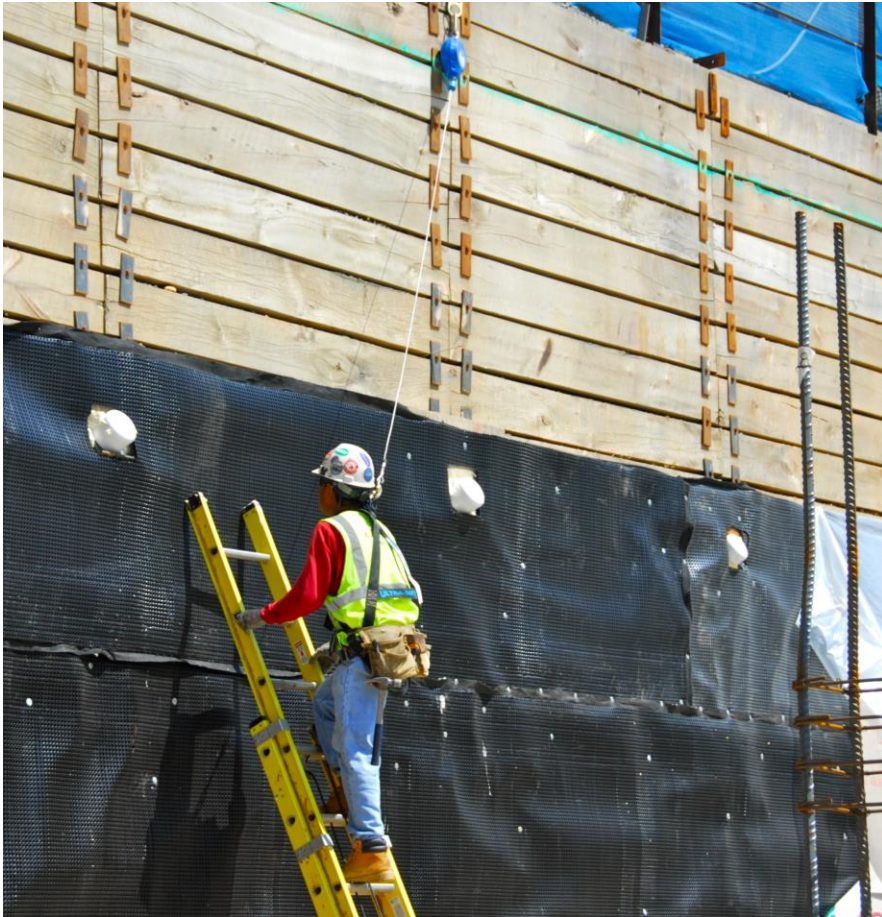


Travel Restraint



Netting

Fall Protection - Control



Fall Arrest - Self Retracting Lifeline



Fall Arrest – 6 Ft. Shock Absorbing Lanyard

Fall Protection - Warn



Warning Line



Safety Monitor

Fall Protection – Specific Requirements



What's Wrong with this Picture?

Ladders

- **Two Categories**

- Portable
- Fixed

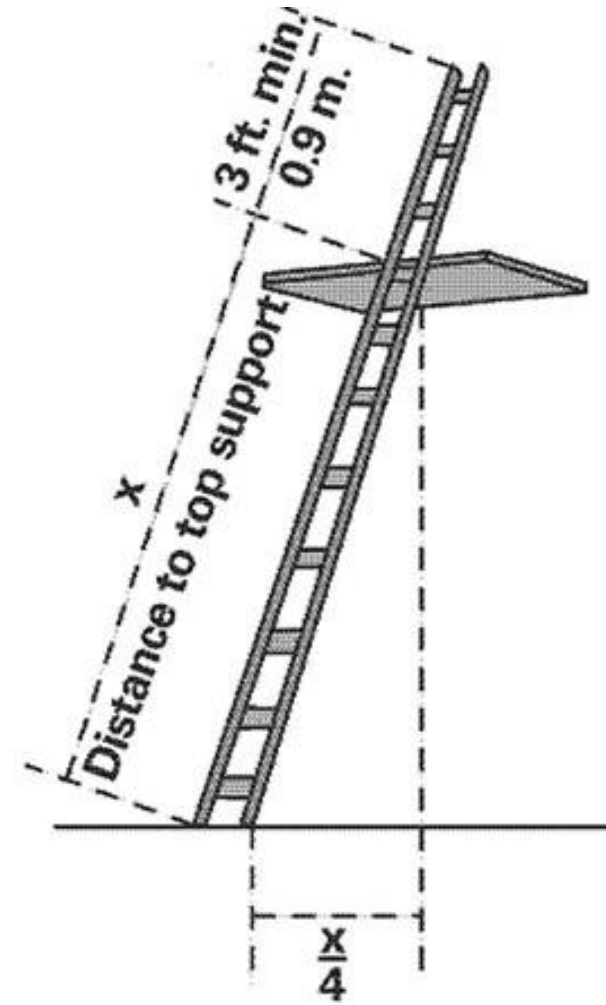
- **Requirements**

- 3 points of contact while ascending and descending.
- Keep belt buckle inside the rails.



Portable Ladder Set-up Requirements

- Ladder at 75 degrees (4 to 1)
- Side rails 3ft above upper level
- Secure at top and bottom
- Stable and level surfaces
- Manufacturer recommendations
- If unsafe, tag "Do Not Use" and remove from service.



Fixed Ladder Requirements

- Side rails extend 42 inches above landing.
- Rest/Landing Platforms
 - Cages & Wells: 50 ft. max.
 - Ladder Safety System & PFAS: 150 ft. max.
- Ladders extending more than 24 ft.:

Installed	Cage	Well	PFAS	Ladder Safety System
New Ladders < 11/19/2018	●	●	●	●
New Ladders ≥ 11/19/2018	∅	∅	●	●
All Ladders > 11/18/2036	∅	∅	●	●



Guardrail Requirements

- **Top Rail**

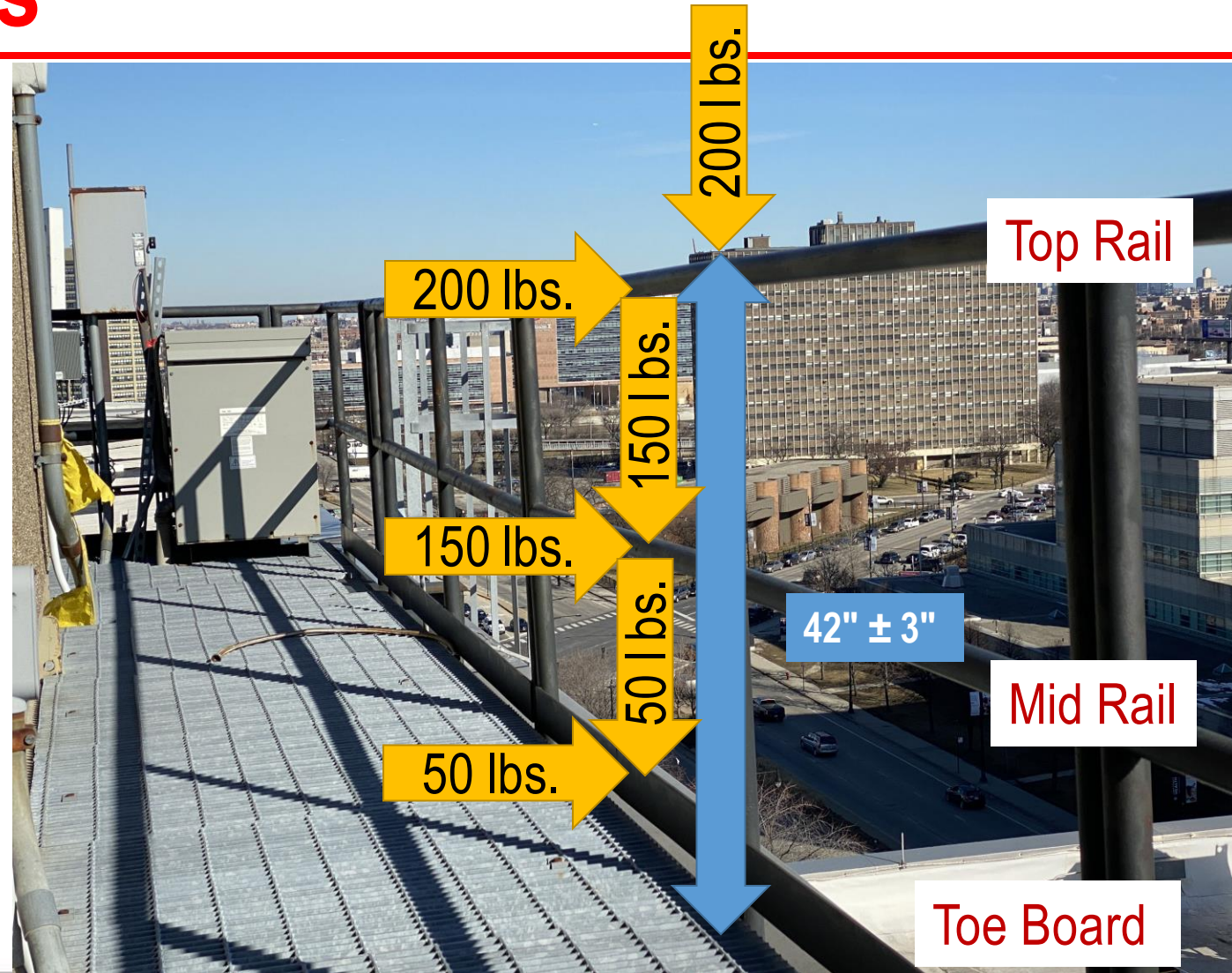
- 42" \pm 3" Tall
- 1/4" Minimum Diameter or Thickness
- 200 lb. Force Outward or Down

- **Mid-Rail**

- Midway between top edge and walking/working surface.
- 1/4" Minimum Diameter or Thickness
- 150 lb. Force Outward or Down

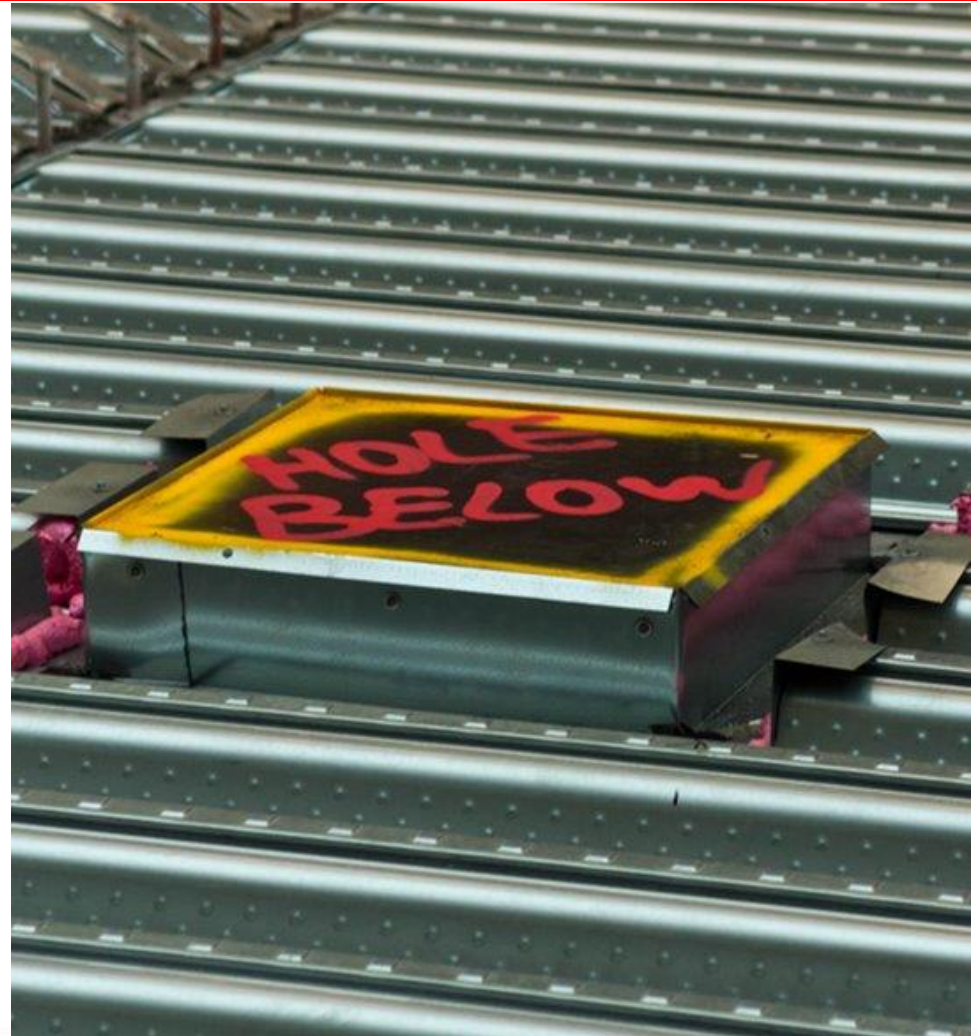
- **Toe Board**

- 3 1/2" Tall Minimum
- 1/4" Above walking/working surface maximum
- 50 lb. Force Outward or Down



Hole Cover Requirements

- **< 4 ft. above lower level (6 ft. Construction)**
 - Covers or
 - Guardrails
- **> 4 ft. above lower level (6 ft. Construction)**
 - Covers or
 - Guardrails or
 - Travel Restraint System or
 - Personal Fall Arrest System
- **Covers**
 - Support twice weight of employee, tools, and materials.
 - Secured in place
 - Color coded or marked "Hole" or "Cover"



Fall/Travel Restraint

- **Anchorage**
 - Rated for 1,000 lbs. per attached or
 - Design by a qualified person with a safety factor of 2.
- **Body Support**
 - Body Belt or
 - Body Harness
- **Connector**
 - Lanyard - Prevents worker from reaching edge.



Fall Arrest ABCD's

- **Anchorage**
 - Rated for 5,000 lbs. or
 - Designed with 2 to 1 factor of safety by a qualified person.
- **Body Support**
 - Body Harness, body belts are prohibited.
- **Connectors**
 - Lanyard & Connections
- **Deceleration Device (On Lanyard)**
 - Arrest fall within 3 1/2 ft.



CAI Safety Systems

Self-Retracting Devices

- **Class A**

- Max. arrest distance of 24 inches.
 - Typically weighs 1 to 3 lbs.
 - Typically extends 6 to 9 feet.

- **Class B**

- Max. arrest distance of 54 inches.
 - Heavier
 - Typically extends up to 200 feet



Self-Retracting Devices

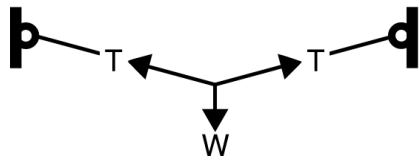
- **Self-Retracting Lifeline**
 - Class A – Max Arrest 24 inches
 - Class B – Max Arrest 54 Inches
- **Self-Retracting Lifeline – R**
 - "R" stands for rescue
 - Automatic
 - Manual
- **Self-Retracting Lifeline – LE**
 - Used on leading edges



Horizontal Lifelines

- **Qualified Person**

- Supervise installation
- Supervise use
- Design
 - 2:1 Safety Factor
 - Catenary



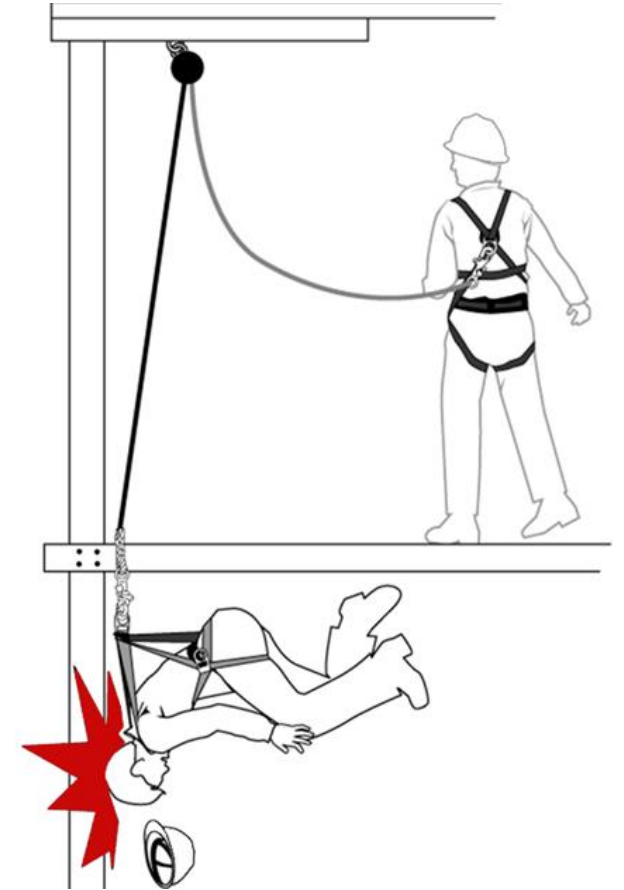
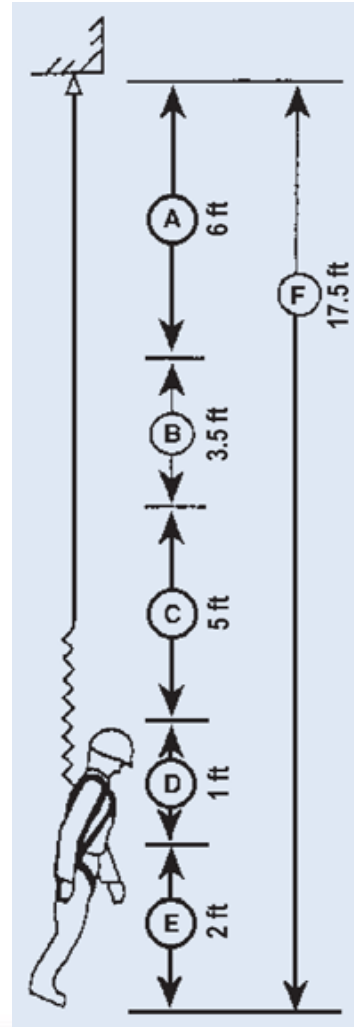
Clearance

1. Vertical Fall

- A. Free Fall: 6 ft. max.
- B. Deceleration Distance: 3 ½ ft.
- C. D-Ring Height: 5 ft.
- D. Harness Stretch: 1 ft.
- E. Safety Factor: 2 ft.
- F. Total Clearance Required: 17 ½ ft.

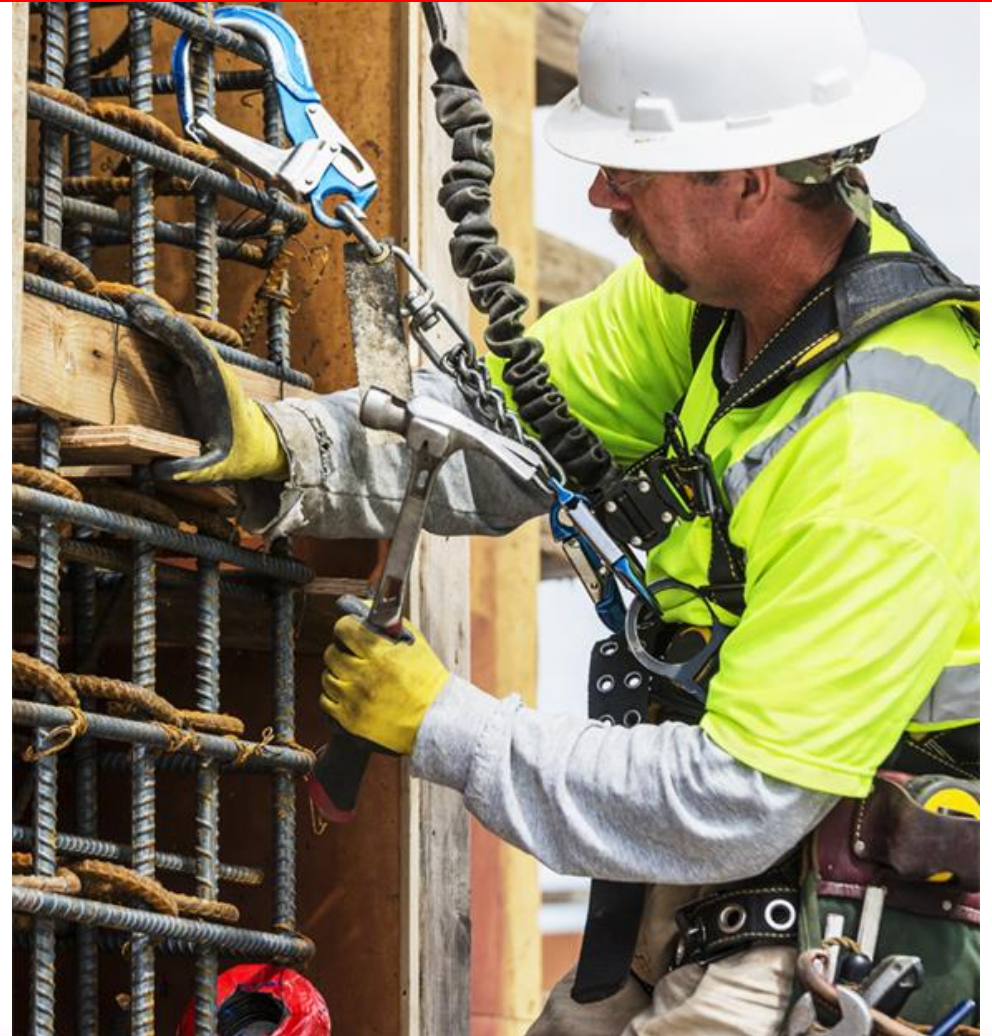
2. Swing Fall

- A. Pendulum effect



Positioning System

- **Free fall < 2 feet.**
- **Anchor Load Rating (Greater of)**
 - 2 x Impact Load
 - 3000 lbs.
- **Connecting Assemblies**
 - Rated for 5,000 lbs.
 - Proof Tested for 3,600 lbs.
 - Inspected prior to each use.
- **Additional fall protection required**



Safety Net Requirements

- **Installation**

- ≤ 30 ft below WWS
- Sufficient clearance below net

- **Mesh openings**

- ≤ 36 in²
- ≤ 6 in per side and on center

- **Strength**

- Border Rope $\geq 5,000$ lb. breaking strength
- 400 lb. Sand-bag drop ≥ 42 in

Vertical Distance from WWS to Net	Minimum Horizontal Distance
Up to 5 feet	8 feet
More than 5 feet up to 10 feet	10 feet
More than 10 feet	13 feet



Image by Walcom

Work Zones on Low-slope Roofs

- **All Work Zones**
 - Guardrail or
 - Safety Net or
 - Travel Restraint or
 - PFAS or
 - Designated Area (≥ 15 ft from edge)
- **Safe access to work zones**



Work on Low-slope Roofs - Temporary and Infrequent

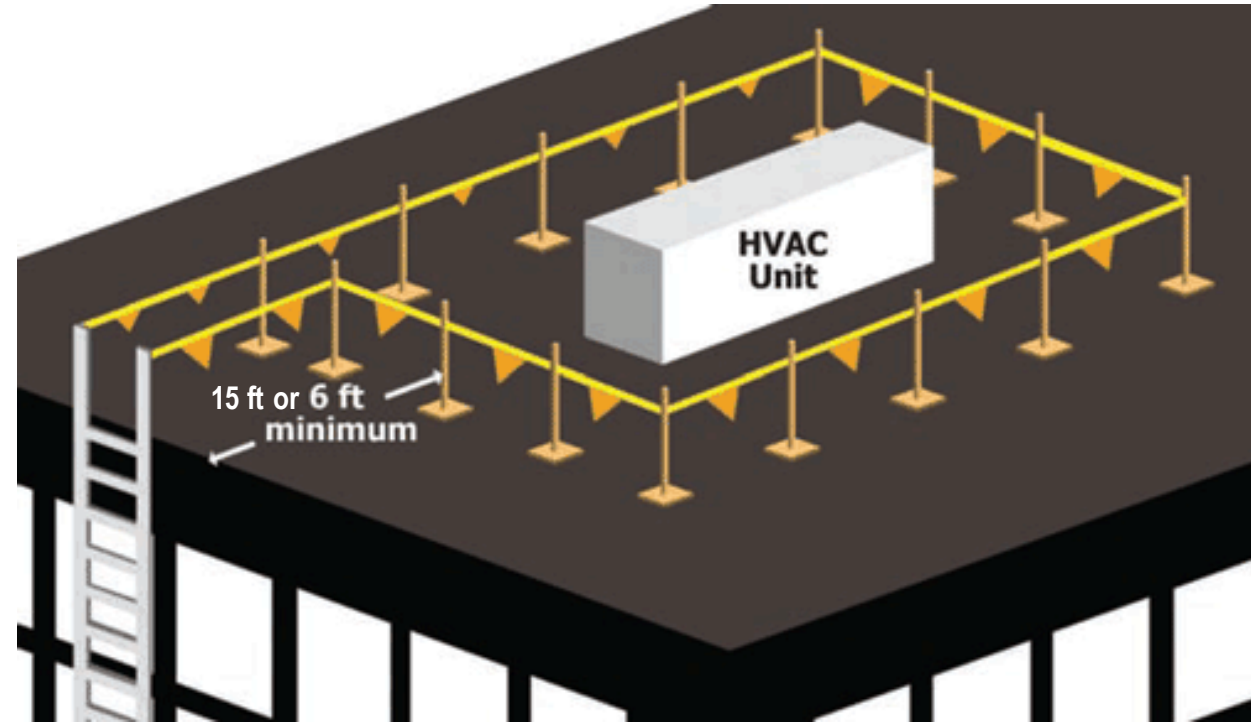
- **Temporary**
 - Simple Task
 - ≤ 2 hrs to complete
- **Infrequent**
 - Performed on occasion
- **< 6 ft. From edge**
 - Fall protection required
- **6 ft. to 15 ft. From edge**
 - May use designated area
- **≥ 15 ft. From edge**
 - No fall protection needed with work rule.



Low-Slope roof work zones Temporary and Infrequent

Designated Area Requirements

- **Remain within Designated Area**
- **Access Path**
 - Formed by two warning lines
 - Block path when not in use
- **Warning Line**
 - Rope, Wire, Tape, or Chain
 - 200 lb. Minimum Breaking Strength
 - ≥ 34 in ≤ 39 in above WWS
 - Visible ≥ 25 ft and within DA
 - Flagging ≤ 6 ft apart



Rope Descent System Requirements

- **Limited to ≤ 300 ft unless**
 - Not feasible by other means
 - Other means pose greater hazard
- **Anchors**
 - Rated to 5,000 lbs.
 - Certified by 11/20/2017
- **Body Support**
 - Bosuns chair ≥ 300 lbs.
 - Harness, Lifeline, PFAS
- **Connector**
 - Min. Rating $\geq 5,000$ lbs.
 - Proof Test to 3,600 lbs.



Industrial Rope Access

- **IRA technicians exempt from:**
 - 300 ft rule
 - Using designated anchors
- **IRA Technicians can ascend and descend**
- **More training than RDS.**



Protection from Falling Objects

- **Head Protection**

- Hardhat
- Guardrail with Toeboards or Screens
- Canopy Structures
- Barricade area into which objects can fall



Learning Objectives

- **Fall Protection**
 - Why
 - Regulations
 - Updated Standards
 - System Requirements

Questions?

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