Wireless Rooftop Deployment Training

U.S. Department of Labor - OSHA
Susan Harwood Grant
SH-05134-SH9

NATE
THE COMMUNICATIONS INFRASTRUCTURE CONTRACTORS ASSOCIATION

NATE WIN
WIRELESS INDUSTRY NETWORK

Acknowledgement

This material was produced under a **2019 Susan Harwood Training Grant (SH-05134-SH9)** from the Occupational Safety and Health Administration (OSHA), U.S. Department of Labor. It does not necessarily reflect the views or policies of the U.S. Department of Labor, nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. Government.

Wireless Rooftop Deployment Topics

The training is organized into the following nine topic sections:

- Section 1: Introduction to NATE and OSHA
- Section 2: State of the Industry
- Section 3: Applicable Laws, Regulations, and Standards
- Section 4: Potential Rooftop Hazards
- Section 5: Hierarchy of Controls Overview
- Section 6: Pre-Task Planning and Job Hazard Assessment
- Section 7: Radio Frequency (RF) Hazards and Mitigation
- Section 8: Fall Protection
- Section 9: Practical Workshop

Wireless Rooftop Deployment Course Objectives

- Section 1: Enhance students knowledge of the roles of OSHA and NATE.
- Section 2: To provide a course overview video of wireless rooftop deployment safety practices and examine industry fatalities that occurred while working on rooftops.
- Section 3: Enhance awareness and knowledge of the current laws, regulations, and standards while working on rooftops.
- Section 4: Enhance awareness of the potential hazards and exposures associated with rooftop work within the telecommunications industry.
- Section 5: Advance awareness in approaching rooftop hazards through the application of the hierarchy of controls.

Wireless Rooftop Deployment Course Objectives

- Section 6: Enhance awareness in recognizing and documenting rooftop hazards by applying control measures through pre-task planning and assessment(s).
- Section 7: Understanding of radio frequency program, signage, personal protection monitor, mitigation, and plans to ensure safe working while on rooftop environments.
- Section 8: Identify, plan, and apply the appropriate fall protection system(s) and methods based on the rooftop environment and scope of work.
- Section 9: Demonstrate the knowledge to identify hazards/exposures and apply the appropriate risk mitigation practice(s) within a rooftop environment.

Turning Point Technology

In this training you will utilize **Turning Point** interactive response software.

You will be asked questions and receive real-time feedback with handheld mobile devices. Results are instantly displayed on the screen and collected in detailed reports to ensure all participants are accounted for.

Pancake : Griddle :: Hamburger : ?

A. Lettuce

B. Grill

C. Bun

D. Ketchup

What is your age?

A. 18-24

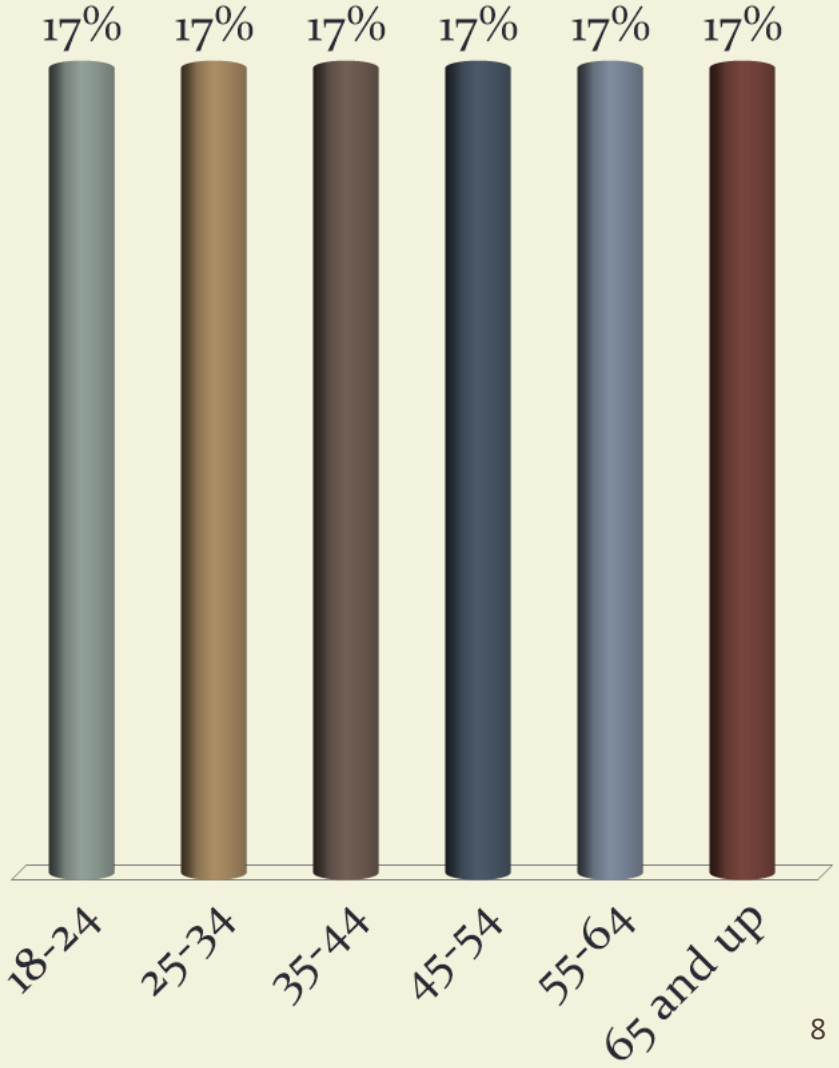
B. 25-34

C. 35-44

D. 45-54

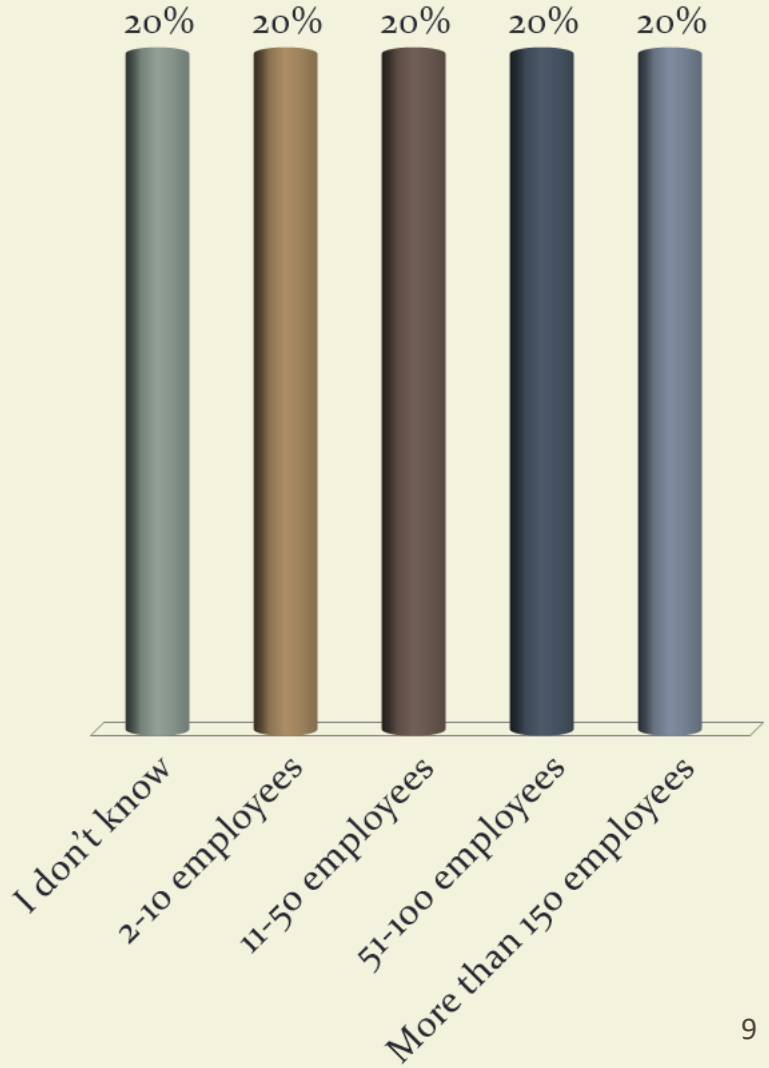
E. 55-64

F. 65 and up



What is the size of your employer?

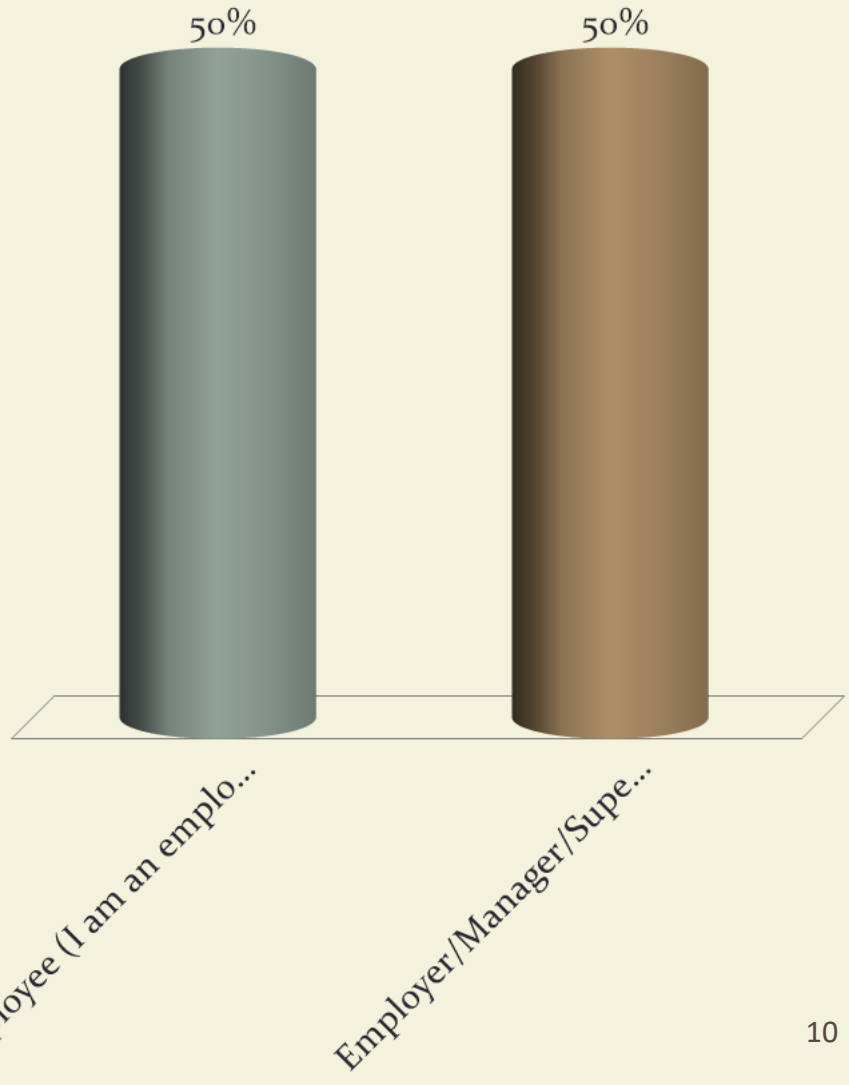
A. I don’t know
B. 2-10 employees
C. 11-50 employees
D. 51-100 employees
E. More than 150 employees



Are you an employee or employer?

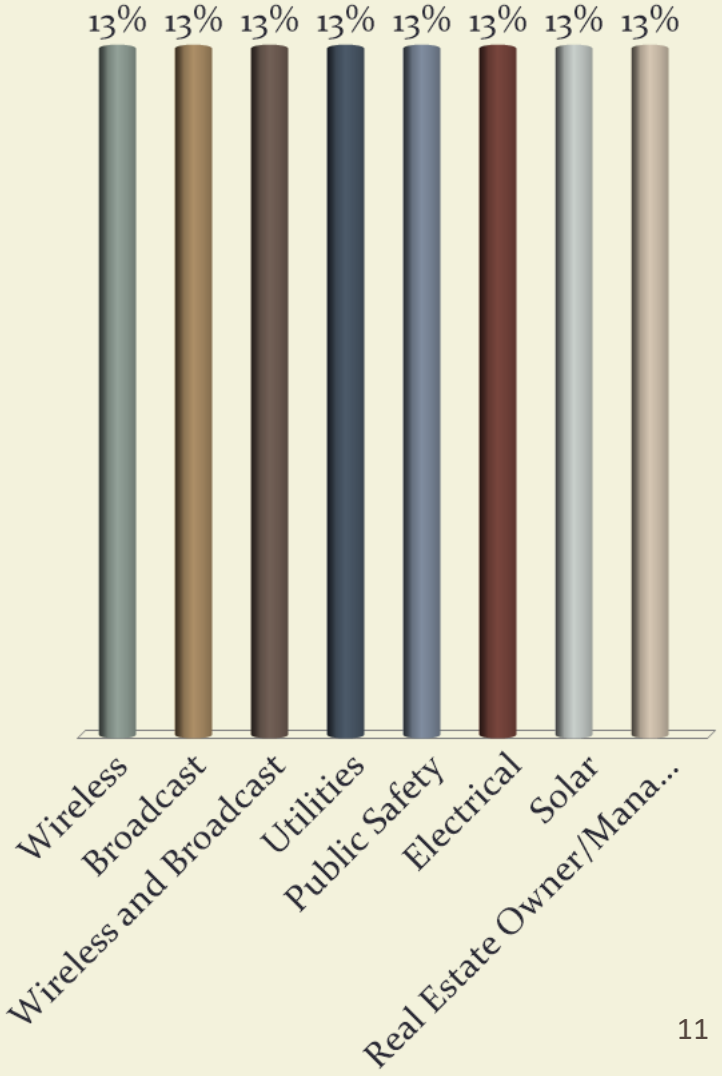
A. Employee (I am an employee at my company)

B. Employer/Manager/Supervisor



What primary sector do you service?

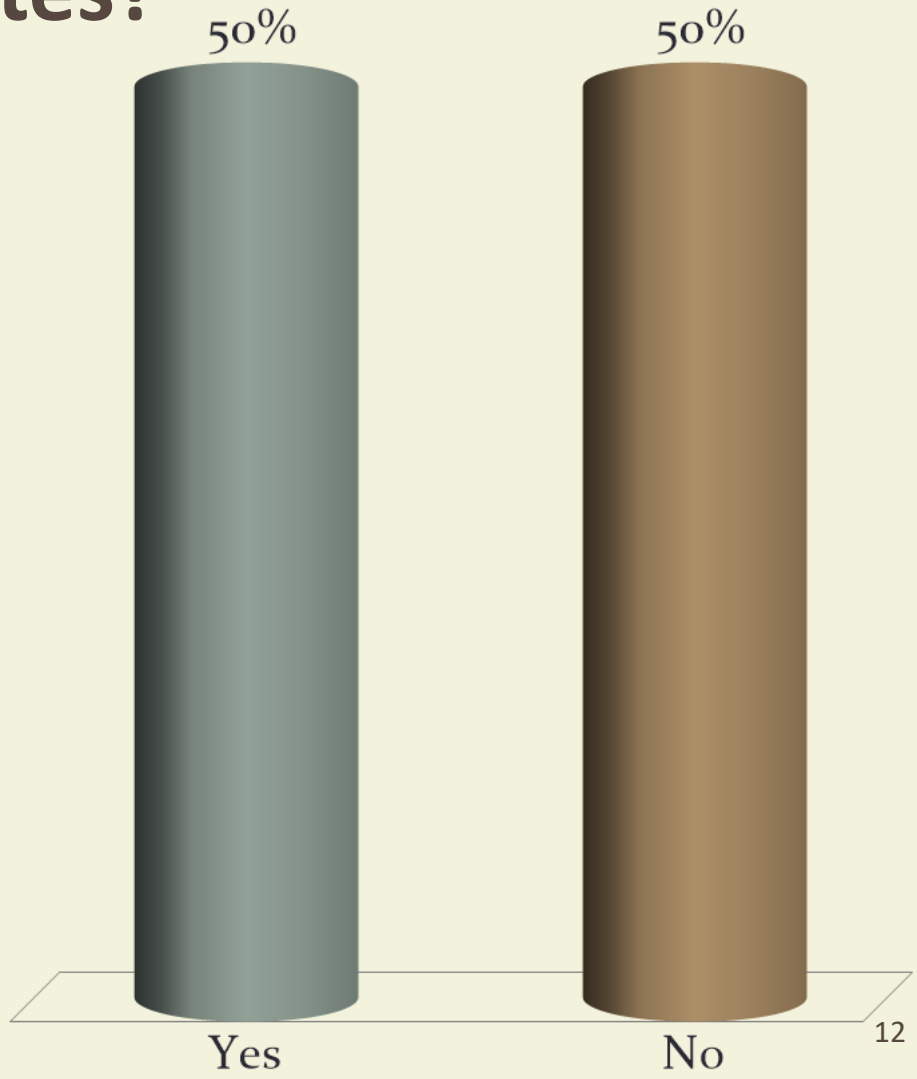
A. Wireless
B. Broadcast
C. Wireless and Broadcast
D. Utilities
E. Public Safety
F. Electrical
G. Solar
H. Real Estate Owner/Manager



Does your company directly perform work activities at rooftop sites?

A. Yes

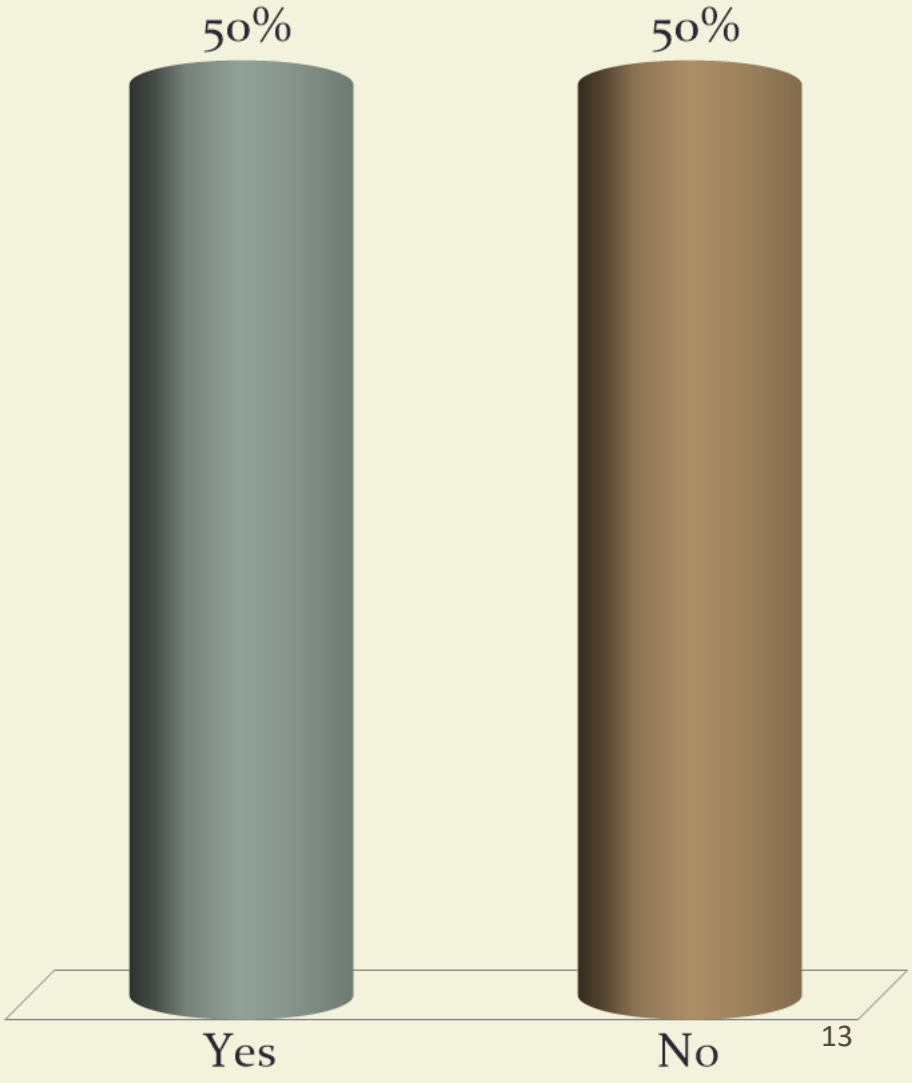
B. No



Have you ever performed work on a telecom rooftop site?

A. Yes

B. No



Section 1

Introduction to NATE and OSHA

NATE and OSHA Topics

- Introduction to NATE and OSHA
- Importance of NATE and OSHA
- Responsibilities of the employer under OSHA
- Employee rights under OSHA

About NATE

- Global leader in industry safety and best practices for 25 years
- Voice of communications infrastructure, service, and maintenance industry
- Diverse membership make-up consisting of over 900 member companies

About OSHA

On December 29, 1970, President Nixon signed the **Occupational Safety and Health Act of 1970 (OSH Act)** into law. The OSH Act created the **Occupational Safety and Health Administration (OSHA)** to assure safe and healthful working conditions for working men and women by setting and enforcing standards and by providing training, outreach, education, and assistance.

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OSHA®

What Does OSHA Do?

- Works with employers and employees to reduce workplace hazards through partnerships and alliances;
- Introduces new or improves upon existing safety and health programs;
- Utilizes consensus standards through an agreement with ANSI;
- Educates on safety and health rules that are designed to protect workers;
- Enforces the rules through inspection and citations;
- Monitors job-related injuries and illnesses through electronic records and reporting; and
- Conducts a variety of inspections to include: accidents, fatalities, complaints and programmed inspections.

Workers Have the Right To:

- Safe and healthful working conditions;
- File a confidential complaint with OSHA in regards to safety and/or health concerns in the workplace;
- Review records of work-related injuries and illnesses;
- Receive training regarding the OSHA standards that apply to their workplace;
- Report any injury or illness without retaliation or discrimination;
- Obtain copies of test results done to find hazards in the workplace; and
- Obtain copies of their medical records.

Source: OSHA 3021-09R 2011, www.osha.gov/workers.html

Employers Must:

- Provide a workplace free from recognized hazards and comply with standards, rules and regulations issued under the OSH Act;
- Eliminate or reduce hazards by making feasible changes in working conditions;
- Not discriminate against employees who exercise their rights under the Act;
- Inform employees of hazards through training, labels, alarms, etc.;
- Train employees in a language/vocabulary employees can understand; and
- Keep accurate records of work-related injuries and illnesses.

Source: OSHA 3021-09R 2011, www.osha.gov/workers.html

OSHA Whistleblower Protection

- Visit www.osha.gov/workers/index.html or call **800-321-OSHA.**
- Be prepared to provide specific details regarding your company and the type of hazard or discrimination being reported.
- Keep a confidential record of all details.
- Once a complaint is filed or reported, an investigation is normally warranted (see criteria on website).

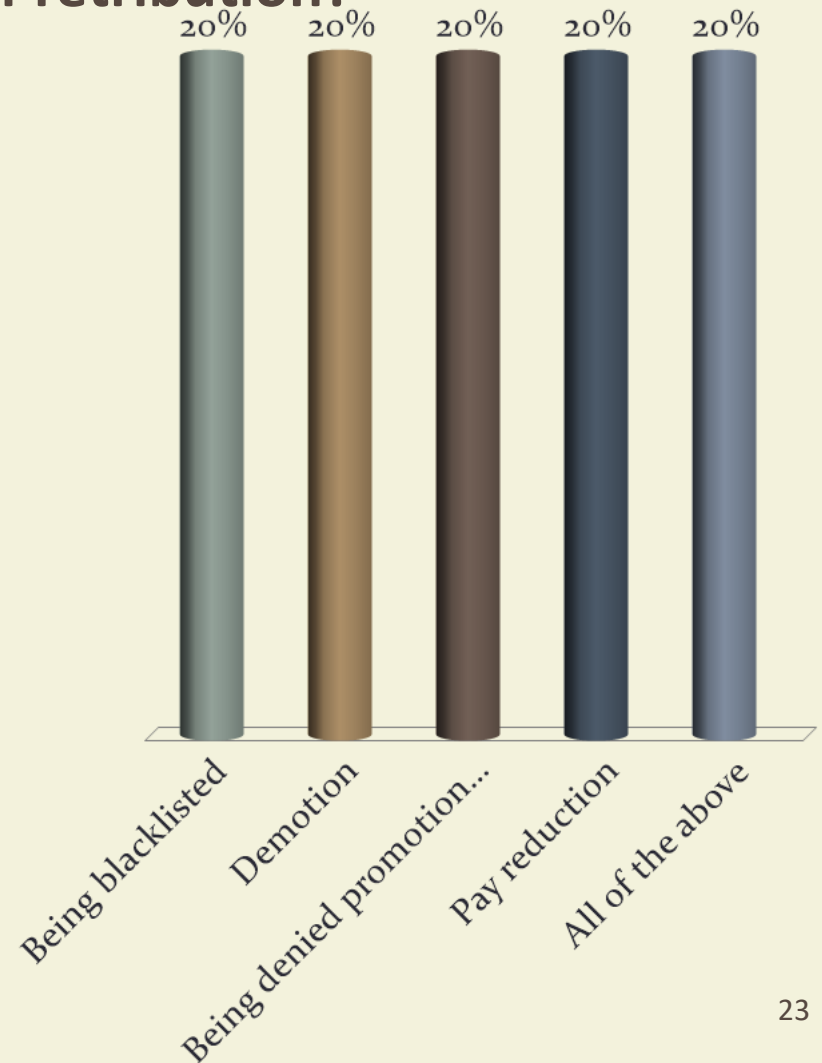
Source: OSHA 3021-09R 2011, www.osha.gov/workers.html

Section 1

Review Questions

What OSHA whistleblower statutes are designed to provide employees the freedom to report violations and protect employees from the following acts of retribution?

A. Being blacklisted
B. Demotion
C. Being denied promotion or overtime
D. Pay reduction
E. All of the above



Employees can report hazards and violations to OSHA through which mediums?

A. By phone: 800-321-OSHA

B. By website: https://www.osha.gov/workers/index.html

C. All of the above

D. None of the above

Section 2

State of the Industry

State of the Industry Topics

- #ClimberConnection Rooftop Deployment Overview Video
- Industry Statistics
- Incident Review

Wireless Rooftop Deployment Video

Video Link: https://www.youtube.com/watch?v=yaPkQFlqRV4

2019 CTIA Annual Survey Results

- Wireless data use almost doubles in one year. This year, we saw mobile data grow by **12.89 trillion MBs to a total of 28.58 trillion.**
- In 2018, Americans connected another **21.5 million mobile devices for a total of 421.7 million devices.**
- This equates to **nearly 1.3 devices for every person in the country.**
- In 2018, **349,344 cell sites** were in **operation - - up 8 percent from previous year.**

On Smart Phones and Pixie Dust

Demand for technician crews is sky high— whether it's working a 50-foot cell tower or a 2,000-foot broadcast tower. And it's easy to take for granted when our cell phones and televisions work, but it's not magic or pixie dust. It's hard, often gritty, and even dangerous work that ensures America's communications services continue to work well and are upgraded as technology improves.

(FCC Commissioner Brendan Carr; NATE UNITE February 2019)

Wireless Estimator Fatality Tracker

According to news website ***Wireless Estimator***, the industry experienced ten fatalities in 2014, four fatalities in 2015, seven fatalities in 2016, eight fatalities in 2017, five fatalities in 2018 and eight fatalities in 2019. Communication tower related accidents and fatalities stemming from falls, RF exposure and other hazards have been well chronicled, but **industry fatalities have also occurred at rooftop sites through the years as well.**

Perspective Industry Fatality Statistics

Year	Fatalities
2003	15
2004	11
2005	7
2006	19
2007	11
2008	12
2009	5
2010	7
2011	7
2012	1
2013	14
2014	10
2015	4
2016	7
2017	8
2018	5
2019	8
Total Fatalities	151

2018 Industry Rooftop Fatality

In **April of 2018** a tower technician died after he was electrocuted upon coming into contact with a 13kv power line while working on an LTE installation on a rooftop in Puerto Rico.

2016 Industry Rooftop Fatality

In **November of 2016** a tower technician fell to his death in Chula Vista, California while working on a rooftop installing transmission lines. The technician died after falling approximately 30 feet from a two-story medical office building rooftop where the work was being conducted.

2008 Industry Rooftop Fatality

In **October of 2008**, a technician was working on a rooftop in Ellensburg, Washington when he fell through a skylight to a concrete floor and was killed.

Moral of the Story

Rooftop telecom sites present as many hazards as traditional communication tower sites. Be **vigilant** while deploying and maintaining infrastructure on rooftop locations!

Section 3

Applicable Laws, Regulations, and Standards


HELP
NOT 1 COVERS ALL

Laws

- Laws are the products of written statutes, passed by either the U.S. Congress or State Legislatures. The legislatures create bills that, when passed by a vote, become statutory law.
  - Clean Air Act
  - Fair Labor Standards Act
  - Occupational Safety and Health Act

Regulations

- Regulations, on the other hand, are standards and rules adopted by administrative agencies that govern how laws will be enforced.
  - OSHA 1926 – (construction)
  - OSHA 1910 – (general industry)

Voluntary Standards

- Voluntary standards are standards established generally by private-sector bodies and that are available for use by any person or organization; private or government. The term includes what are commonly referred to as ‘industry standards’ as well as ‘consensus standards.’
  - Industry – (ANSI/ASSP A10.48)
  - Quality – (ISO 45001)
  - Safety – (ANSI Z359)
  - TIA – (ANSI/TIA -222-H)
  - TIA – (ANSI/TIA 322)

International/Local Building Codes

- The **International Building Code** (**IBC**) is a model building code developed by the International Code Council (ICC). It has been adopted for use as a base code standard by most jurisdictions in the United States. The IBC recognizes the TIA 222 standard as the governing standard for communications structures.
- **Local Building Codes:** The main purpose of local building codes is to protect public health, safety, and general welfare as they relate to the construction and occupancy of buildings and structures.

Applicable Rooftop Regulations

Regulation	Application
International/Local Building Codes	Building codes are regulations that set forth standards to which buildings must conform.
OSHA 1926 (construction)	Safety and Health Regulations for Construction.
OSHA 1910 (general industry)	Occupational Safety and Health Standards.

Applicable Rooftop Standards

Standard	Title	Application
ANSI/ASME B30.9,.10,.26,.30	Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings	Standards for any/all rigging components involved in an overhead lift.
ANSI/ASSP A10.48	Criteria for Safety Practices With the Construction, Demolition, Modification, and Maintenance of Communication Structures	Means and methods for work being performed on telecommunications sites.
ANSI/ISEA 121	Standard for Dropped Object Prevention Solutions	This standard establishes minimum design, performance, testing and labeling requirements.

Applicable Rooftop Standards (cont.)

Standard	Title	Application
ANSI/ISEA Z87	Standard for Occupational and Educational Personal Eye and Face Protection Devices	Standard sets forth requirements for the design, construction, testing, and use of eye protection devices, including standards for impact and penetration resistance.
ANSI/ISEA Z89.1	Standard for Industrial Head Protection	This standard describes types and classes, testing, and performance requirements for protective helmets. These include recommended safety requirements for authorities considering the establishment of regulations or codes concerning the use of protective helmets.

Applicable Rooftop Standards (cont.)

Standard	Title	Application
ANSI/TIA-222-H	Structural Standard for Antenna Supporting Structures, Antennas and Small Wind Turbine Support Structures	Standard for the design, analysis and condition assessment of antenna support structures.
ANSI/TIA-322	Loading, Analysis, and Design Criteria Related to the Installation, Alteration and Maintenance of Communication Structures	Standards related to the installation alteration and maintenance of communication structures.

Applicable Rooftop Standards (cont.)

Standard	Title	Application
FCC-OET 56	Questions and Answers About Biological Effects and Potential Hazards of Radio Frequency Electromagnetic Fields	Understanding effects of overexposure and how to mitigate and manage exposure.
FCC- OET 65	Evaluating Compliance With FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields	Understanding allowable limits of RF exposure to humans.
NATE CTS	NATE Climbing Training Standard	Training topics which must be covered to be in compliance with the standard.

Imagine a World With no Laws, Regulations or Standards…

Section 3

Review Questions

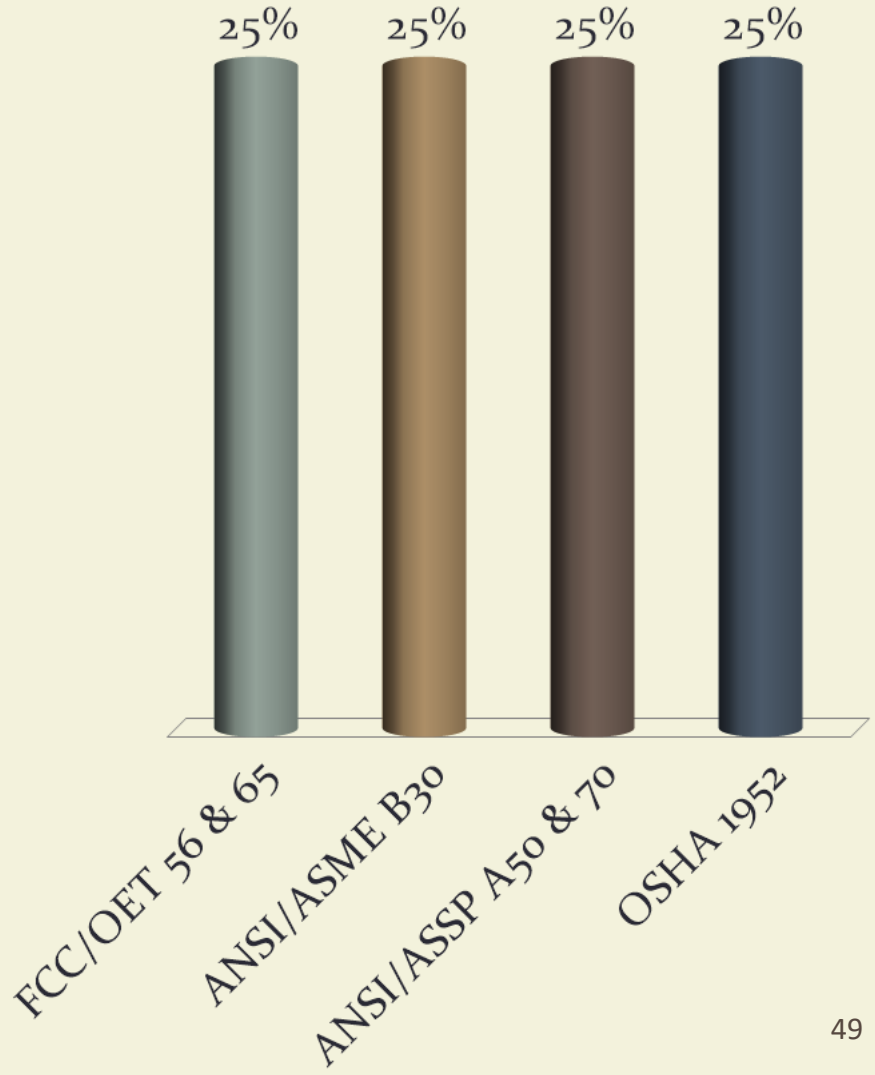
Which standard applies to RF/EME?

A. FCC/OET 56 & 65

B. ANSI/ASME B30

C. ANSI/ASSP A50 & 70

D. OSHA 1952



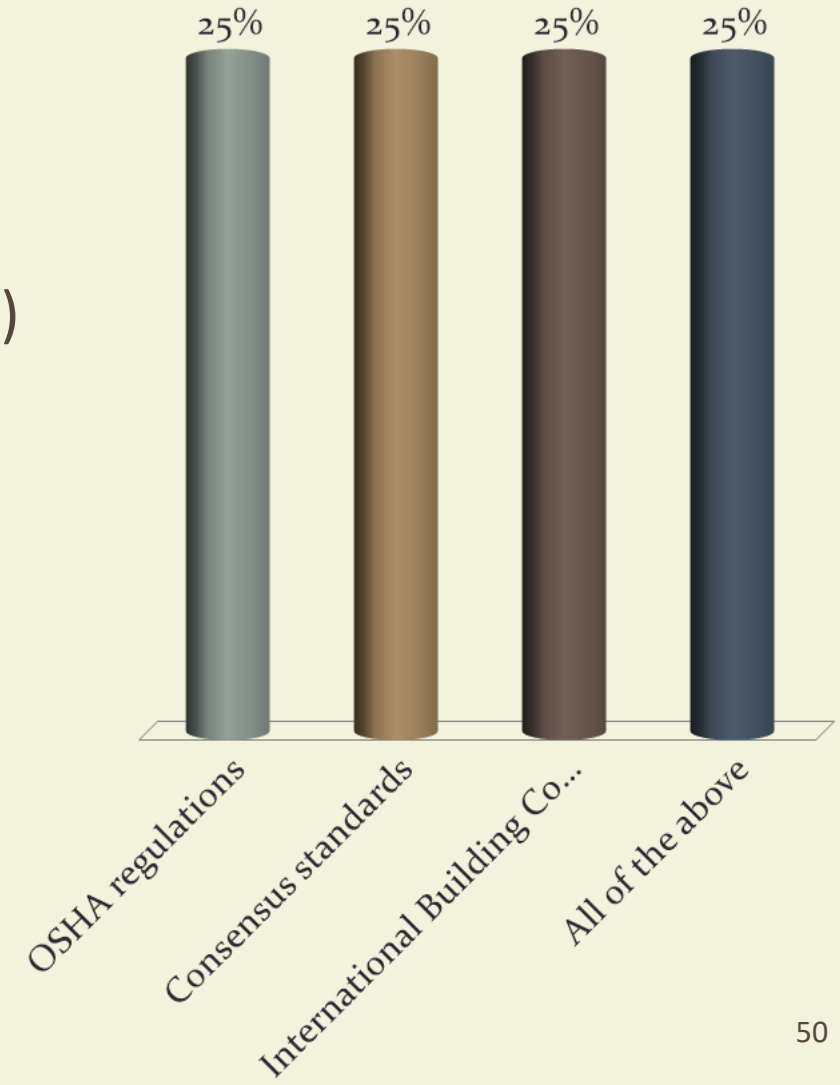
A group of private sector bodies has the ability to create?

A. OSHA regulations

B. Consensus standards

C. International Building Codes (IBC)

D. All of the above



Section 4

Potential Rooftop Hazards

Elevator Equipment Rooms

Window Cleaning Equipment

HVAC Equipment

Skylights / Hatches / Holes

Rooftop Hazards

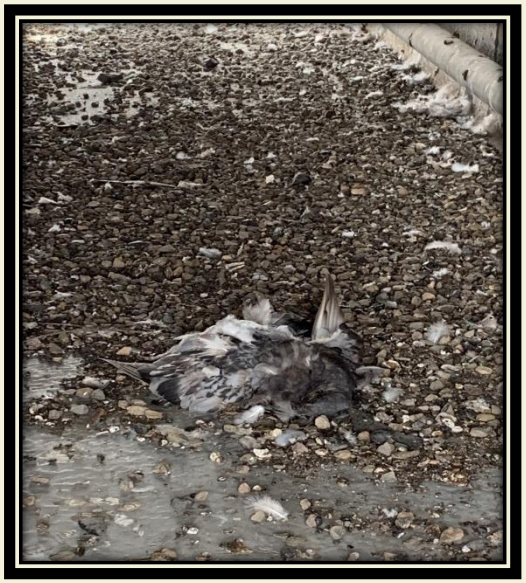
Asbestos

Silica

Lead

Respiratory Fumes

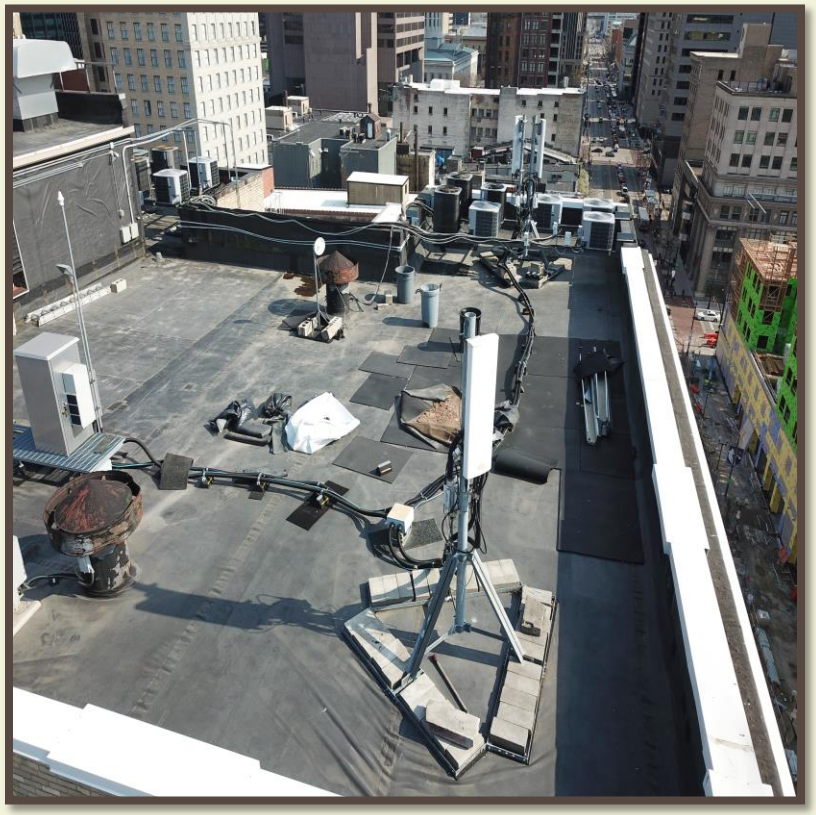
Animals / Insects / Bird Droppings



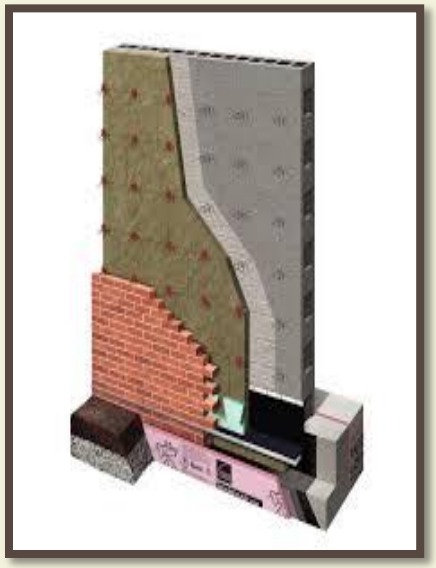
More Rooftop Hazards

Weather

Slips / Trips / Falls



Structural Defects

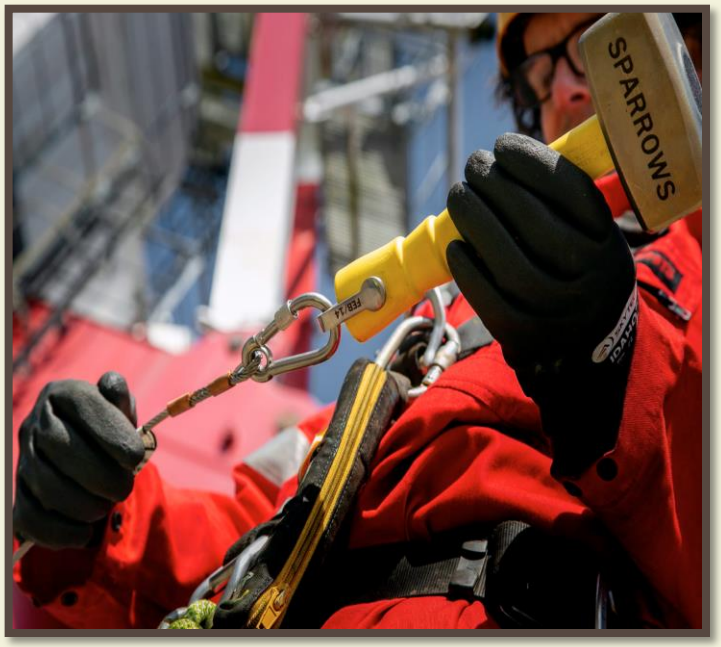


Fire and Emergency

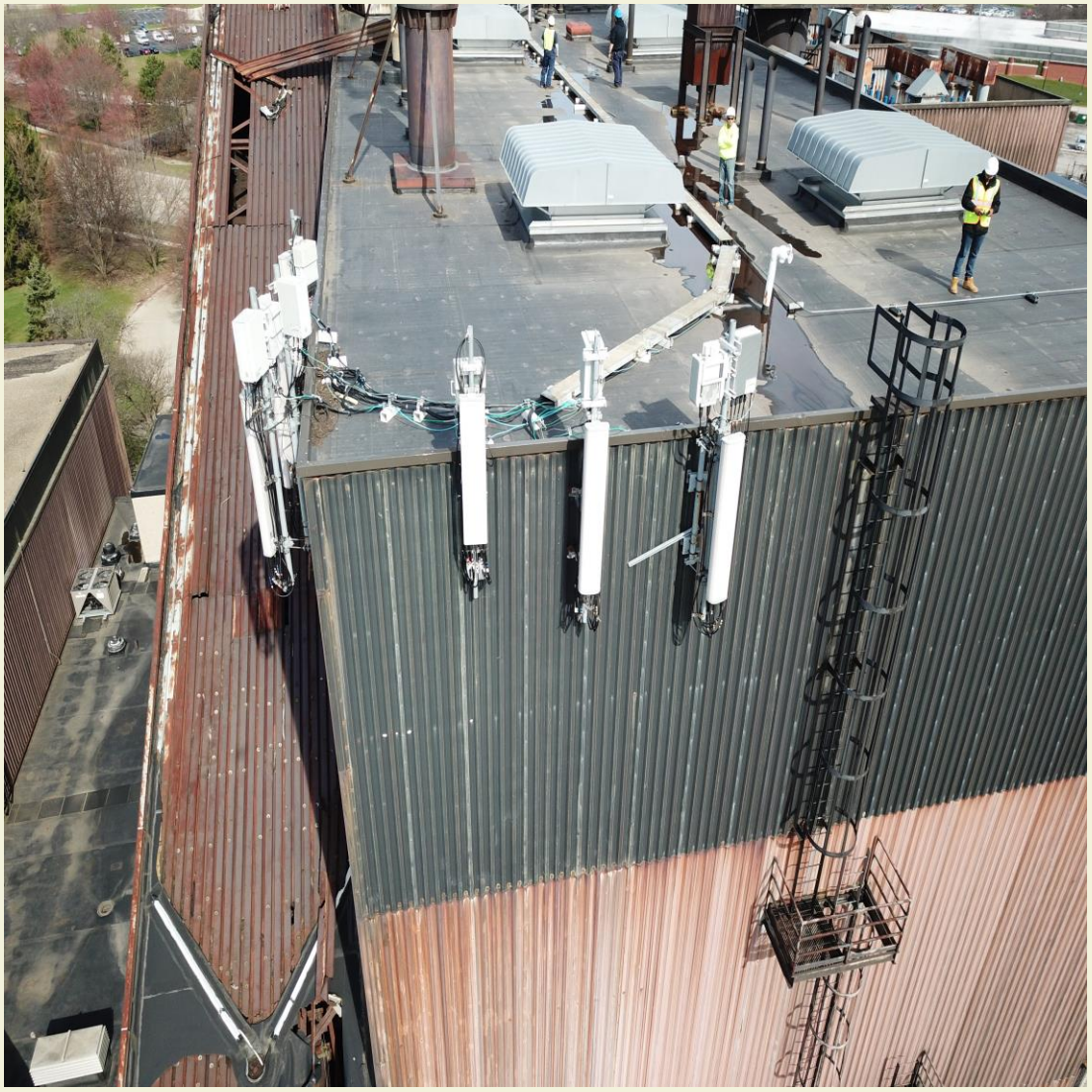
Falls From Elevation Unprotected Edges

RF/EME

Dropped Objects



Ladders: Portable and Fixed

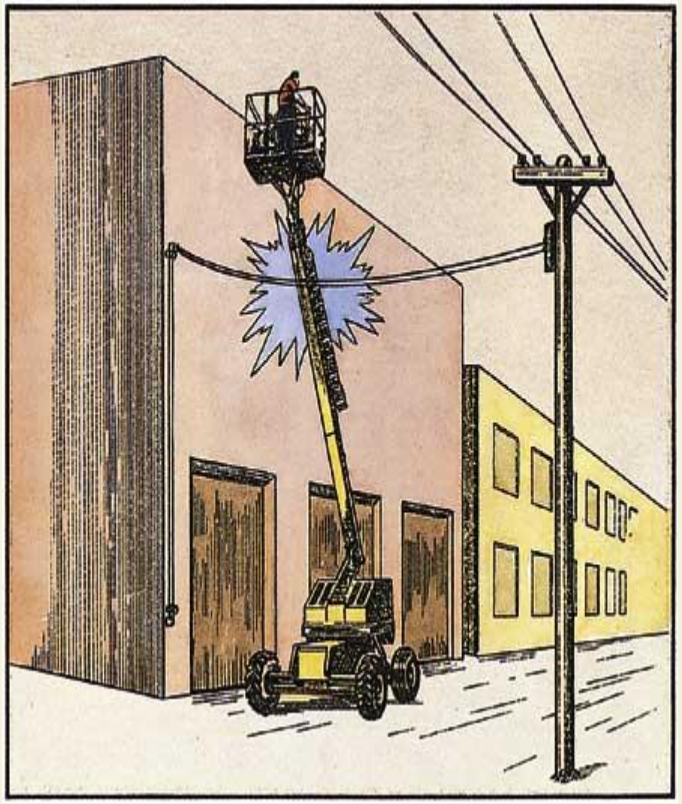


Access and Training

Unauthorized Access

Improper Training

Electrical Lines

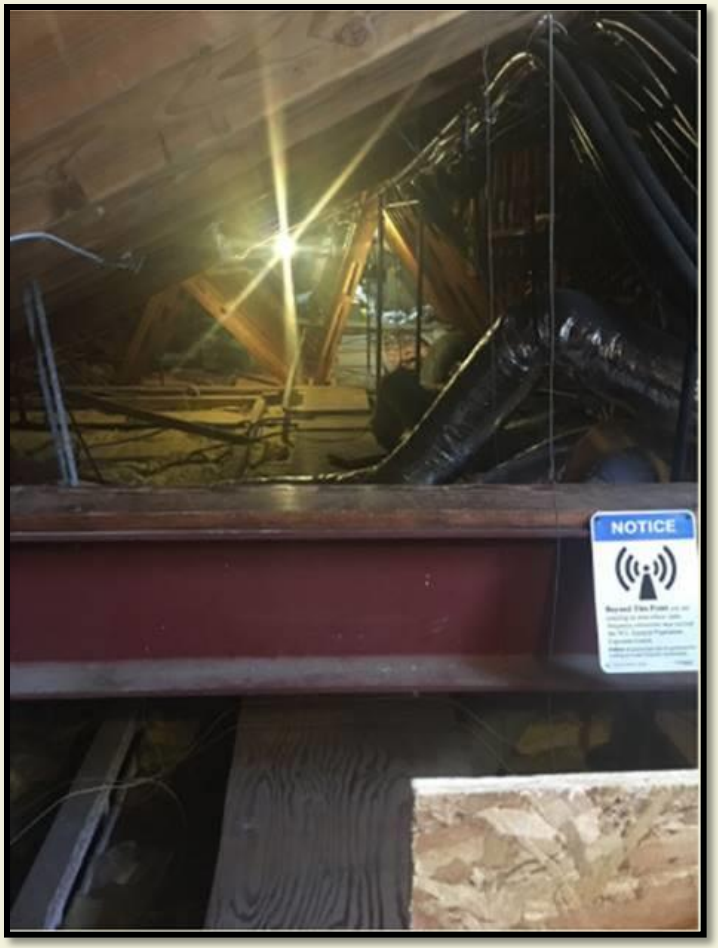


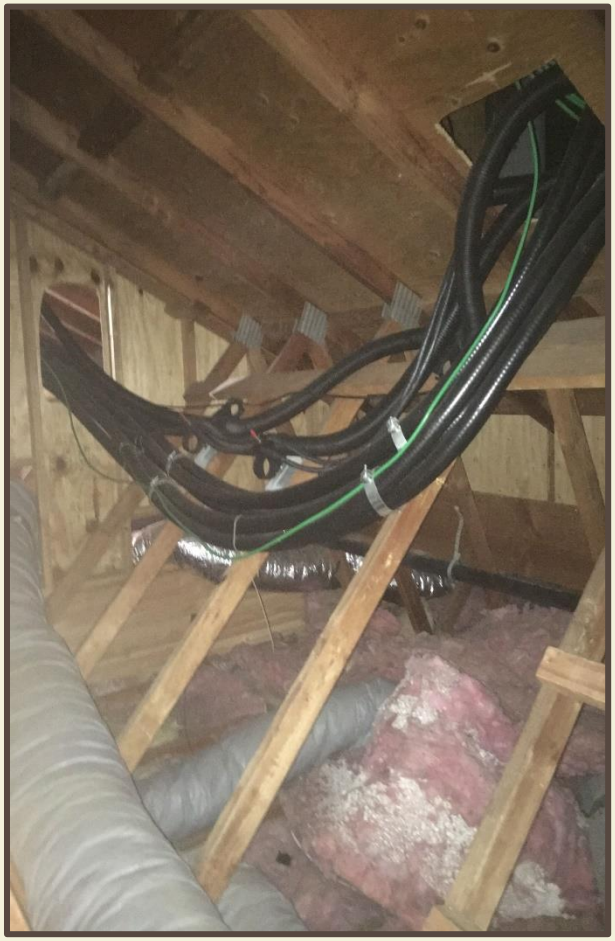
Overhead and on Building

Inadequate Existing Equipment

Anchors and
Horizontal Lifelines

Confined Spaces





Section 4

Review Questions

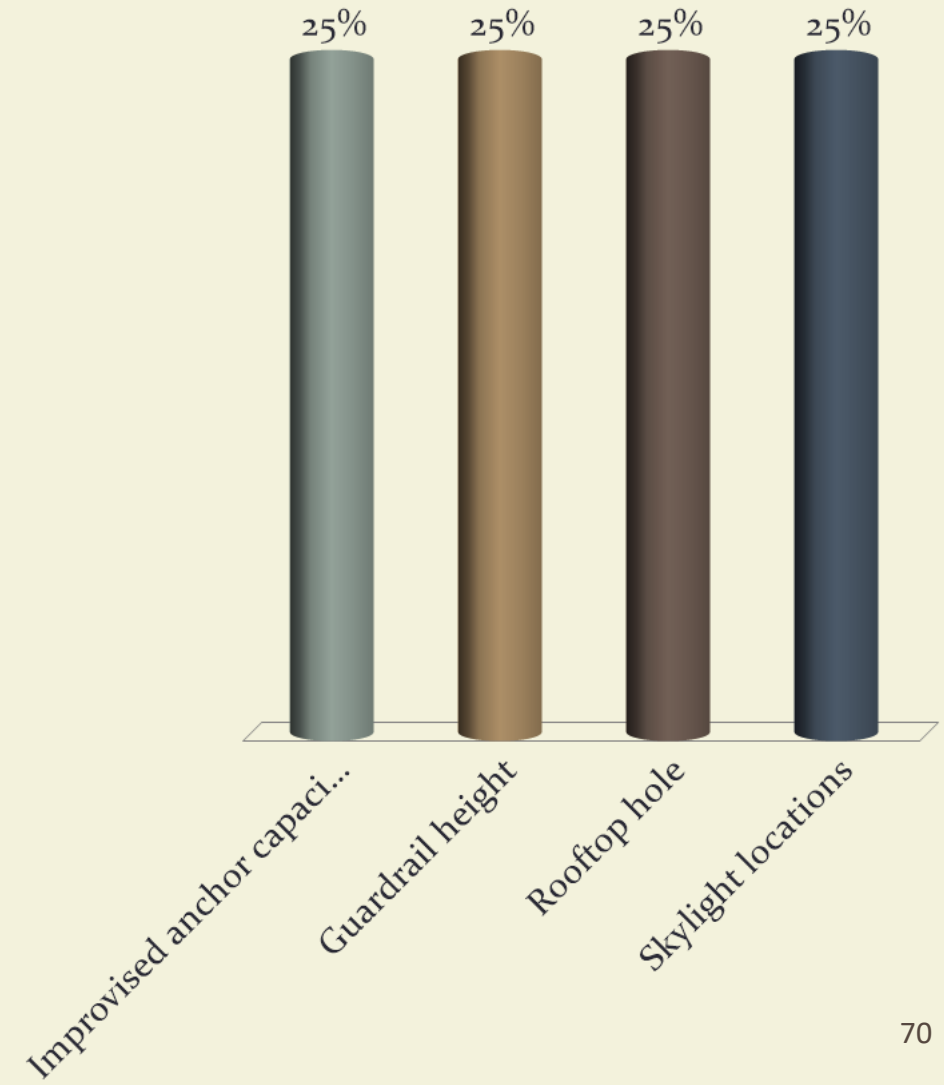
Which item must be marked if present?

A. Improvised anchor capacity

B. Guardrail height

C. Rooftop hole

D. Skylight locations



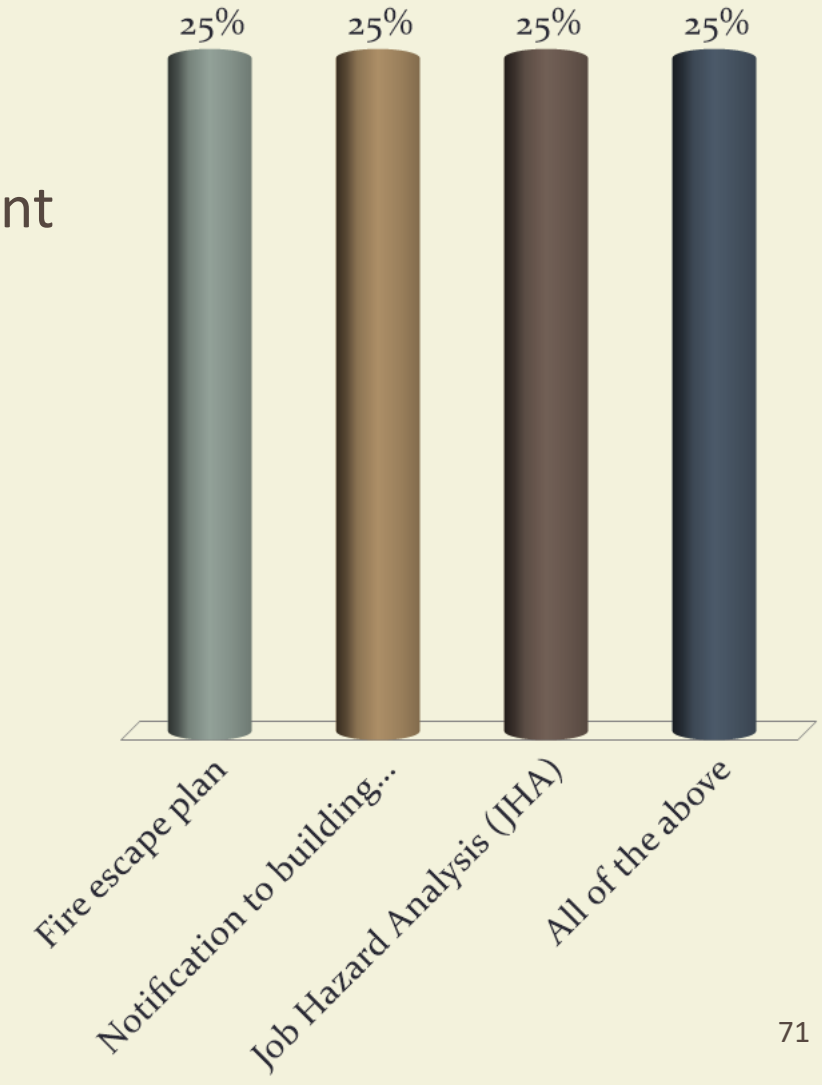
What should take place on a rooftop prior to work?

A. Fire escape plan

B. Notification to building management

C. Job Hazard Analysis (JHA)

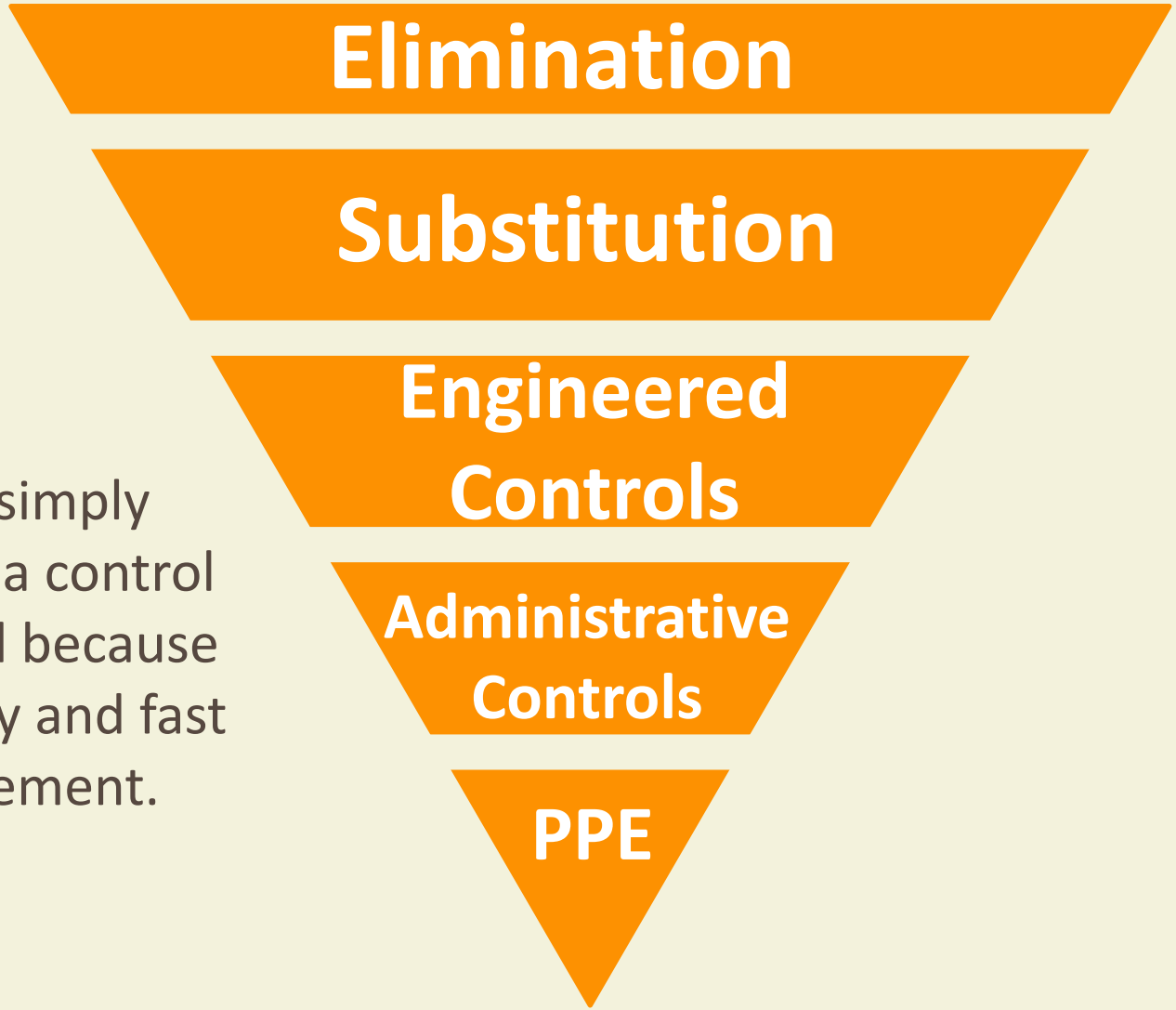
D. All of the above



Section 5

Hierarchy of Controls Overview

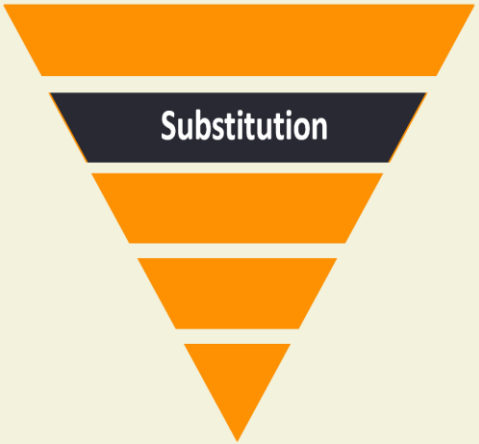
Hierarchy of Controls



Do not simply choose a control method because it is easy and fast to implement.

Elimination

Substitution



Engineered Controls

Administrative Controls

Personal Protective Equipment (PPE)

Section 5

Review Questions

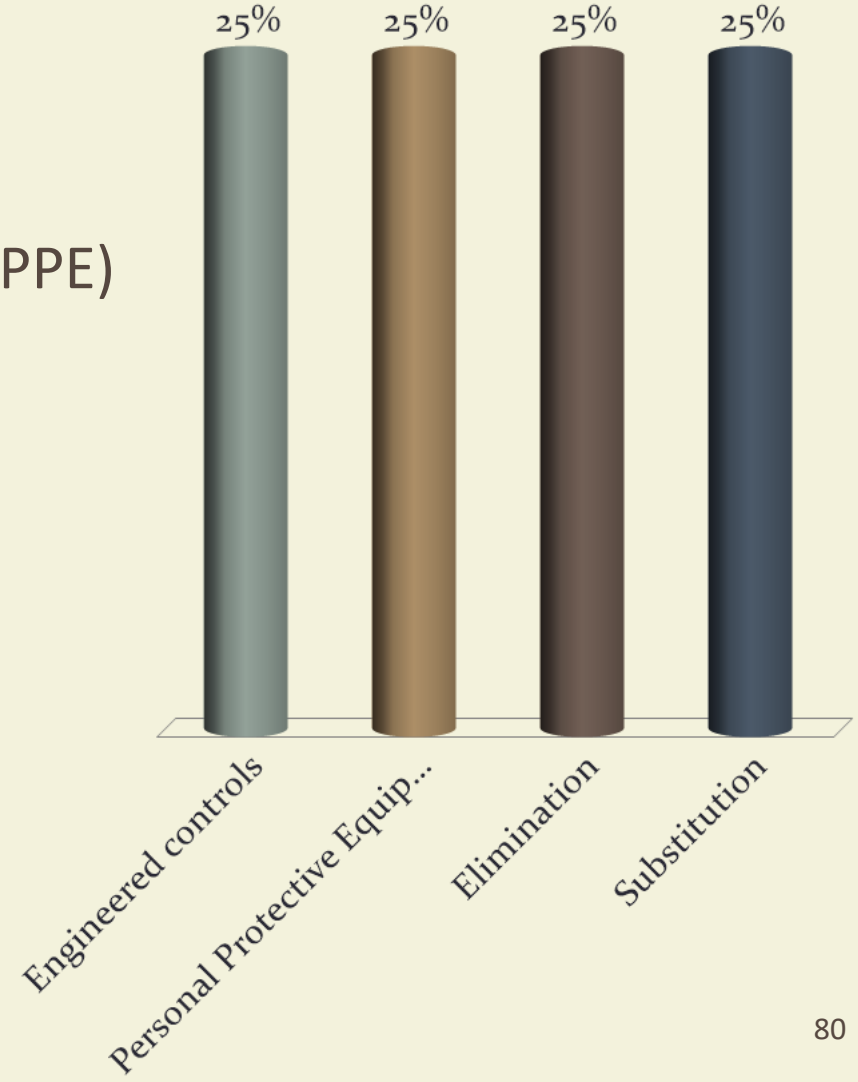
What Hierarchy of Controls is the most desirable solution for reducing hazards but often difficult to achieve?

A. Engineered controls

B. Personal Protective Equipment (PPE)

C. Elimination

D. Substitution



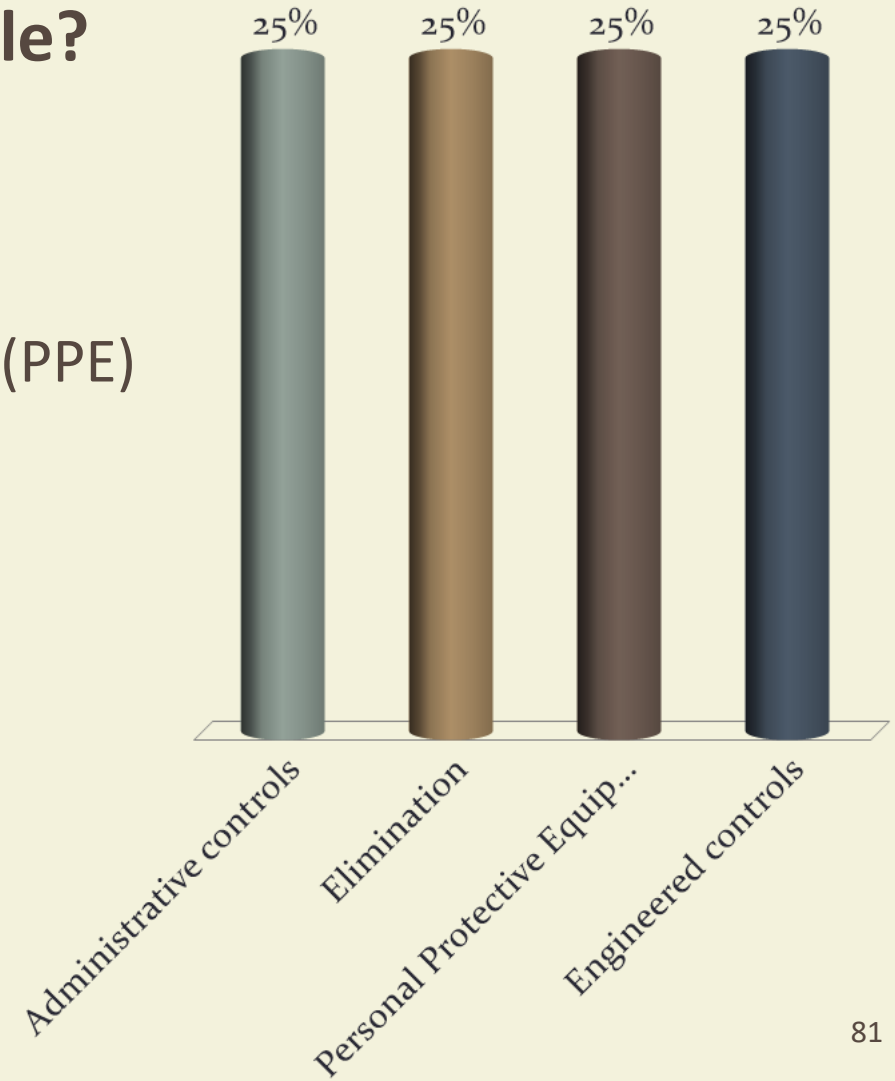
What Hierarchy of Controls is the least desirable solution for reducing hazards but often utilized because other controls are not possible?

A. Administrative controls

B. Elimination

C. Personal Protective Equipment (PPE)

D. Engineered controls



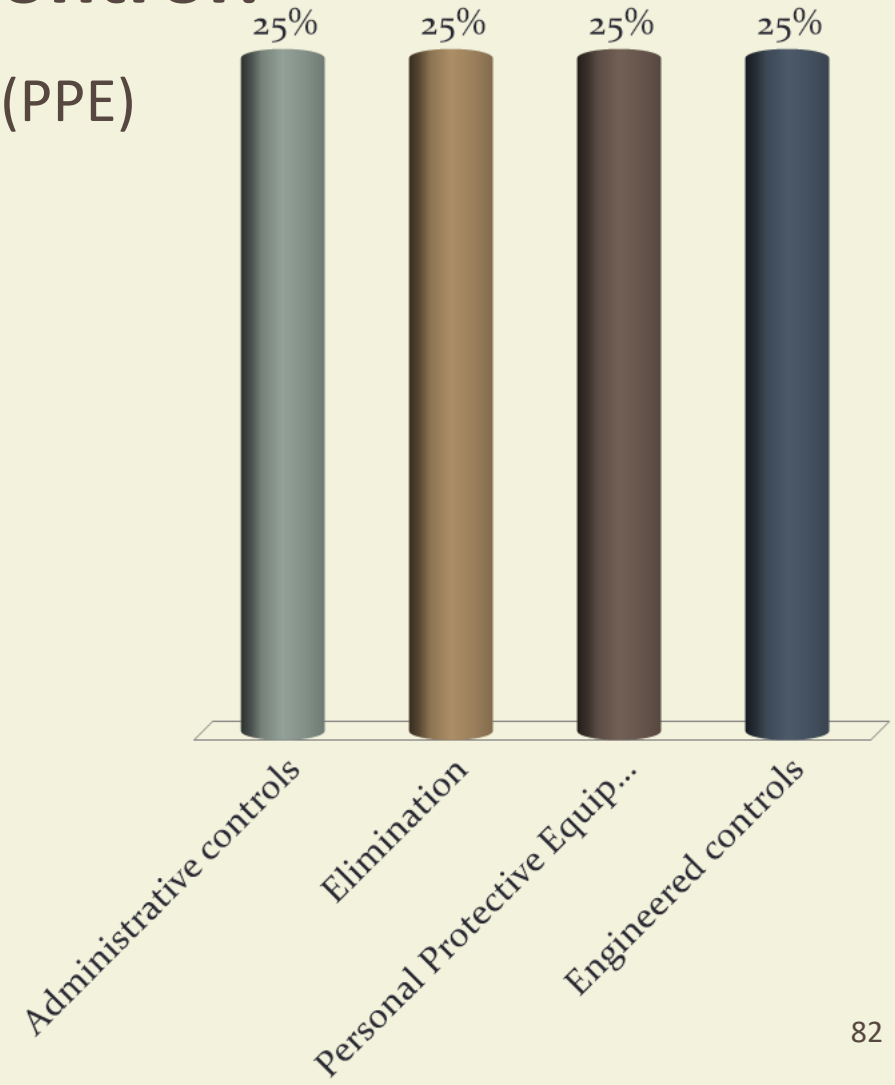
If a hazard cannot be eliminated what is the next best Hierarchy of Control?

A. Personal Protective Equipment (PPE)

B. Administrative controls

C. Engineered controls

D. Substitution



Section 6

Pre-Task Planning and Job Hazard Assessment

Pre-Task Planning and Job Hazard Assessment

This section is designed to enhance awareness of rooftop hazards. A thorough process to define work scope, recognize and document hazards, and develop mitigation measures through pre-task planning and job hazard assessment is the foundation of safe work on rooftops.

Pre-Task Planning

Pre-task planning includes but is not limited to the following categories:

- Scope of Work
- Job Hazard Assessment (JHA)
- Pre-Job Meeting
- Multi-Employer Worksite
- Competent Person
- Emergency Information
- Rescue Plan (Site Specific)
- Training

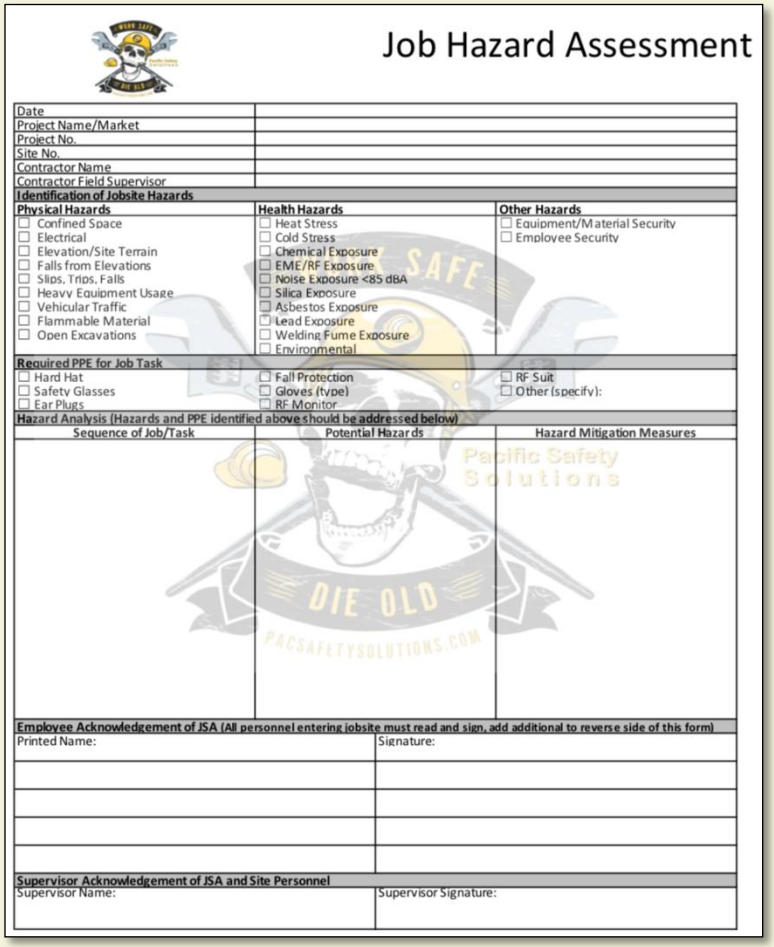
Scope of Work

The scope of work is broken down into specific tasks, materials, required equipment, and tools.

As each component is identified, lists can be made of the known and possible hazards and exposures associated with each respective task.

Job Hazard Assessment

- A Job Hazard Assessment must be conducted to address the potential hazards and methods to mitigate those hazards.
- A hazard assessment must be updated daily or whenever the tasks and hazards change during the construction process.



Job Hazard Assessment

Date	
Project Name/Market	
Project No.	
Site No.	
Contractor Name	
Contractor Field Supervisor	

Identification of Jobsite Hazards

Physical Hazards	Health Hazards	Other Hazards
☐ Confined Space	☐ Heat Stress	☐ Equipment/Material Security
☐ Electrical	☐ Cold Stress	☐ Employee Security
☐ Elevation/Site Terrain	☐ Chemical Exposure	
☐ Falls from Elevations	☐ EME/RF Exposure	
☐ Slips, Trips, Falls	☐ Noise Exposure <85 dBA	
☐ Heavy Equipment Usage	☐ Silica Exposure	
☐ Vehicular Traffic	☐ Asbestos Exposure	
☐ Flammable Material	☐ Lead Exposure	
☐ Open Excavations	☐ Welding Fume Exposure	
	☐ Environmental	

Required PPE for Job Task

☐ Hard Hat	☐ Fall Protection	☐ RF Suit
☐ Safety Glasses	☐ Gloves (type)	☐ Other (specify):
☐ Ear Plugs	☐ RF Monitor	

Hazard Analysis (Hazards and PPE identified above should be addressed below)

Sequence of Job/Task	Potential Hazards	Hazard Mitigation Measures

Employee Acknowledgement of JSA (All personnel entering jobsite must read and sign, add additional to reverse side of this form)

Printed Name:	Signature:

Supervisor Acknowledgement of JSA and Site Personnel

Supervisor Name:	Supervisor Signature:

Pre-Job Meeting

- There should be an initial meeting between as many of the involved parties as possible, including but not limited to:
  - Building owner
  - Engineer
  - General contractor and lower tier sub-contractor(s)
- In this initial meeting, the attendees shall designate and/or verify each party's role and responsibilities.

Multi-Employer Work Site

On multi-employer worksites, all employers must work together to identify and control hazards to meet OSHA regulations and applicable ANSI standards for employee health and safety.

Competent Person

There must be a competent person on site when any work is being performed by the contractor's employees or contractor's lower tier subcontractor.

Rescue Plan (Site Specific)

Each employer must have a documented site-specific rescue plan.

The site-specific plan must identify those employees that are designated by the employer to provide first aid, CPR, and rescue.

Site Specific Rescue Plan			
Date:		Job Number:	
Site Name:		Site Supervisor:	
Work is taking place at an elevated location and a rescue plan is necessary.			☐ Yes ☐ No
The rescue plan is good for the complete job.			☐ Yes ☐ No
Type of Structure			
☐ Monopole ☐ Self Support Tower ☐ Guyed ☐ Rooftop ☐ Water Tank ☐ Other			
Method(s) Used To Rescue A Fallen Climber			
Manual Rope Rescue ☐ Capstan Hoist ☐ Base Mounted Hoist ☐ Crane/Boom Truck ☐ Bucket Truck ☐ Aerial Lift Equipment ☐			
Check List			
The Emergency Data Sheet is filled out and posted?			☐ Yes ☐ No
The Job Safety Analysis is complete and on-site?			☐ Yes ☐ No
The appropriate First Aid individuals are on-site?			☐ Yes ☐ No
The appropriate Rescue individuals are on-site?			☐ Yes ☐ No
The appropriate Rescue Equipment is on-site for the rescue plan.			☐ Yes ☐ No
If there are any special obstructions or conditions that need to be discussed, ensure you document them in the comments.			☐ Yes ☐ No
Once the rescue plan is made, the equipment for the plan shall be inspected to ensure it is on-site and in proper working condition.			☐ Yes ☐ No
Descriptive Comments			
Reminders			
1. Remain calm. 2. Call EMS first. 3. Assess the person's medical condition. 4. Do not become the victim. 5. Secure the site of any other hazards. 6. Contact the office as soon as possible.			
Employee's Name (Print)		Rescue Trained	Employee's Initials
		☐ Yes ☐ No	
		☐ Yes ☐ No	
		☐ Yes ☐ No	
		☐ Yes ☐ No	
		☐ Yes ☐ No	
		☐ Yes ☐ No	
All employees on-site must be part of the rescue plan discussion, and the rescue plan shall stay on-site for the duration of the job. On completion of the job, this form shall be put in the job file.			
Competent Person Signature			

Training

It is the employer's responsibility to have a program in place ensuring all employees are appropriately trained to perform their expected tasks and recognize hazards that may be encountered.

It is the responsibility of the employer and competent person to ensure that each employee is properly and adequately trained to perform the tasks required of them.

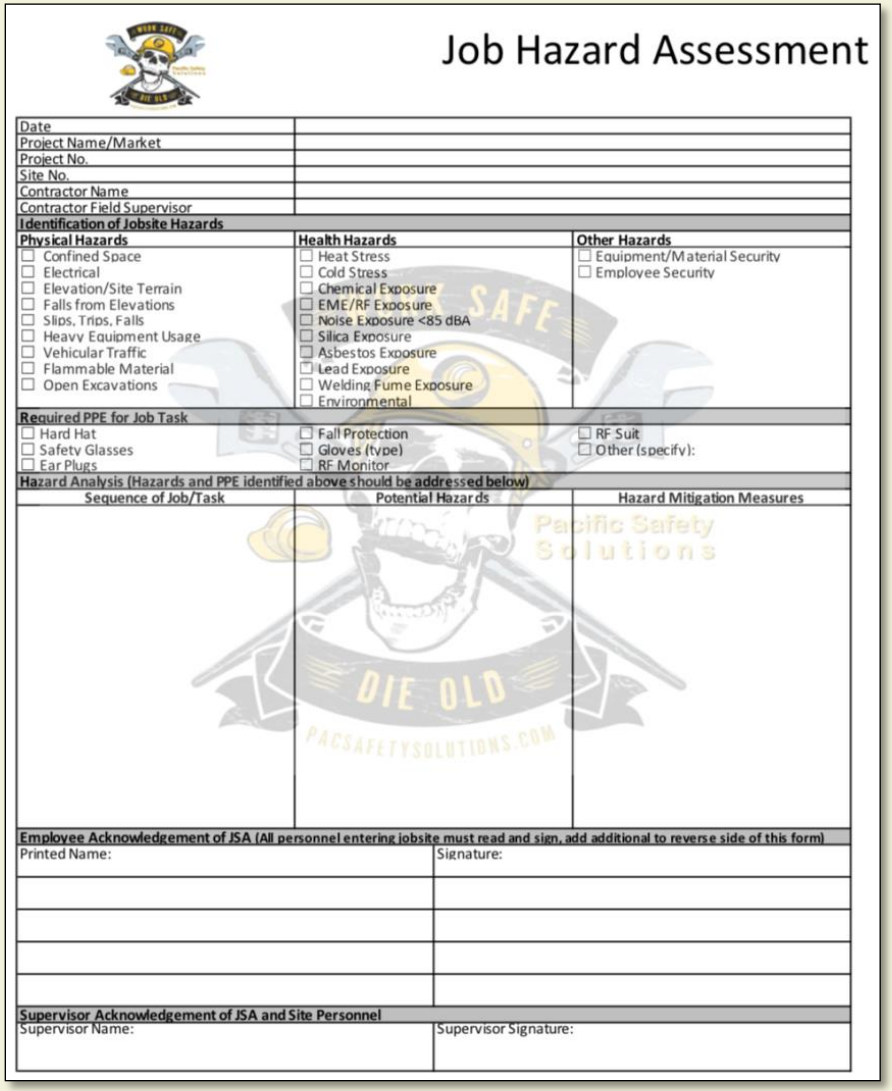
Emergency Information

The competent person must ensure site specific emergency information is readily accessible to the entire crew.

All information must be verified prior to commencement of work.

Emergency Data Sheet			
SITE NAME:			
Job Number:			
SITE Latitude & Longitude:			
AMBULANCE #:			
FIRE DEPT #:			
POLICE #:			
R S& QA Name:			
R S&QA Phone Number			
Branch Office #:			
Site Address:			
Hospital Address			
Hospital #:			
Hospital Longitude & Latitude:			
Hospital/EMS Verification:	☐ **Yes**	**Date:**	
** Some facilities do not accept emergency calls so as a result all facilities with an older confirmation than 3 years must be confirmed before work starts. When facilities are confirmed, the date, address and phone number must be added to the database.*			
Directions for EMS crews to the Site:			
Directions from the Site to the Medical Facility:			

Job Hazard Assessment Form



Job Hazard Assessment

Date	
Project Name/Market	
Project No.	
Site No.	
Contractor Name	
Contractor Field Supervisor	

Identification of Jobsite Hazards

Physical Hazards	Health Hazards	Other Hazards
☐ Confined Space	☐ Heat Stress	☐ Equipment/Material Security
☐ Electrical	☐ Cold Stress	☐ Employee Security
☐ Elevation/Site Terrain	☐ Chemical Exposure	
☐ Falls from Elevations	☐ EME/RF Exposure	
☐ Slips, Trips, Falls	☐ Noise Exposure <85 dBA	
☐ Heavy Equipment Usage	☐ Silica Exposure	
☐ Vehicular Traffic	☐ Asbestos Exposure	
☐ Flammable Material	☐ Lead Exposure	
☐ Open Excavations	☐ Welding Fume Exposure	
	☐ Environmental	

Required PPE for Job Task

☐ Hard Hat	☐ Fall Protection	☐ RF Suit
☐ Safety Glasses	☐ Gloves (type)	☐ Other (specify):
☐ Ear Plugs	☐ RF Monitor	

Hazard Analysis (Hazards and PPE identified above should be addressed below)

Sequence of Job/Task	Potential Hazards	Hazard Mitigation Measures

Employee Acknowledgement of JSA (All personnel entering jobsite must read and sign, add additional to reverse side of this form)

Printed Name:	Signature:

Supervisor Acknowledgement of JSA and Site Personnel

Supervisor Name:	Supervisor Signature:

Job Hazard Assessment Tasks

Scope: Break the Job Down Into Tasks

- Describe each task in detail.
- Break down the task into a sequence of steps.
- Describe what work is being done and what materials and tools are being used.

Job Hazard Assessment

Sequence of Job/Task: Break the Job Down Into Steps

Sequence of Job/Task	Potential Hazards	Hazard Mitigation Measures

Job Hazard Assessment

Identify Potential Hazards and Causes of Injuries and Incidents

- When describing predictable hazards; document those produced by the environment, design of the rooftop, and those connected with the task.
- Document predictable causes of incidents or injuries.

Job Hazard Assessment

Identify Potential Hazards and Causes of Injuries and Incidents

Sequence of Job/Task	Potential Hazards	Hazard Mitigation Measures

Job Hazard Assessment

Develop Mitigation Measures

- Develop recommended safe job procedures to prevent the occurrence of injuries/incidents.
- Prescribe appropriate engineering, administrative, and work practice controls, and any appropriate PPE to mitigate hazards.

Hazard Mitigation Measures

Develop Mitigation Measures

Sequence of Job/Task	Potential Hazards	Hazard Mitigation Measures

Job Hazard Assessment Example

Sequence of Job/Task	Potential Hazards	Hazard Mitigation Measures
Removing coax from existing cable tray	Fall hazard	1. Maintain good housekeeping 2. Install temporary guardrails along the unprotected edge on Alpha sector 3. Install warning line 15’ from unprotected edge on Beta and Gamma sectors

Job Hazard Assessment

- A JHA is used to communicate the job tasks, hazards of the work tasks and control measures to:
  - Crewmembers
  - Subcontractors
  - Customers
  - Inspectors
- The JHA must be reviewed by affected employees:
  - Before commencement of work each day.
  - When subcontractor arrives.
  - When inspector arrives.
  - When customer representative arrives.
  - When conditions change.
  - When work conditions deviate from the original scope.
  - When an unidentified hazard surfaces.

Section 6

Review Questions

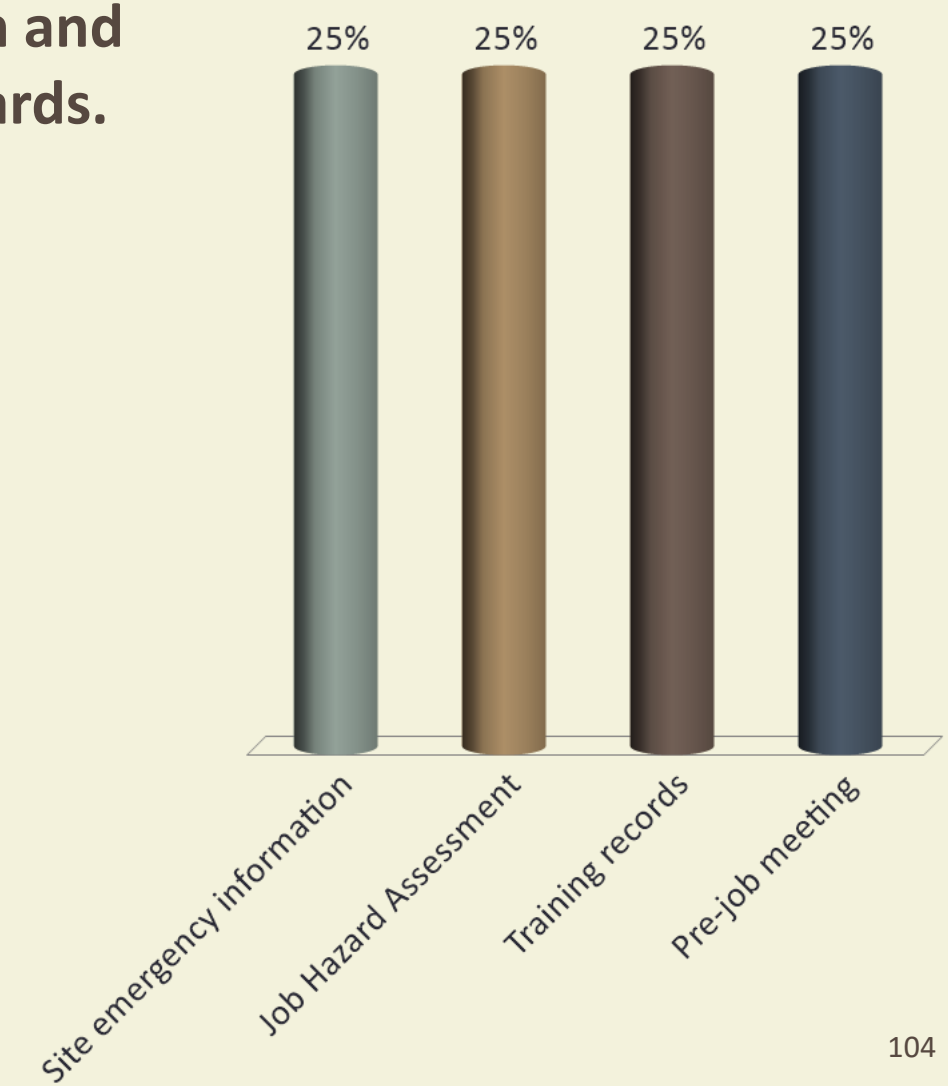
The _____ is part of your rooftop work pre-task planning which must be conducted to detail work scope, identify potential hazards, and develop mitigation and control measures for those hazards.

A. Site emergency information

B. Job Hazard Assessment

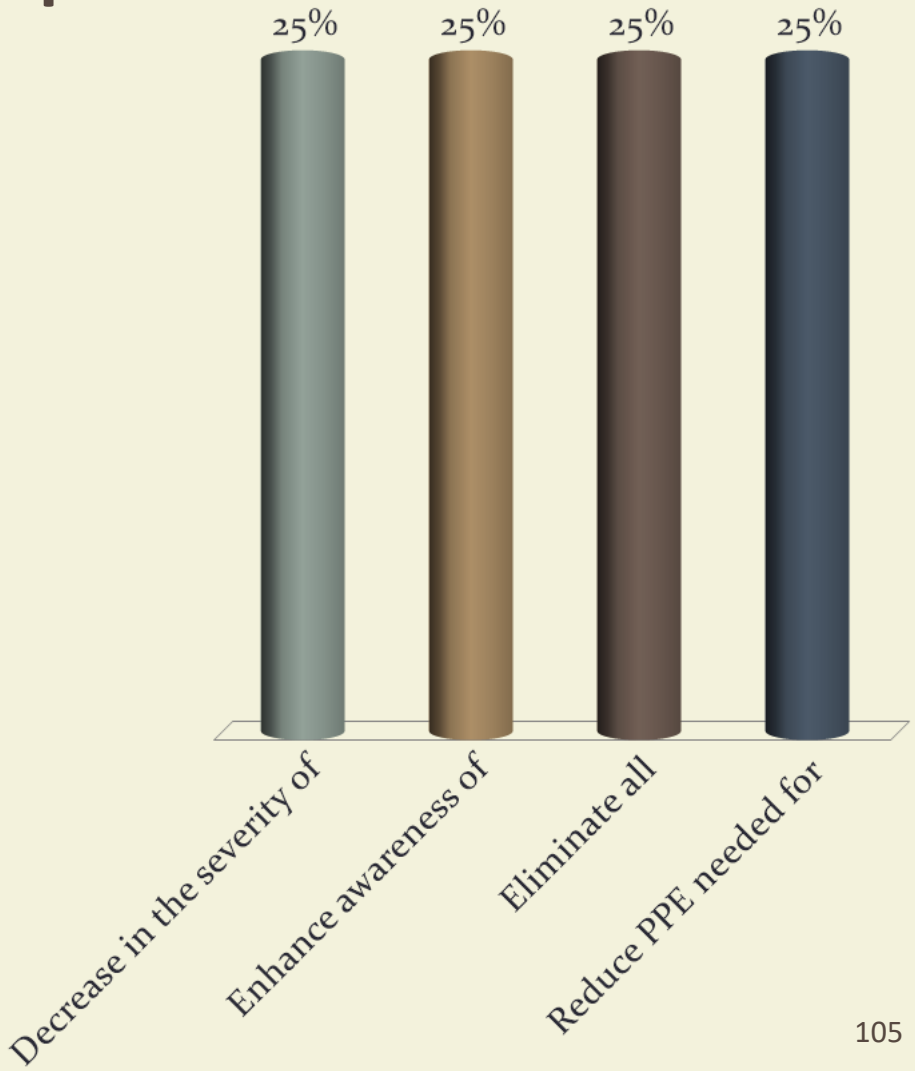
C. Training records

D. Pre-job meeting



Pre-task planning prior to work on a rooftop is designed to _____ rooftop hazards.

A. Decrease in the severity of
B. Enhance awareness of
C. Eliminate all
D. Reduce PPE needed for



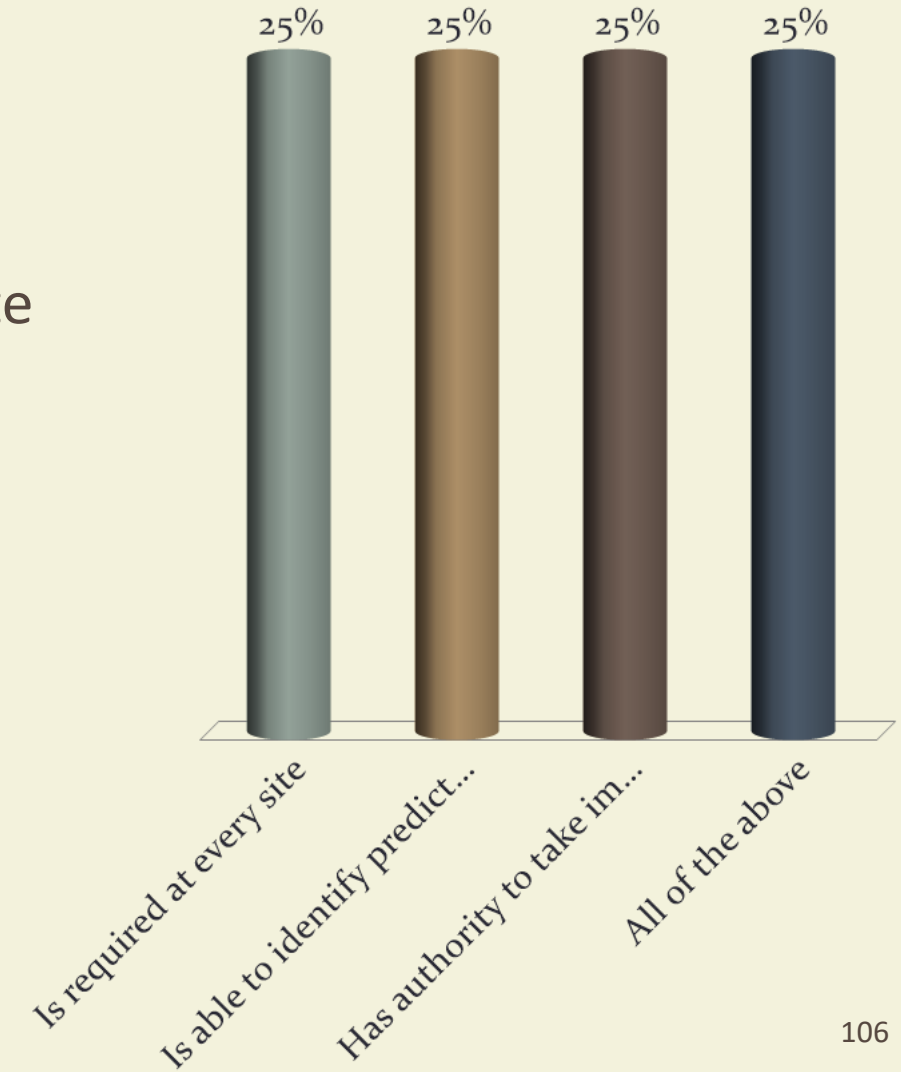
A competent person:

A. Is required at every site

B. Is able to identify predictable hazards

C. Has authority to take immediate action

D. All of the above



Section 7

Radio Frequency (RF) Hazards and Mitigation

Five Basic Components of Wireless Site Compliance

- Access Management
- “RF” Awareness Training
- Hazard Identification
- Site Policies for Worker Safety
- RF Mitigation Measures

Physical Hazard

Because **RF (Radio Frequency)** energy is recognized as a ***Physical hazard***, you must consider both the worker's and the public's exposure when planning operations at communications sites, or for that matter, any location where RF energy may be present.

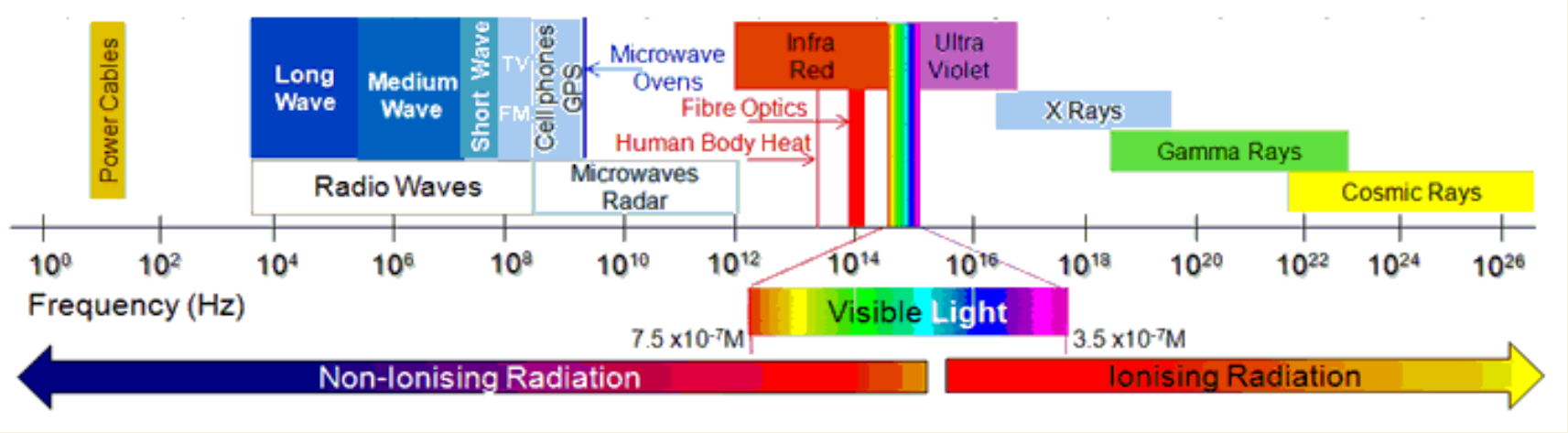
(Some states list it in their Hazcom standards)

OSHA 1910.1020 (c)(13)

“Toxic substance or harmful physical agent” means any chemical substance, biological agent, or physical stress (noise, heat, cold, vibration, repetitive motion, ionizing, and non-ionizing radiation).

What is Non-Ionizing Radiation?

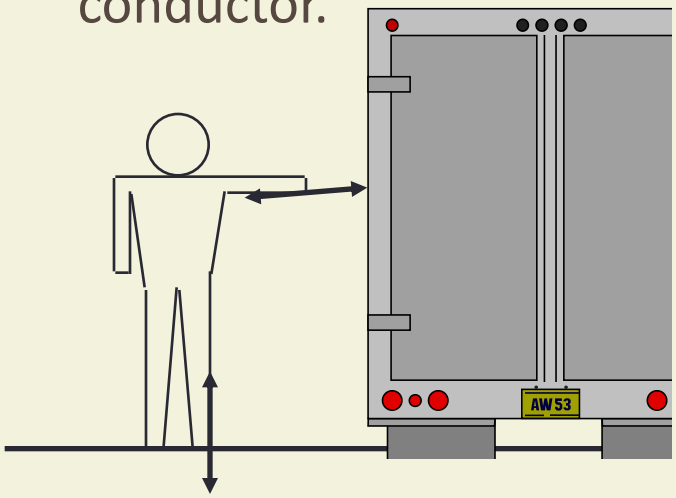
Non-ionizing radiation is described as a series of energy waves composed of oscillating electric and magnetic fields traveling at the speed of light.



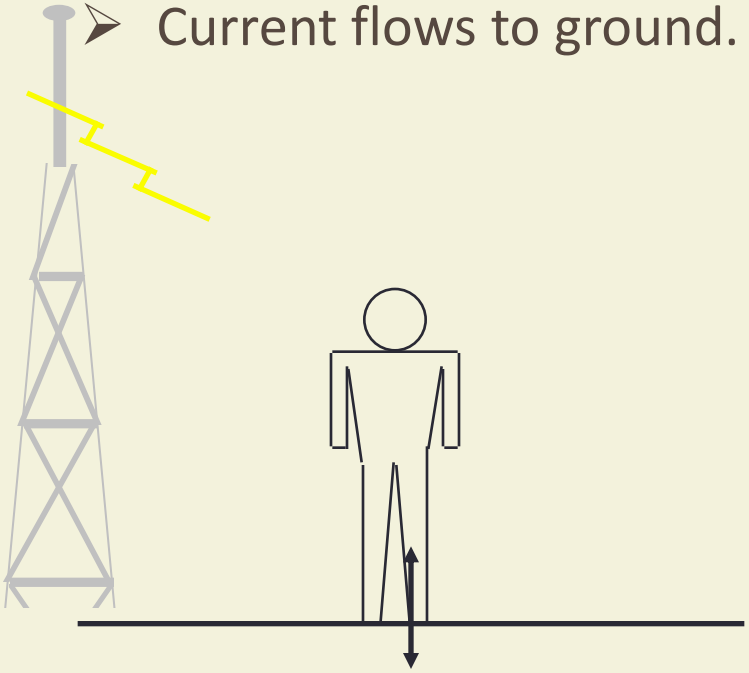
Induced and Contact Currents

Two Scenarios:

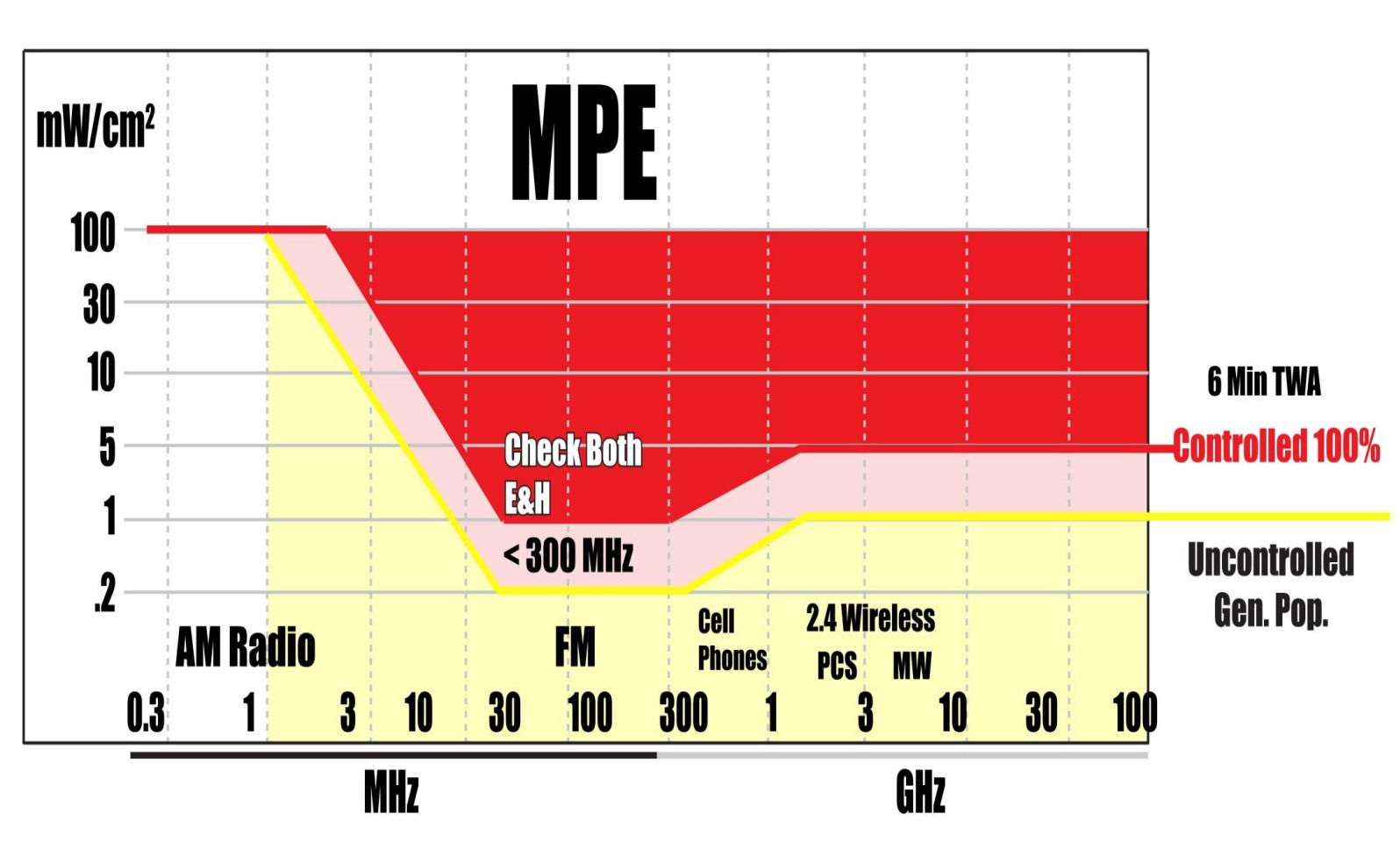
- RF induces voltage in ungrounded conductor.
- Person acts as current path to ground by touching charged conductor.



- RF induces voltage flow in person.
- Current flows to ground.



FCC Maximum Permissible Exposure (MPE) Rule



General Population/Uncontrolled Exposure Level - Not Trained

Applies to situations in which the public may be exposed or persons who are exposed as a part of their employment (workers).

They may have not been made fully aware of the potential for exposure or cannot exercise control over their exposure.

Controlled Exposure

Controlled Environments: locations where there is exposure that may be incurred by persons who are made **“fully aware”** of the potential for exposure **and can exercise control** over their exposure.

Antenna Identification

- Antenna identification is a critical part of assessing RF hazards.
- Different antennas radiate varying frequencies and power levels.
- High power broadcast antennas for FM radio and TV are often the most dangerous.
  - These antennas operate at frequencies that will heat body tissue and they operate at very high levels of power.

Radiation Risks

Non-Ionizing Radiation

RF energy that only causes vibrations or oscillations of the atoms which result in **heat** but do not strip electrons from atoms.

Ionizing Radiation

Which is much higher in **frequency** and with energy to cause electrons to be stripped from atoms "ionizing" the atom and changing its characteristics.

The person's tissue is no longer as it was.

Thermal Health Effects

The main effect of RF is **Heating.**

Other affected areas include:

- Skin
- Eyes
- Body Parts
- Whole Body

Symptoms that may occur:

- Blurred Vision
- Confused Behavior
- Dizziness or Vertigo
- Headaches
- Metallic Taste
- Nausea
- Sore Joints

Body Heating

- RF **over**exposure could heat jewelry and metal on clothing.
- It could affect medical implanted devices.

Electromagnetic Energy Exposure (EME)

EME exposure is **non-accumulative,** if exposure is kept below the body heating damage range and the 6 minute time limit.

This means EME exposure does not build up in the body the way ionizing radiation can.

Depending on frequency, the ability of RF energy to heat varies greatly. Even in the cases of severe exposure to high energy levels, if the individual **removes him or herself** from the RF environment, the human body which is an excellent "radiator" **will cool itself** through biological processes in a short period of time.

RF Hot Spots

When working at a site, attention should be given to the possibility that conductive objects may distort RF fields in their vicinity even though they are not actively energized by a transmitter and may produce RF hot spots exceeding the MPE's and may have possible high current.

Many sources of RF fields may exist in the form of **metallic structures** found near active RF sources that can **reflect and scatter fields** into areas not anticipated.

Induced Current

Has a strong potential to induce electrical current in nearby conductive or metal objects.

NOTE: The tower could also be a mile or more from your site.

Crane is close to an AM tower, when they lowered the hook and it got to a certain point the trolley took off, goes to the end of the boom and hits the e-stop. The operator does not know what was wrong but found the trolley contacts welded closed. They fix them and start up again, lower the hook, the trolley takes off and goes to the end of the boom.

When the cables get to a point they resonate with the AM station the crane has an induced current strong enough to weld the contacts together. The crane actually becomes a passive repeater.

Controlled Limits

Time Weighted Average

Are based on 6 minute time averages

"Controlled" Exposure is when someone is in an area with 100% MPE for 6 minutes

TWA or Excursions above the controlled limits are allowed if 6 minute average is within limits.
(i.e. 200% = 3 min; 600% = 1 min, 1200% = 30 sec)

Cardiac Pacemakers, Defibrillators, and Drug Delivery Systems

Wireless Implantable Medical Devices

These can exhibit **improper** operation when subjected to RF fields. Devices and systems that are used external to the body can be substantially more susceptible to interference.

For personnel who use electronic medical devices or systems and may need access to areas near RF sources, a request for an evaluation of the potential interference can be referred to the manufacturer for the manufacturer's own evaluation and guidance on electromagnetic compatibility (EMC).

This may require contact with the device manufacturer and/or appropriate regulatory authorities and an evaluation of the RF fields where the subject employee may need access.

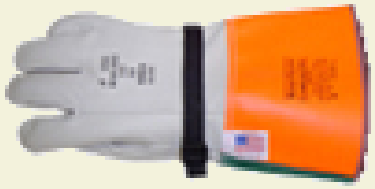
It is important to note that device interference may occur at RF field strengths that are substantially less than human exposure limits.

Radio Frequency Safety Plan (RFSP) Controls

- Engineering
  - Shielding, site configuration, barriers
- Administrative
  - Signs, floor markings, work practices, lockout/tagout, time averaging, personal monitors
- PPE
  - Gloves, protective clothing
- Training
  - General awareness, limits, controls, medical devices, over-exposures, electro-explosives, ancillary hazards

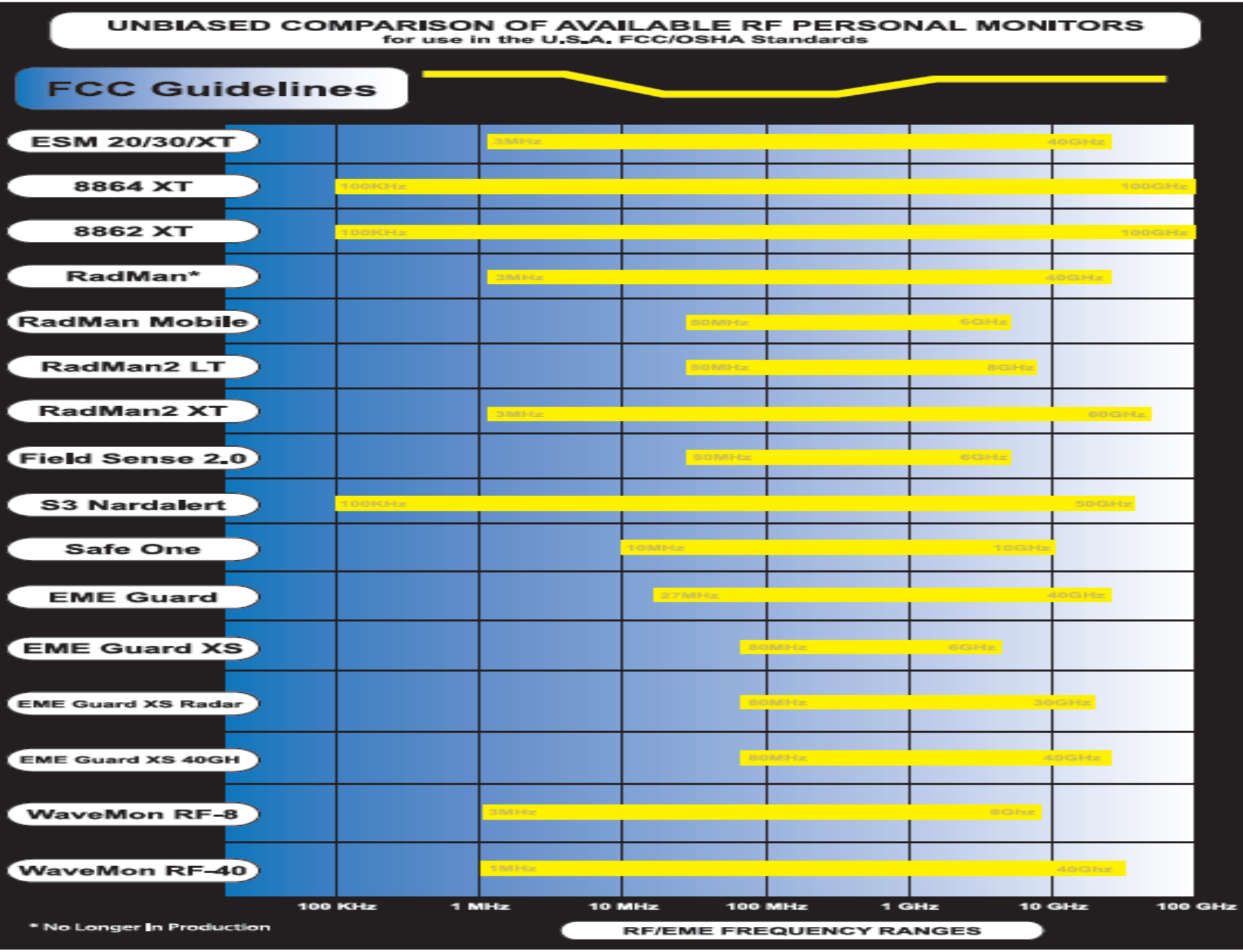
PPE for RF Safety

- RF Suits
- Electrically rated hard hats
- High Voltage Gear
  - Arc-Flash
  - HV gloves
  - Hot Sticks/Grounding
  - Flame retardant clothing
  - Eye protection



Personal Protection Monitors (PPM)

- Provide Personal Monitoring for areas where RF may be present. (PPM's)
- **Many** are narrow in bandwidth (with limited frequency response) and not fully isotropic (may not be accurate in near field).


UNBIASED COMPARISON OF AVAILABLE RF PERSONAL MONITORS
for use in the U.S.A. FCC/OSHA Standards
FCC Guidelines
ESM 20/30/XT
3MHz
40GHz
8864 XT
100KHz
100GHz
8862 XT
100KHz
100GHz
RadMan*
3MHz
40GHz
RadMan Mobile
50MHz
6GHz
RadMan2 LT
50MHz
8GHz
RadMan2 XT
3MHz
60GHz
Field Sense 2.0
50MHz
6GHz
S3 Nardalert
100KHz
50GHz
Safe One
10MHz
10GHz
EME Guard
27MHz
40GHz
EME Guard XS
80MHz
6GHz
EME Guard XS Radar
80MHz
30GHz
EME Guard XS 40GH
80MHz
40GHz
WaveMon RF-8
3MHz
8Ghz
WaveMon RF-40
1MHz
40Ghz
100 KHz
1 MHz
10 MHz
100 MHz
1 GHz
10 GHz
100 GHz
* No Longer In Production
RF/EME FREQUENCY RANGES

Personal Protection Monitors

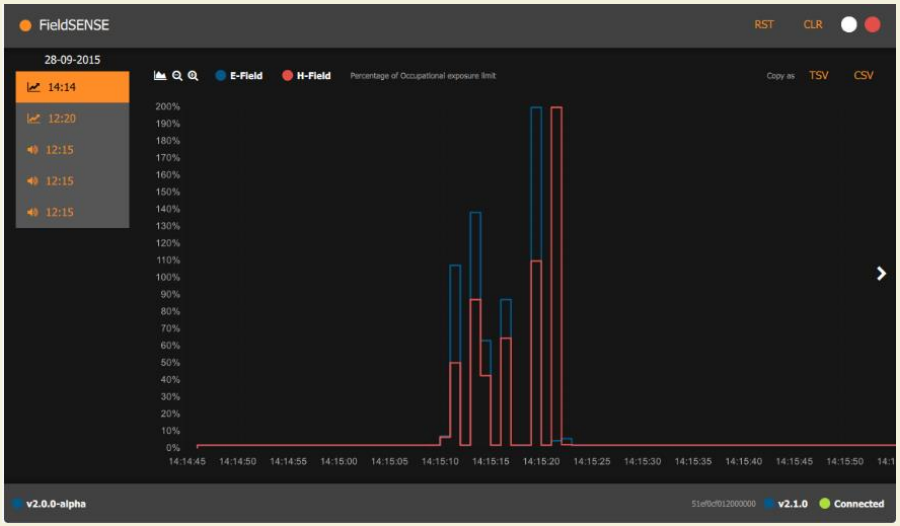
- Personal monitors can be useful tools.
- Care must be used in selecting a monitor that is **appropriate for the range of potential frequencies** of the exposure fields and which responds appropriately to the RF field.
- In addition, training on appropriate use of personal monitors and their limitations (such as **frequency response and detection angles**) is important if monitors are to be used effectively.

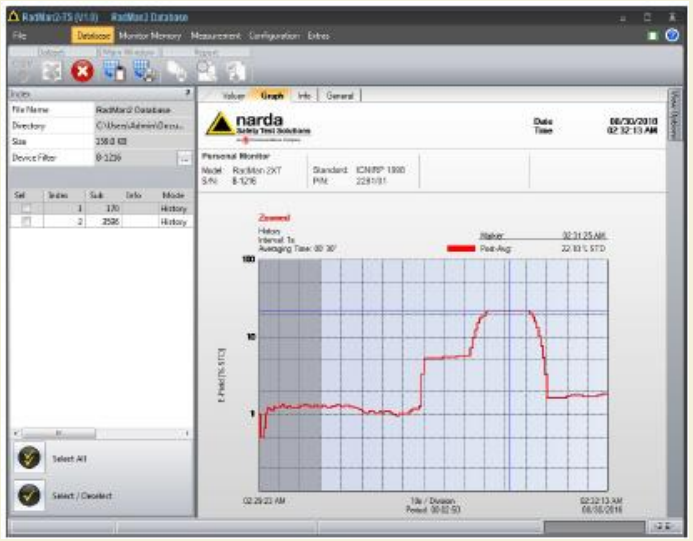
Calibration

Your group must make sure that the RF personal monitors have regular calibration as per the manufacturer requirements.

Documentation/Record Keeping

Personal Protection Monitor (PPM) exposure **data must be retained and put in the employees records** anytime an employee is in an area over the controlled standard.





All records should be filed and stored in a manner required by applicable national, federal, state, and/or local regulations and organization policies.

RF Site Signage

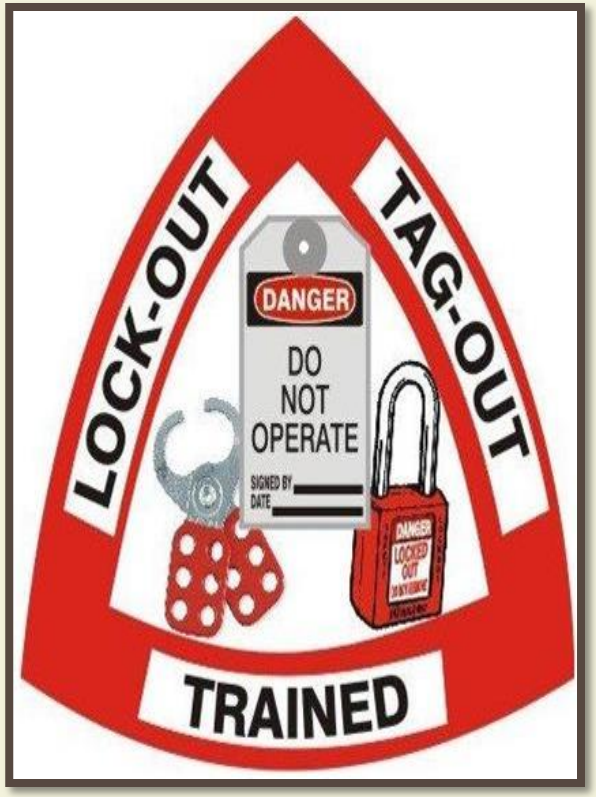
- Shall use the ANSI symbols and colors.

- Shall be used as an integral part of an overall site compliance plan.
- Be aware of signage as this indicates RF is on the site.

Which Sign is Correct?

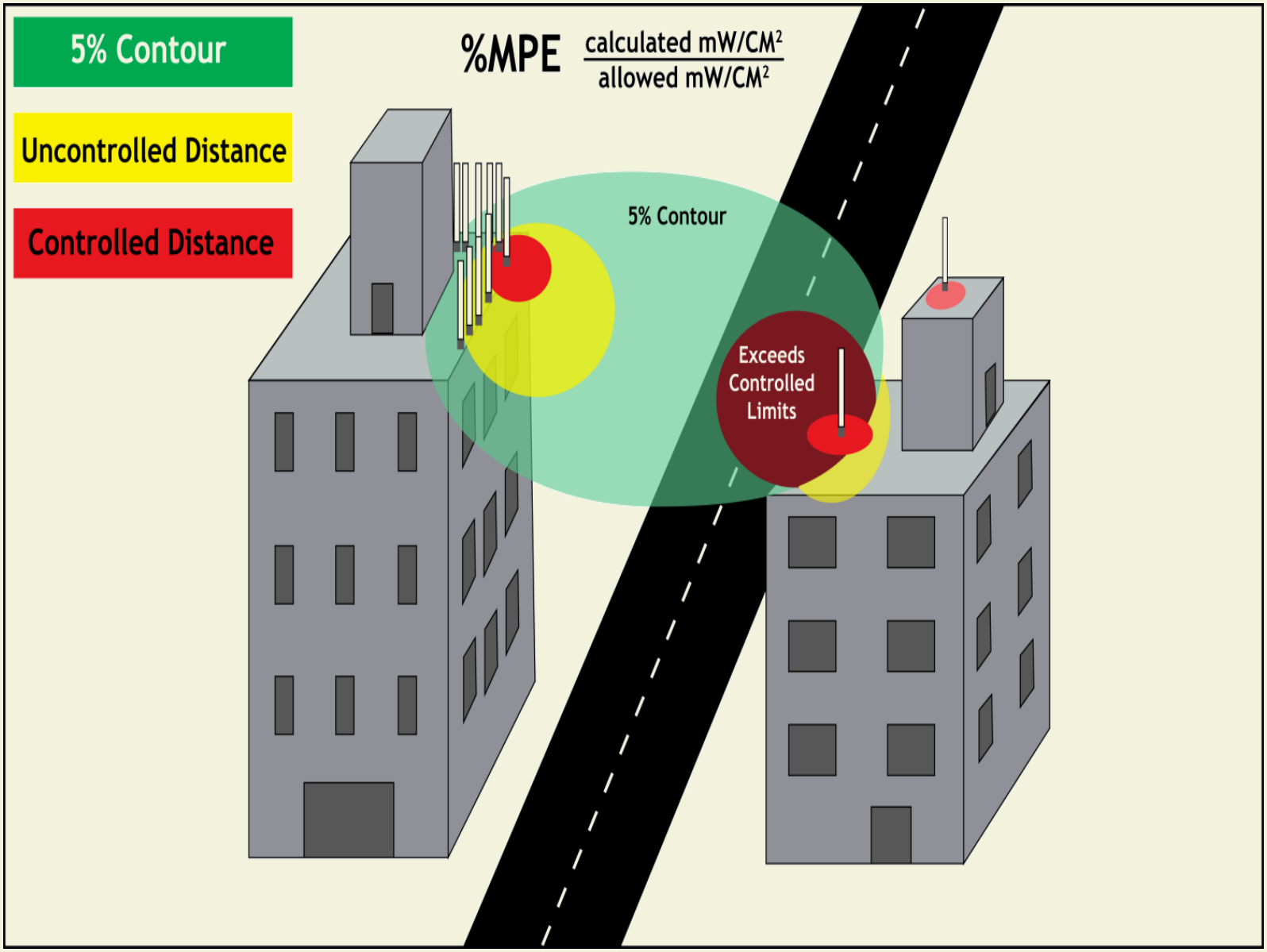
Power Down

- Calibrated personal RF monitors can be valuable tools for ascertaining relevant transmitter status.
- Control of power will also require the use of Lock Out, Tag Out (LOTO) procedures.



Power Down Administrative Controls

Are a crucial aspect of such power reduction schemes; however, **ensuring that the power reduction has, in fact, taken place** prior to personnel entering critical areas and that the **power reduction is maintained** until personnel have left the area.



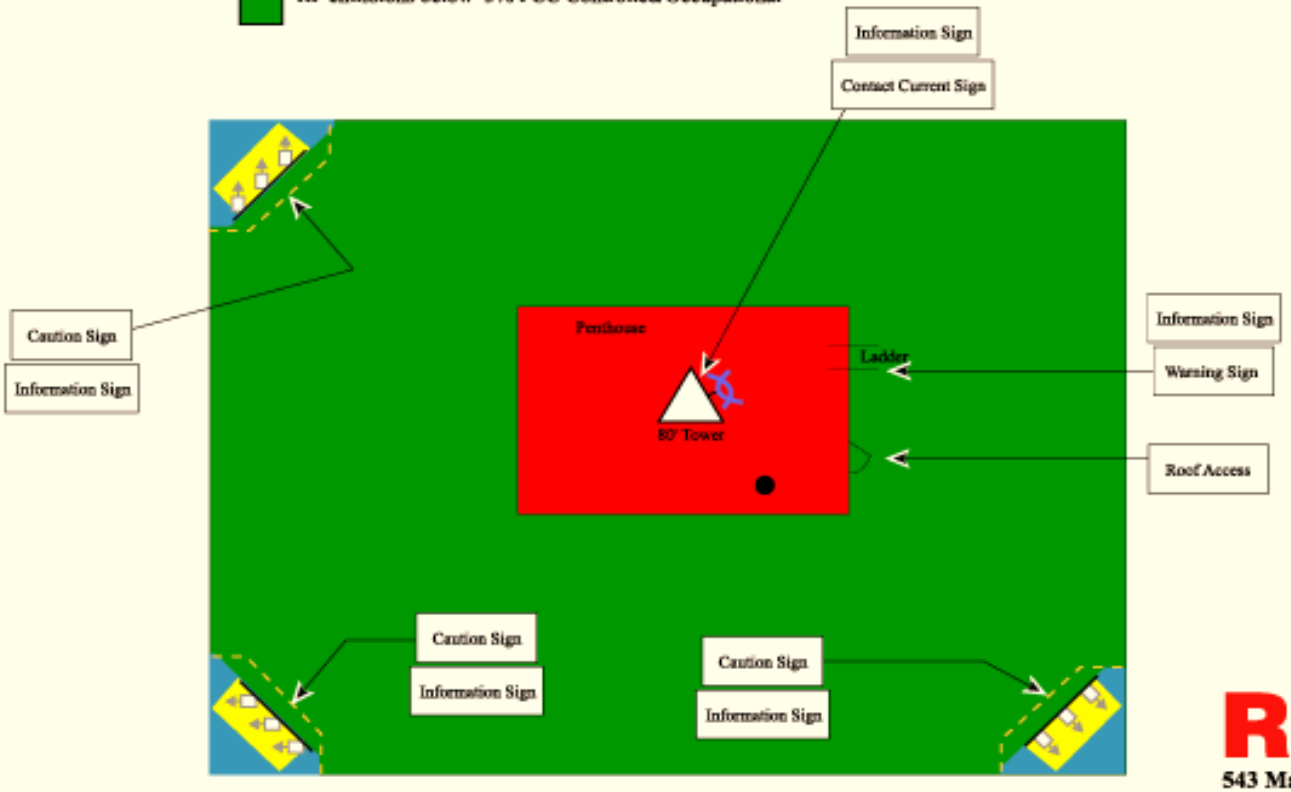
Color coded areas below define required actions for personnel entering this area. Please follow the instructions by the color coded key for your responsibilities regarding how to act in each area.

No access without approved permission and precautions per the written safety program.
RF emissions exceed the controlled exposure limits. (Peak readings exceed FCC Controlled/General Population Limit)

No access without approved permission and precautions per the written safety program.
RF emissions at or near the controlled exposure limits. (Peak readings exceed FCC Uncontrolled/General Population Limit)

RF emissions 5-20% FCC Controlled/Occupational Limit

RF emissions below 5% FCC Controlled/Occupational



RSI Corp.
543 Main Street
Kiowa, KS 67070

RF Emissions Peak Readings on
12-30-08

Sample Rooftop Tower
123 Main Street
Anytown, USA

RSI
543 Main
Kiowa, Kansas 67070
(888) 830-5648 phone
(866) 825-4324 fax
www.rfcomply.com

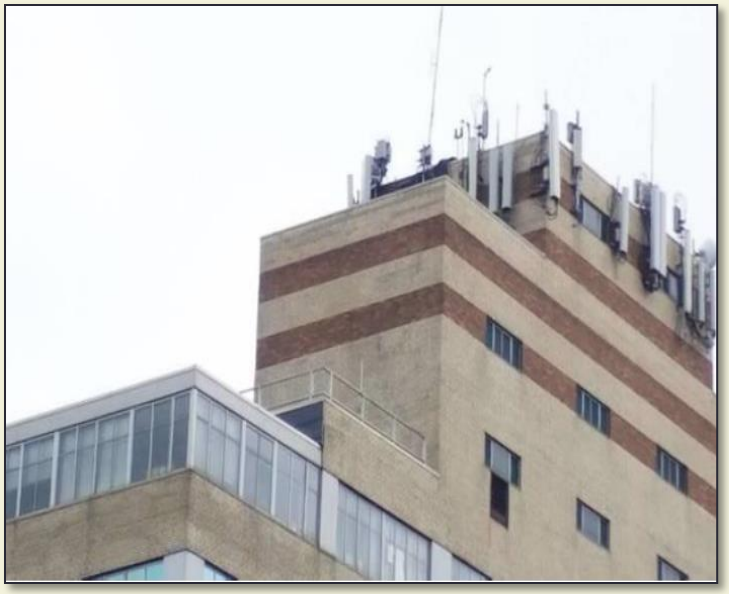
See Complete Report
for more Data

The Radiofrequency Safety Program (RFSP) Has Several Requirements:

1. An RF Safety Plan
2. Administration/enforcement of the RF Safety Program: RFSP training is the starting point for this requirement
3. RF Training for anyone that could be exposed to RF
4. RF personal protection monitors
5. RF Hazard Assessments: if you are a licensee or site owner
6. RF Signage

RF Mitigation Measures

- Elevate antennas
- Reduce power
- Relocate antennas
- Increase distance between antennas
- Install semi-permanent or permanent barriers



Section 7

Review Questions

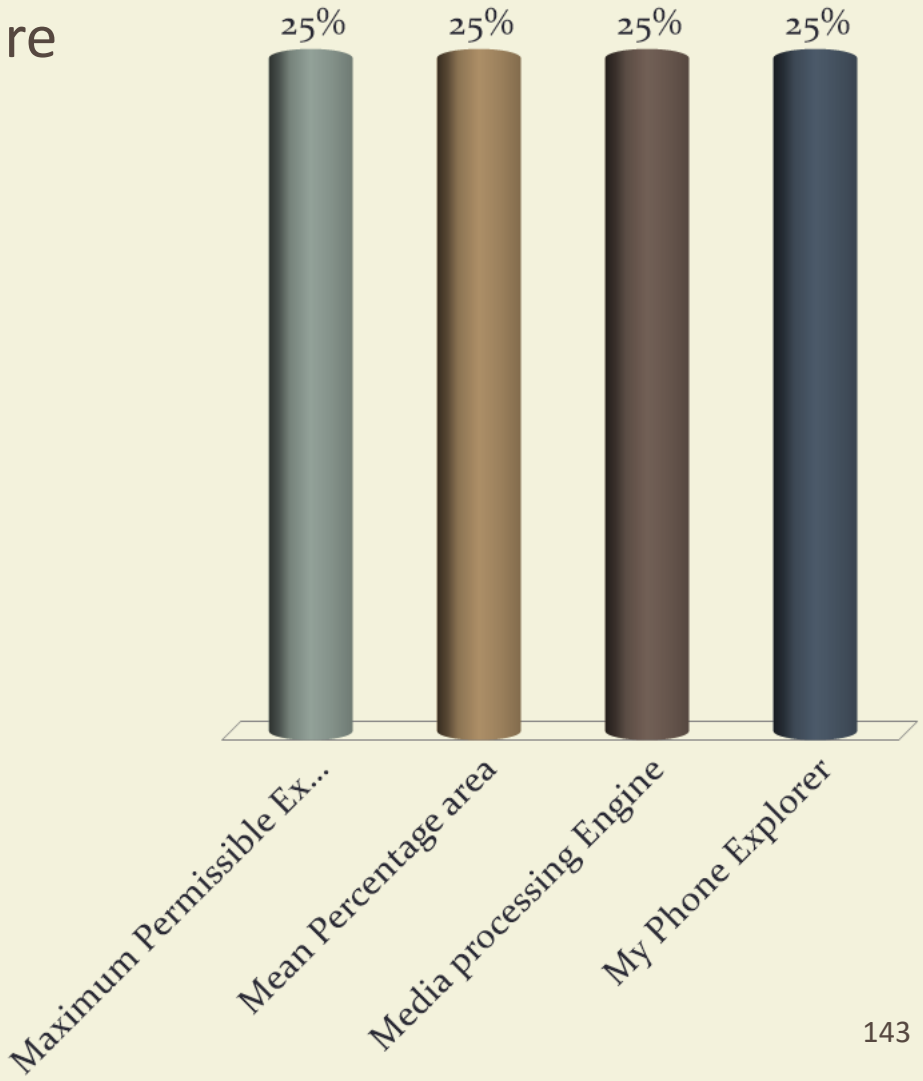
What does MPE stand for?

A. Maximum Permissible Exposure

B. Mean Percentage area

C. Media processing Engine

D. My Phone Explorer



What is the main effect of RF overexposure?

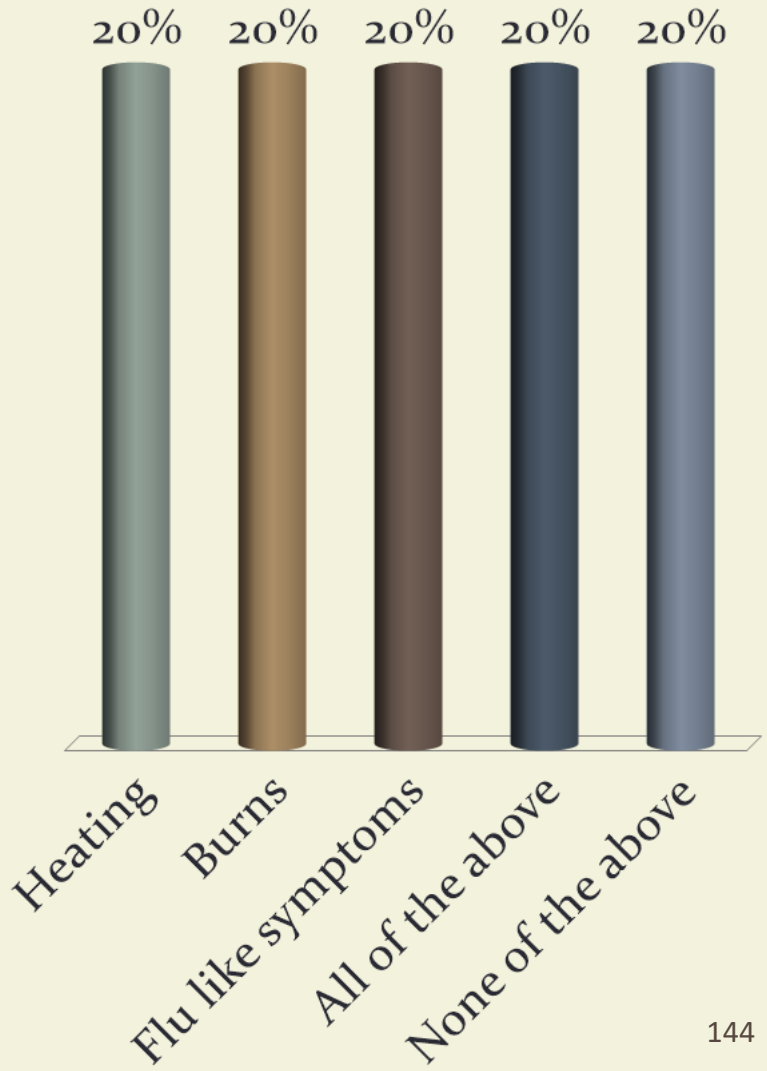
A. Heating

B. Burns

C. Flu like symptoms

D. All of the above

E. None of the above

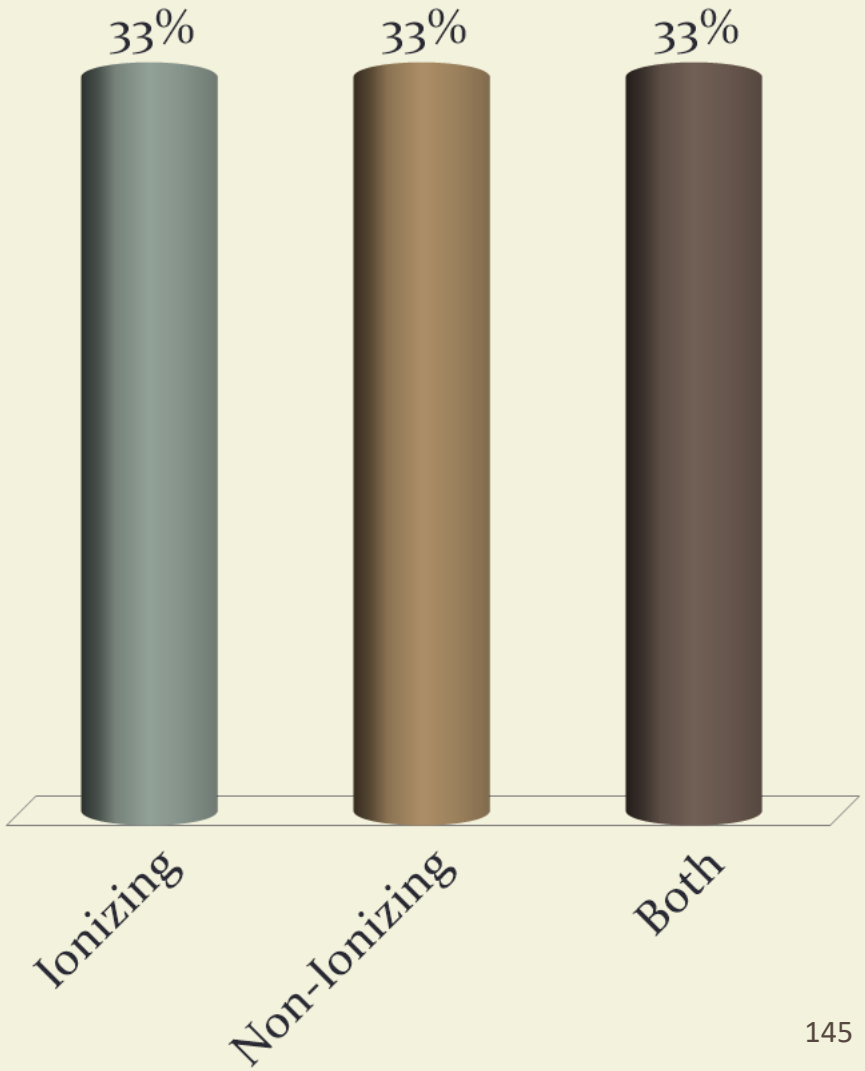


What is RF Radiation?

A. Ionizing

B. Non-Ionizing

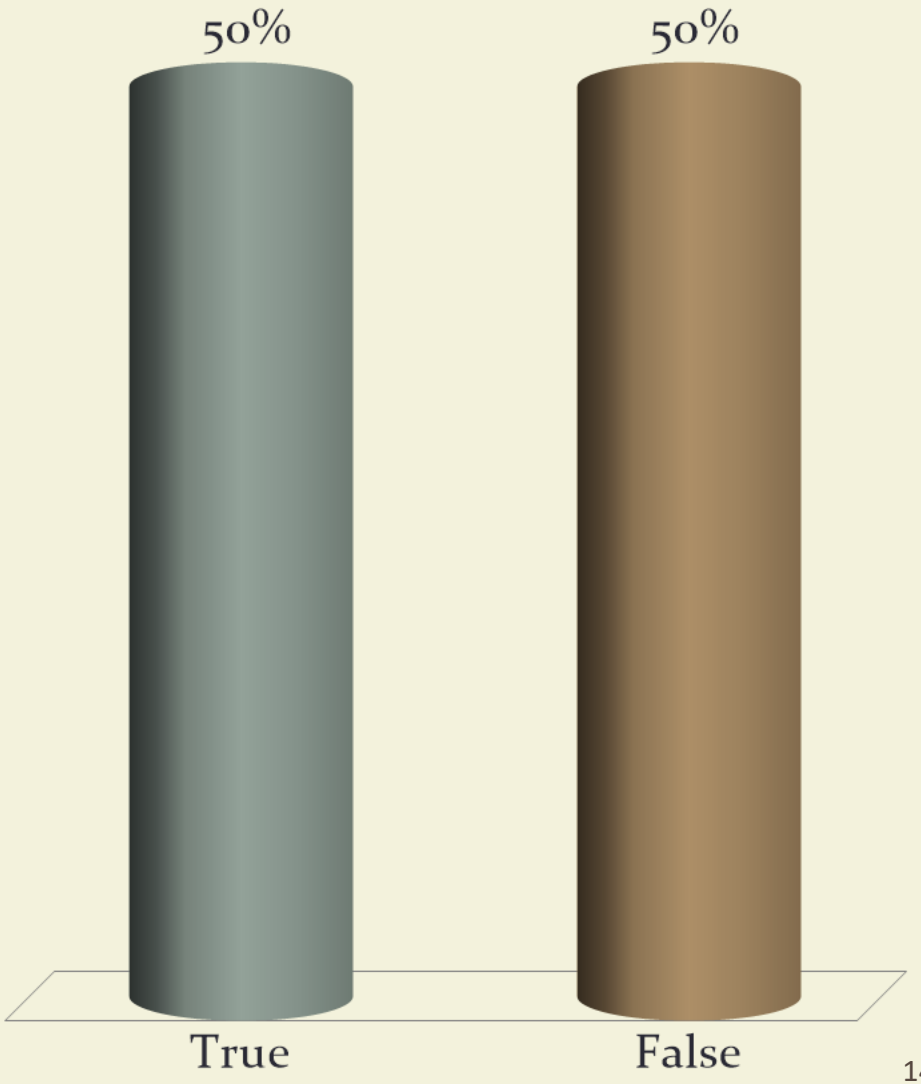
C. Both



Is RF a physical hazard?

A. True

B. False



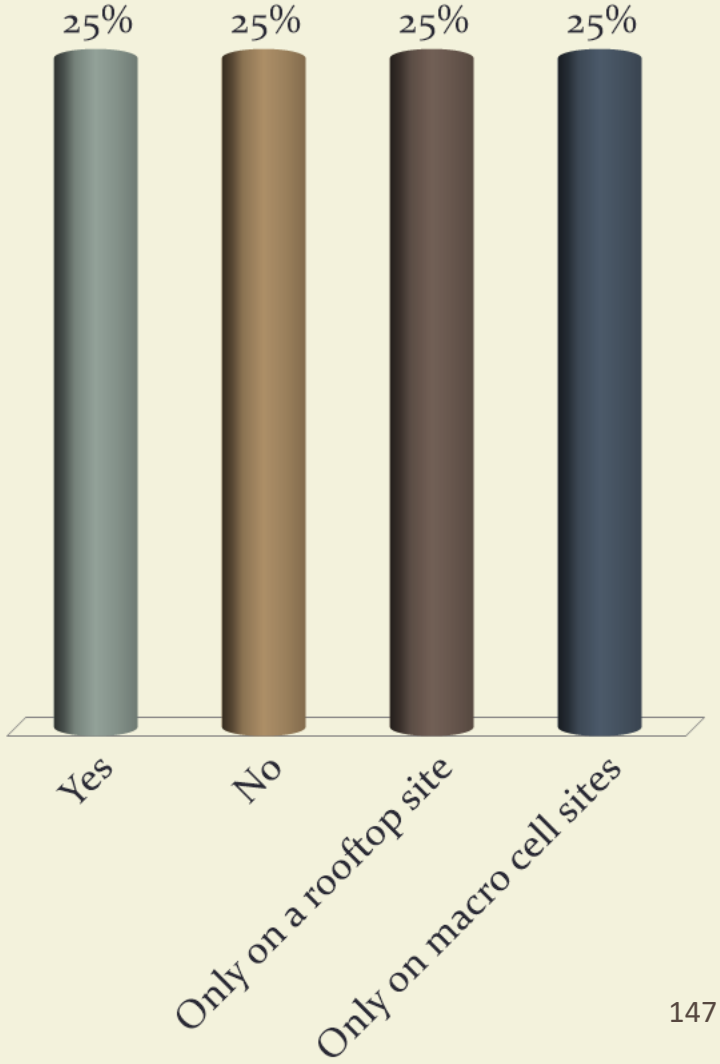
Does an alarm by the RF personal monitor always have priority over posted signage?

A. Yes

B. No

C. Only on a rooftop site

D. Only on macro cell sites

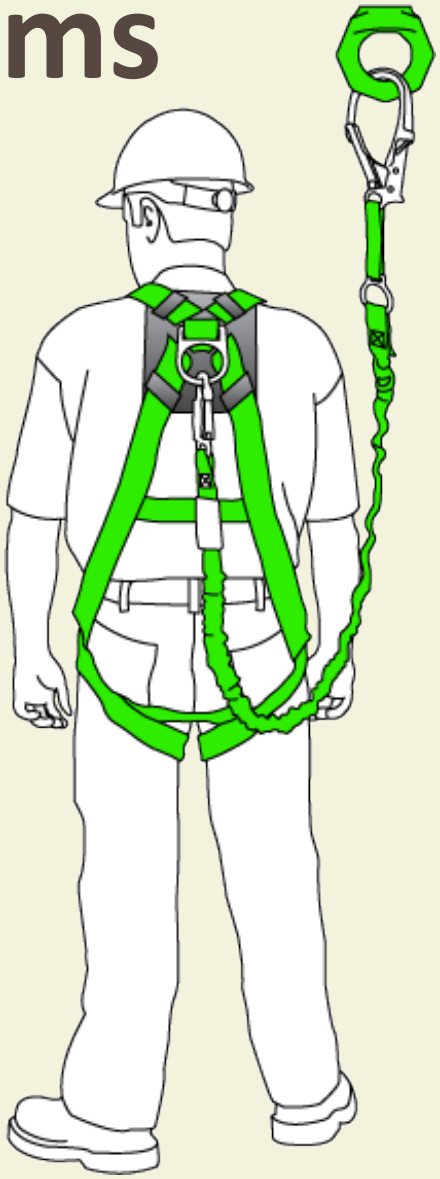


Section 8

Fall Protection

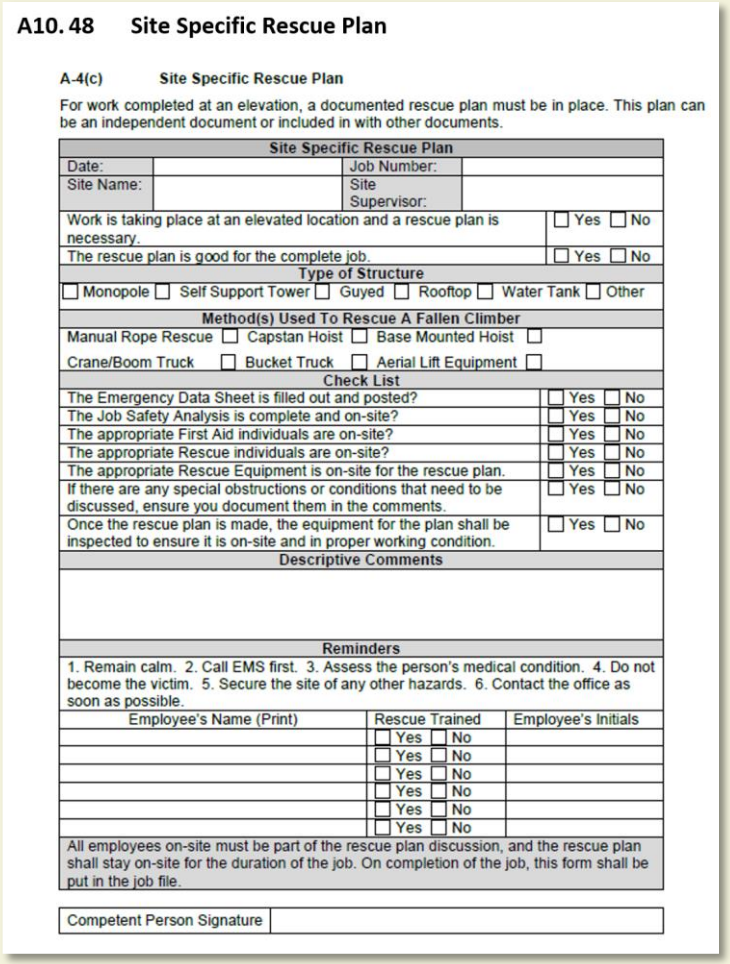
Fall Protection Systems

- Should be based on the work environment, resources, the task at hand, as well as identified and potential hazards.
- Shall be compliant with applicable regulations, standards, and original equipment manufacturer's recommendations.
- Individuals installing, utilizing, and maintaining fall protection systems must be adequately trained.



Site Specific

- A site-specific fall protection and rescue plan shall be written by a qualified person, documented, and adhered to.
- If any changes are made while on site, those changes must be documented on the appropriate plan.



A10. 48 Site Specific Rescue Plan

A-4(c) Site Specific Rescue Plan

For work completed at an elevation, a documented rescue plan must be in place. This plan can be an independent document or included in with other documents.

Site Specific Rescue Plan			
Date:		Job Number:	
Site Name:		Site Supervisor:	
Work is taking place at an elevated location and a rescue plan is necessary.			☐ Yes ☐ No
The rescue plan is good for the complete job.			☐ Yes ☐ No

Type of Structure

☐ Monopole ☐ Self Support Tower ☐ Guyed ☐ Rooftop ☐ Water Tank ☐ Other

Method(s) Used To Rescue A Fallen Climber

Manual Rope Rescue ☐ Capstan Hoist ☐ Base Mounted Hoist ☐
Crane/Boom Truck ☐ Bucket Truck ☐ Aerial Lift Equipment ☐

Check List	
The Emergency Data Sheet is filled out and posted?	☐ Yes ☐ No
The Job Safety Analysis is complete and on-site?	☐ Yes ☐ No
The appropriate First Aid individuals are on-site?	☐ Yes ☐ No
The appropriate Rescue individuals are on-site?	☐ Yes ☐ No
The appropriate Rescue Equipment is on-site for the rescue plan.	☐ Yes ☐ No
If there are any special obstructions or conditions that need to be discussed, ensure you document them in the comments.	☐ Yes ☐ No
Once the rescue plan is made, the equipment for the plan shall be inspected to ensure it is on-site and in proper working condition.	☐ Yes ☐ No

Descriptive Comments

Reminders

1. Remain calm. 2. Call EMS first. 3. Assess the person's medical condition. 4. Do not become the victim. 5. Secure the site of any other hazards. 6. Contact the office as soon as possible.

Employee's Name (Print)	Rescue Trained	Employee's Initials
	☐ Yes ☐ No	
	☐ Yes ☐ No	
	☐ Yes ☐ No	
	☐ Yes ☐ No	
	☐ Yes ☐ No	
	☐ Yes ☐ No	

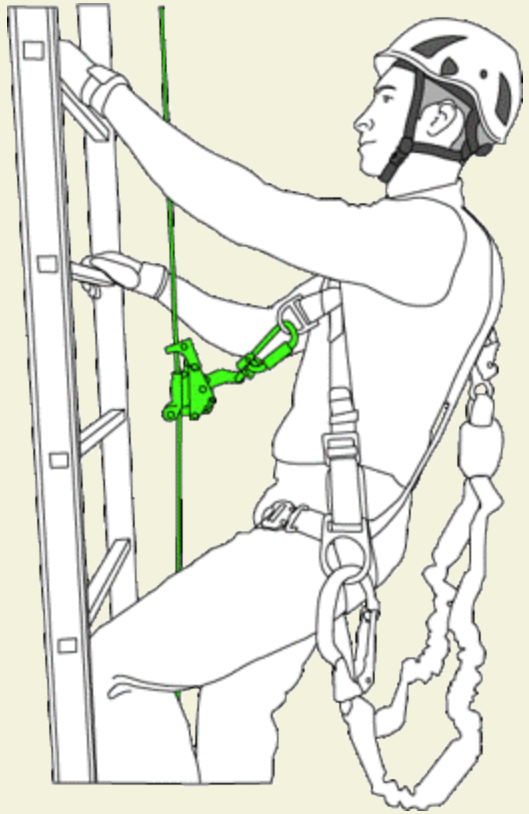
All employees on-site must be part of the rescue plan discussion, and the rescue plan shall stay on-site for the duration of the job. On completion of the job, this form shall be put in the job file.

Competent Person Signature	

Individual Identification

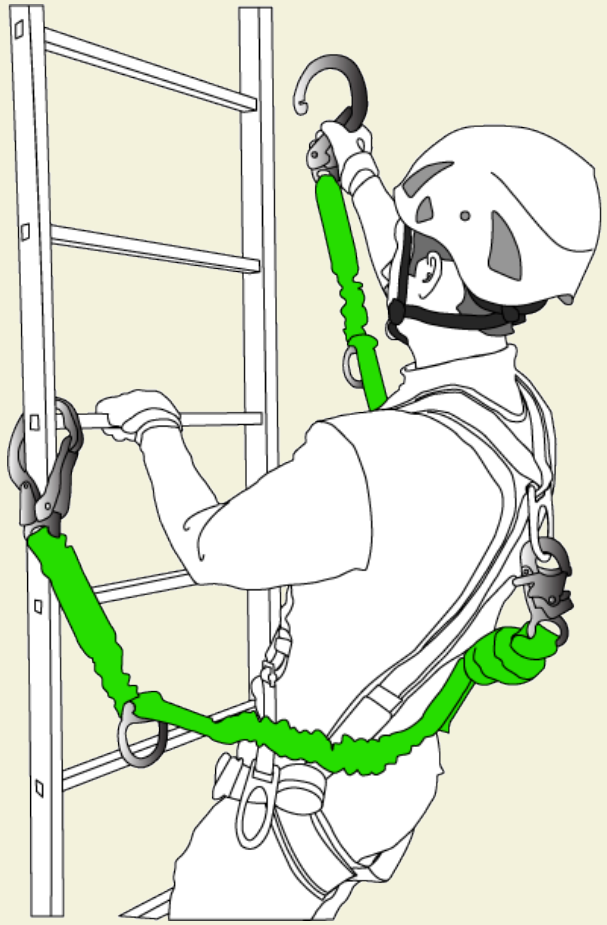
Individuals following a site-specific fall protection and rescue plan shall be identified as such:

- **Authorized Person:**
  - Demonstrates physical capabilities to perform tasks at height
  - Can identify hazards
  - Can inspect equipment
  - **Must** be supervised by a competent person
  - Should an individual be climbing a structure, authorized climber designation must be **required**.



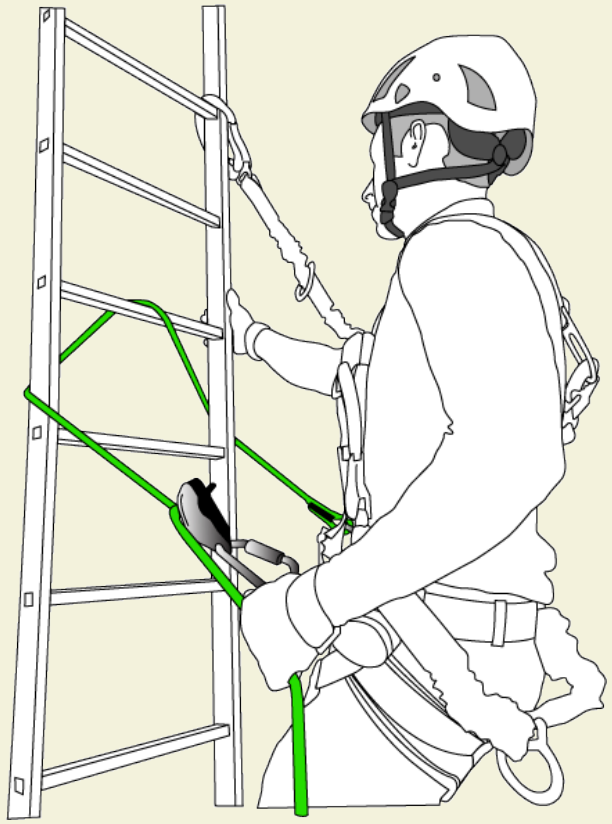
Individual Identification

- **Competent Person:**
  - Ensure fall protection plan and rescue plans are followed and reviewed with personnel on site.
  - Equipment is compliant and fit for purpose and inspected prior to each use.
  - Ensure supervision responsibilities are fulfilled.
  - Should an individual be climbing a structure, competent climber designation must be **required**.

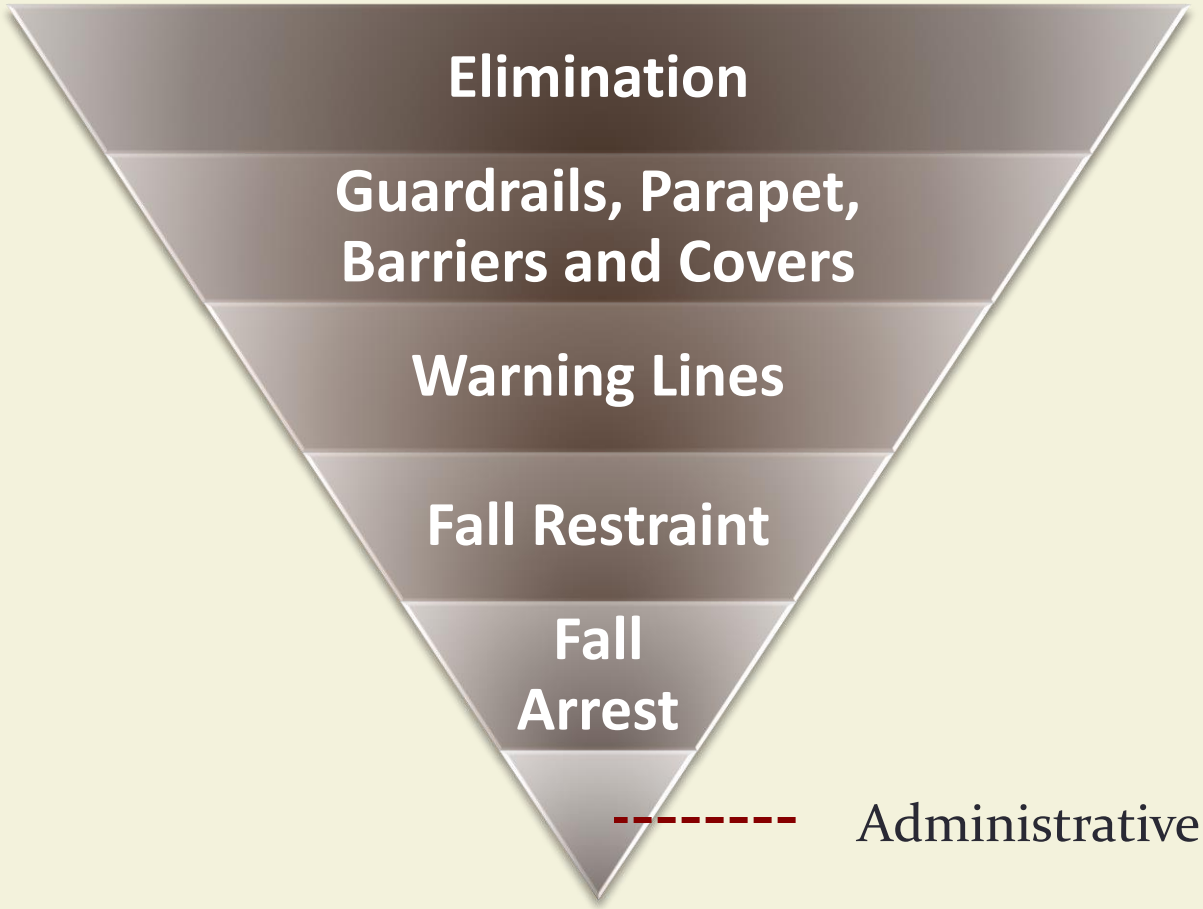


Individual Identification

- **Qualified Person:**
  - An individual who possesses a recognized degree, certificate, or through outstanding professional experience, can demonstrate the ability to solve or resolve problems relating to the subject matter, the work, or the project.

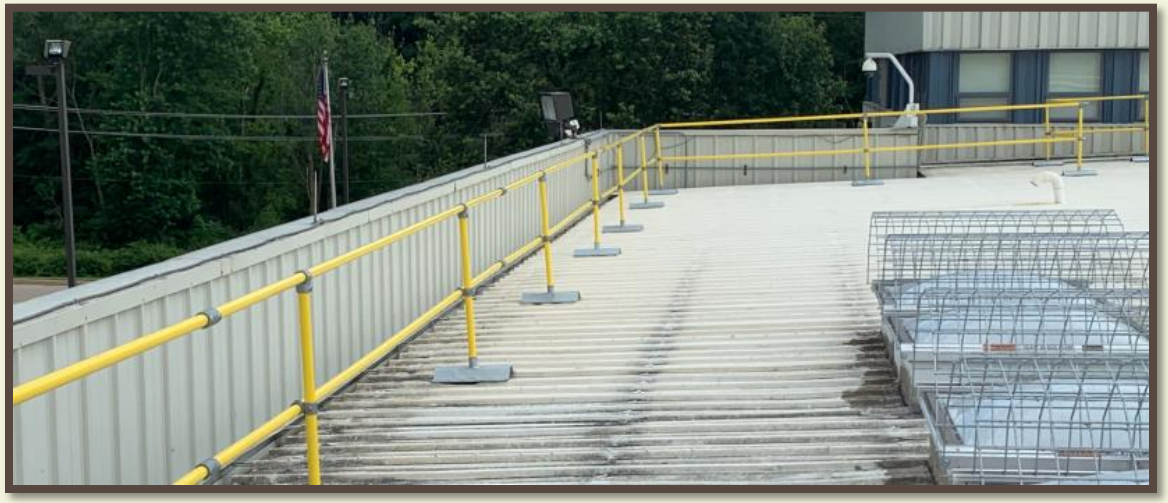


Hierarchy of Fall Protection



Elimination

- **Safest form of fall protection**
  - Passive – does not require action / application
  - Completely removes the fall hazard
  - Most effective hazard control
  - Not always possible



Guardrails and Parapet

- **Guardrails**
  - Top rails: 42 inches plus or minus 3 inches.
  - Mid-rails: Height midway.
  - Guardrail systems must be capable of withstanding a force of at least 200 pounds.
  - When guardrail systems are used at hoisting areas, a chain, gate, or removable guardrail section must be placed across the access opening between guardrail sections during those times when hoisting operations are not taking place.
- **Parapet**
  - Minimum height requirement: 39 inches.

Barriers and Covers

- **Barriers and Covers**
  - Covers shall be strong enough to hold twice the intended force that will be applied.
  - Secured when installed.
  - Color coded or marked “hole” or “cover.”
  - Reference 1926.501(i).

Warning Lines

- Erected not less than 6’ from the roof edge for work that is temporary and infrequent, or not less than 15’ for other work – low slope roof only (less than 4:12)
- Warning lines shall consist of ropes, wires, or chains, and supporting stanchions erected as follows:
  - Shall be flagged at not more than 6 foot intervals with high-visibility material.
  - Shall be rigged and supported in such a way that its lowest point (including sag) is no less than 34 inches from the walking/working surface and its highest point is no more than 39 inches from the walking/working surface.
  - After being erected, shall be capable of resisting, without tipping over, a force of at least 16 pounds applied horizontally against the stanchion, 30 inches above the walking/working surface, perpendicular to the warning line, and in the direction of the floor, roof, or platform edge.

Warning Lines (cont.)

- Shall have a minimum tensile strength of 500 pounds and after being attached to the stanchions, shall be capable of supporting, without breaking, the loads applied to the stanchions.
  - The line shall be attached at each stanchion in such a way that pulling on one section of the line between stanchions will not result in slack being taken up in adjacent sections before the stanchion tips over.
  - If there are any changes to the work environment (need to work outside a warning line) the hierarchy of fall protection controls should be assessed for the best solution.

Fall Protection - Administrative

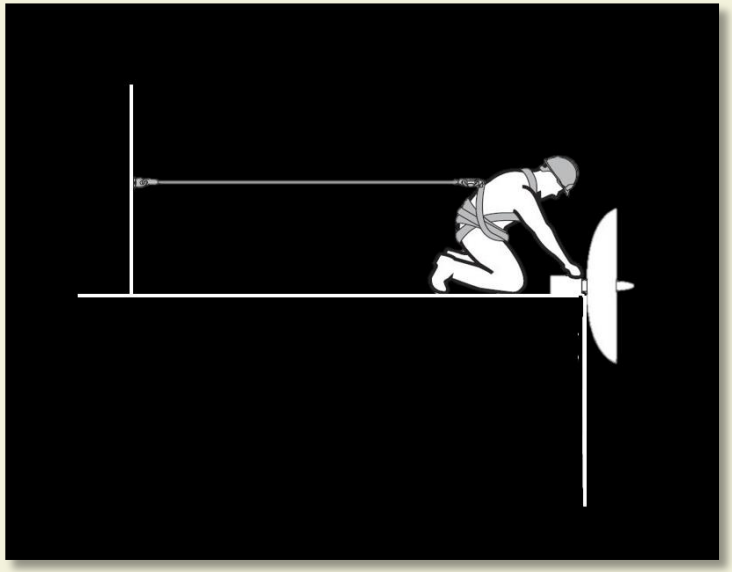
Passive System

Administrative fall protection

"Employer mandated safe work practices or procedures that are designed to prevent exposure to a fall by signaling or warning an authorized person to avoid approaching a fall hazard." – *ANSI Z359.0*

Fall Restraint

- Eliminates the possibility of falling to the lower level
  - Isolates worker from fall hazards if installed properly
  - Maximum fall distance - **ZERO**



Fall Restraint (cont.)

- Anchor requirements: must be secured to an anchorage capable of supporting at least twice the potential impact load of an employee's fall or 3,000 pounds, whichever is greater. ANSI Z359 requirement is 1,000 pounds or 4 times the maximum intended load.
  - Anchor Types
    - Engineered/Certified
    - Improvised

Fall Restraint Equipment

- Equipment required:
  - Synthetic rope
  - Carabiners
  - Anchorage straps if using improvised anchor
  - Positive stop device (rope grab)
  - Restraint belt or full body harness

Control Descent

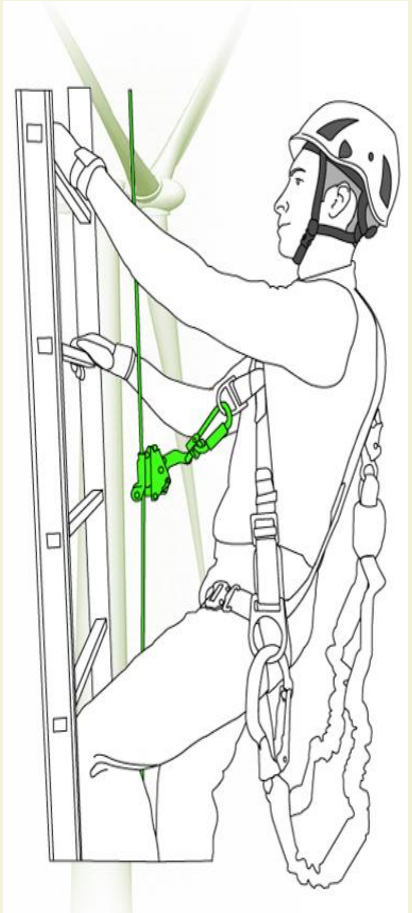
- Justification
- Proposed anchor points
- Rope types
- Rigging overview
- Descent hardware

Control Descent (cont.)

- Rope abrasion protection
- Secondary systems
- Edge negotiation
- Rescue plan
- Training

Limited Fall Arrest

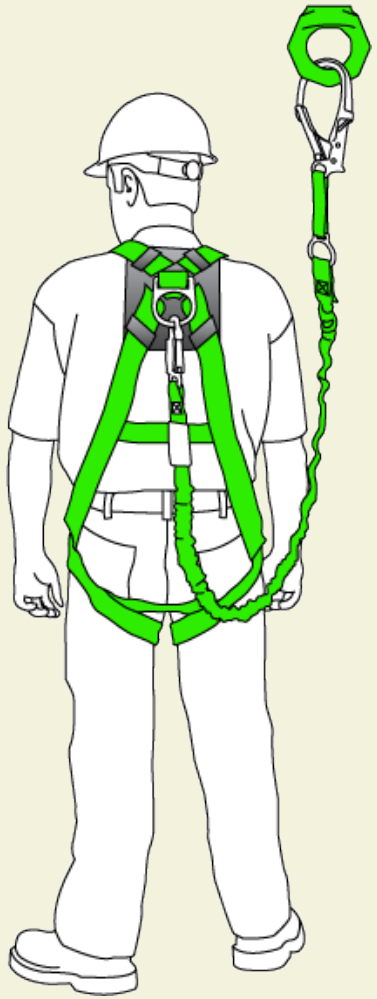
- **Limits maximum free fall distance – 2 feet**
  (primarily upper sternum attachment)
  - Active
  - Ladder safe-climb system
    - Cable
    - Rail



Fall Arrest

ABC's:

- Anchor
- Body Harness
- Connector
- Lifeline or
- PEA Lanyard

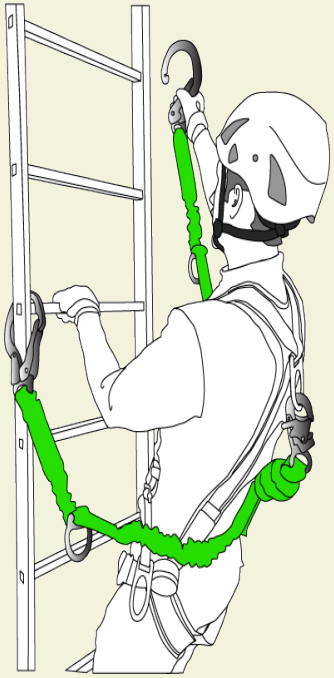


Capacity 130 to 310 lbs.

OSHA standards allow for capacities to exceed 310 lbs. as long as the manufacturer ensures that their products will provide the proper protection for the weight listed.

Fall Arrest (cont.)

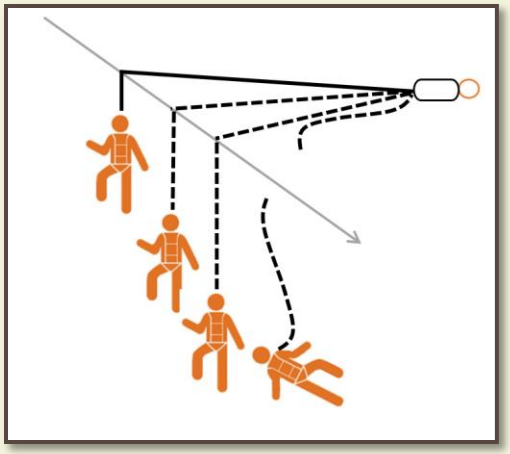
- **Most dangerous method of fall protection**
  - At risk of injury during a fall
    - Forces on the body - Maximum Arresting Force (MAF) allowed by OSHA = 1,800 lbs.
      - ANSI – 900 lbs.
    - Swing fall
  - At risk of injury after a fall
    - Possibility of suspension out of reach
    - Medical concerns



Fall Arrest: Self-Retracting Devices

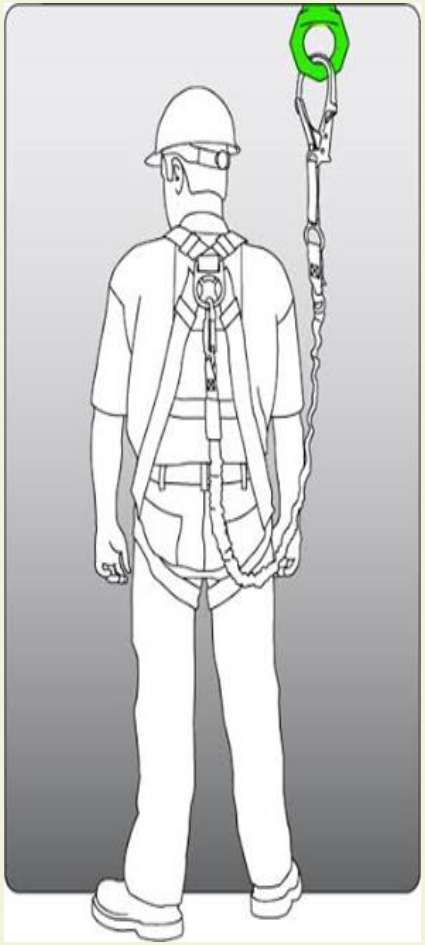
Maximum Arrest Distance
(comparable to deceleration distance)

- **Class A**
  - 24” Max. Arrest Distance.
  - Average Arresting Force 1,350 lbs.
  - Peak Arresting Force Not To Exceed 1,800 lbs.
- **Class B**
  - 56” Max. Arrest Distance
  - Average Arresting Force 900 lbs.
  - Peak Arresting Force Not To Exceed 1,800 lbs.
- **SRL-LE (Leading Edge)**
  - The energy absorber ANSI/ASSE Z359.13.



Fall Arrest

- **Anchorage** – Structure to which equipment is attached
  - **Types**
    - Certified Anchors
    - Improvised Anchors

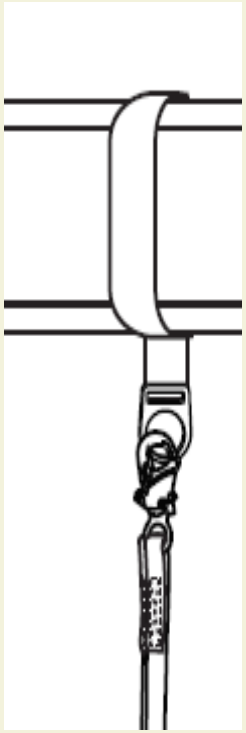


Certified Anchors

- Engineered by a qualified person
- Eliminates worker assessment – “human error”
- Must be at least 2 times the Maximum Arresting Force (MAF) of 1,800 lbs.
  - A 2:1 calculation equals **3,600 lbs.**

Improvised Anchors

- Workers MUST have an overwhelming evidence of strength when identifying a structure
- Assessed to be **5,000 lbs.** or greater
- Greatest potential for human error



Section 8

Review Questions

According to ANSI, what is the maximum allowable free fall distance for limited fall arrest?

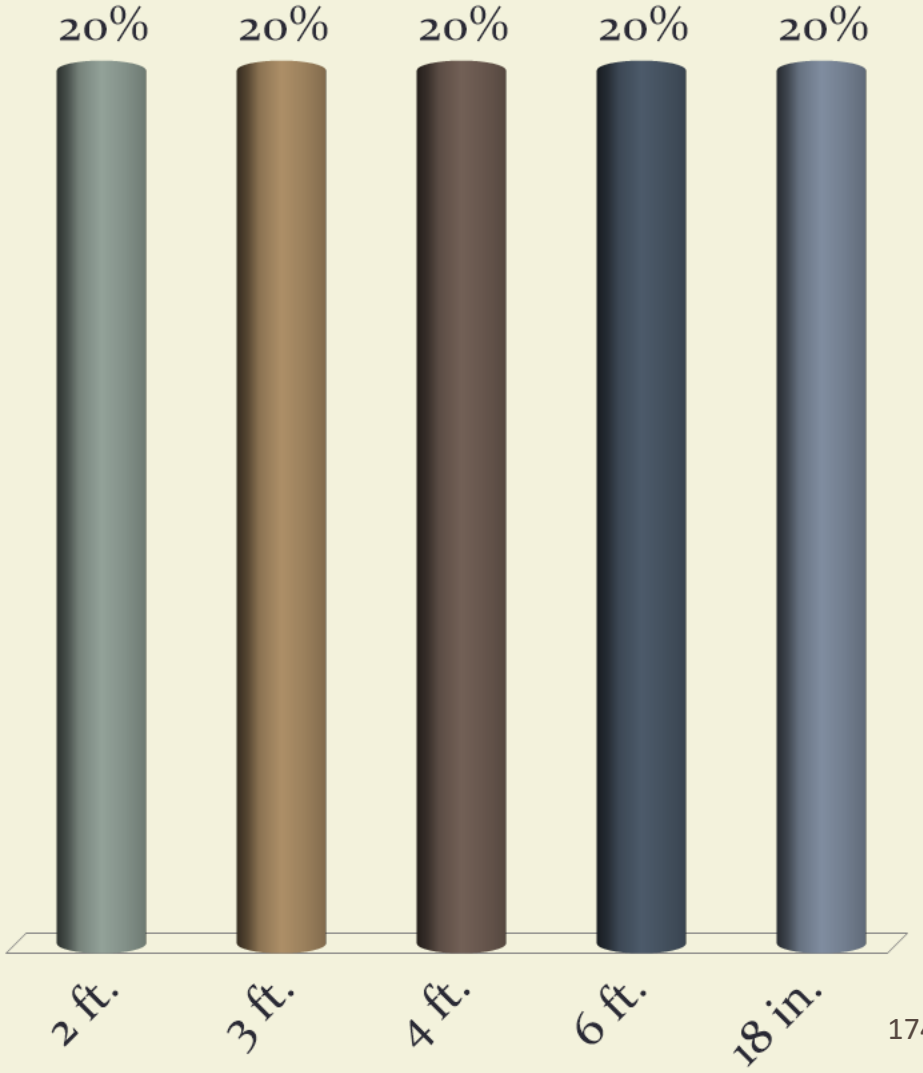
A. 2 ft.

B. 3 ft.

C. 4 ft.

D. 6 ft.

E. 18 in.



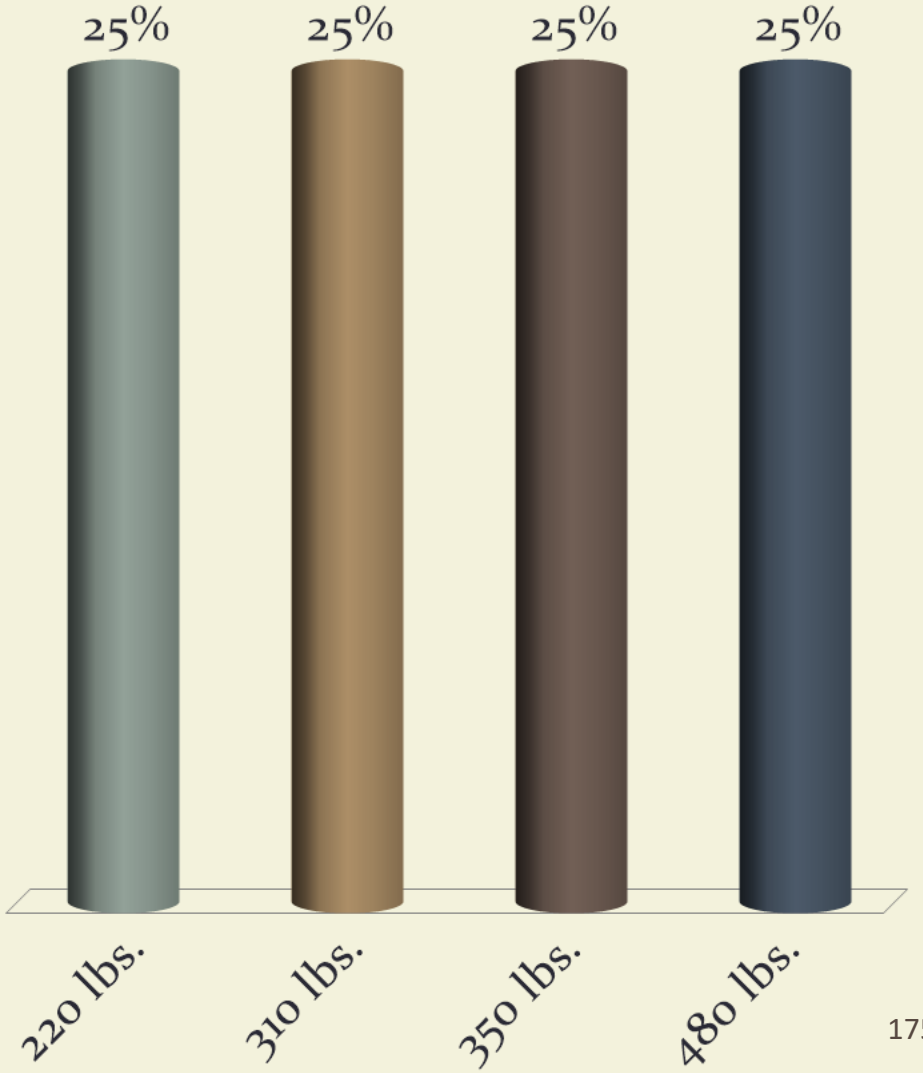
According to OSHA, what is the recommended maximum weight of a worker and their tools?

A. 220 lbs.

B. 310 lbs.

C. 350 lbs.

D. 480 lbs.



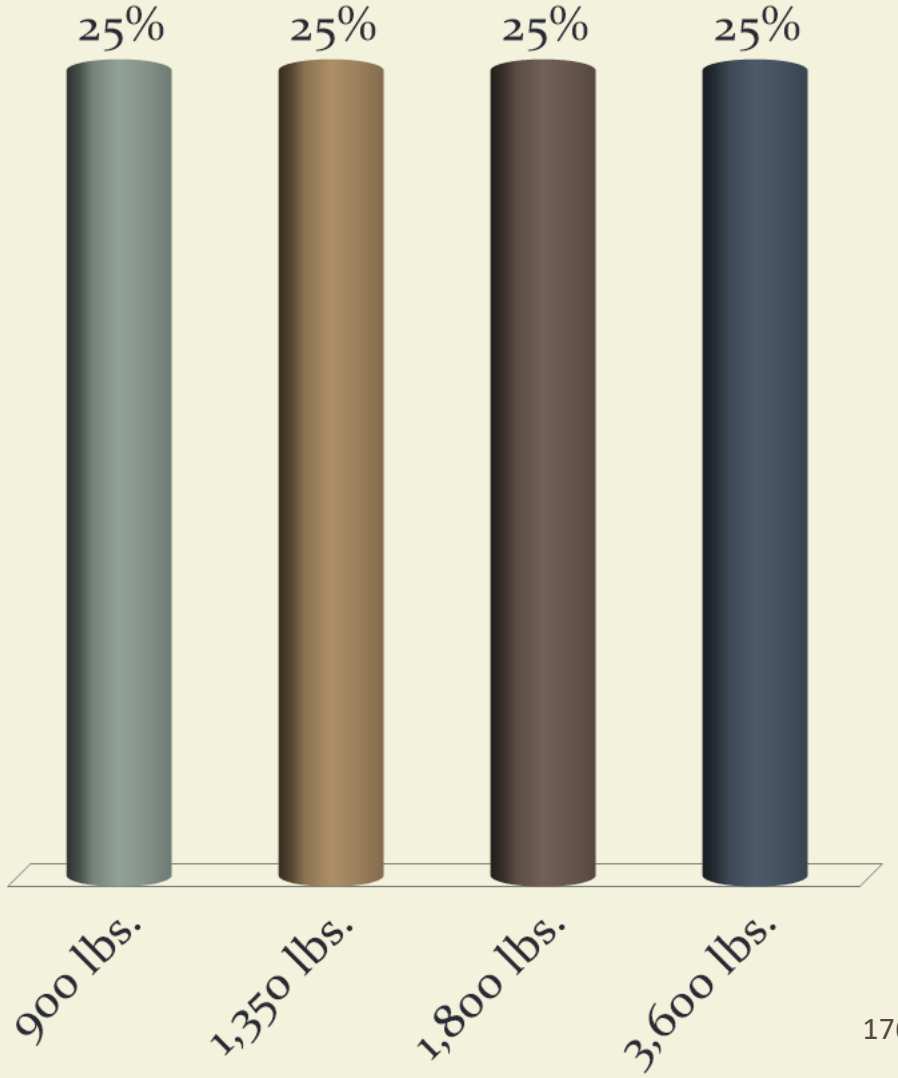
According to OSHA, personal fall arrest systems shall limit the maximum arresting force on an employee to how many pounds?

A. 900 lbs.

B. 1,350 lbs.

C. 1,800 lbs.

D. 3,600 lbs.



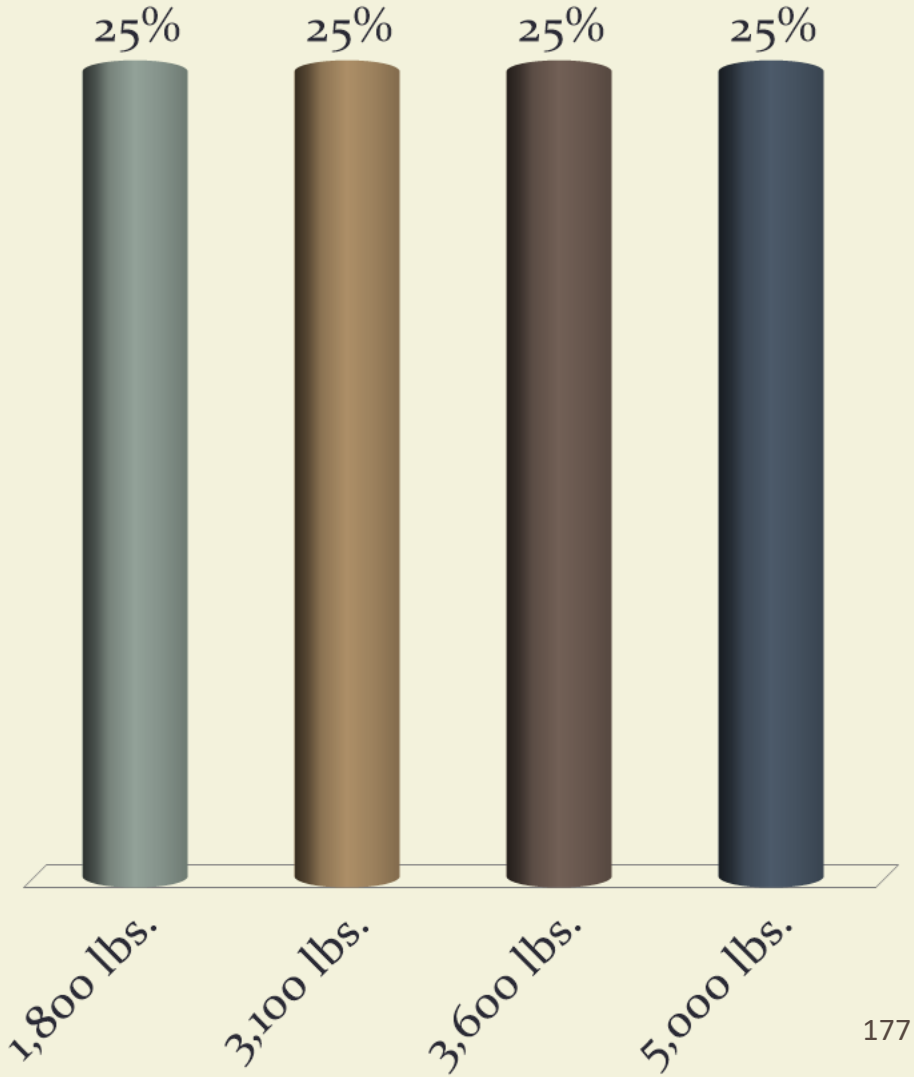
What is the minimum strength assessment for an “Improvised” anchor?

A. 1,800 lbs.

B. 3,100 lbs.

C. 3,600 lbs.

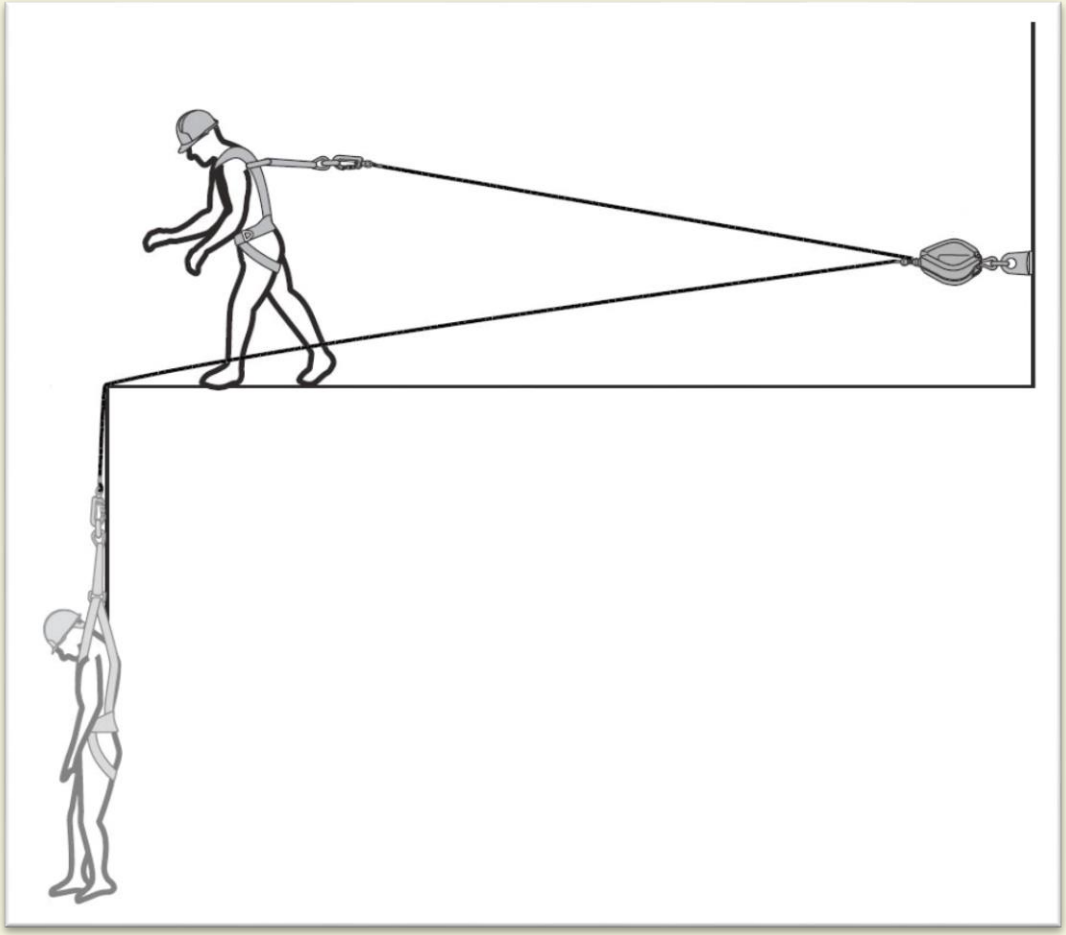
D. 5,000 lbs.

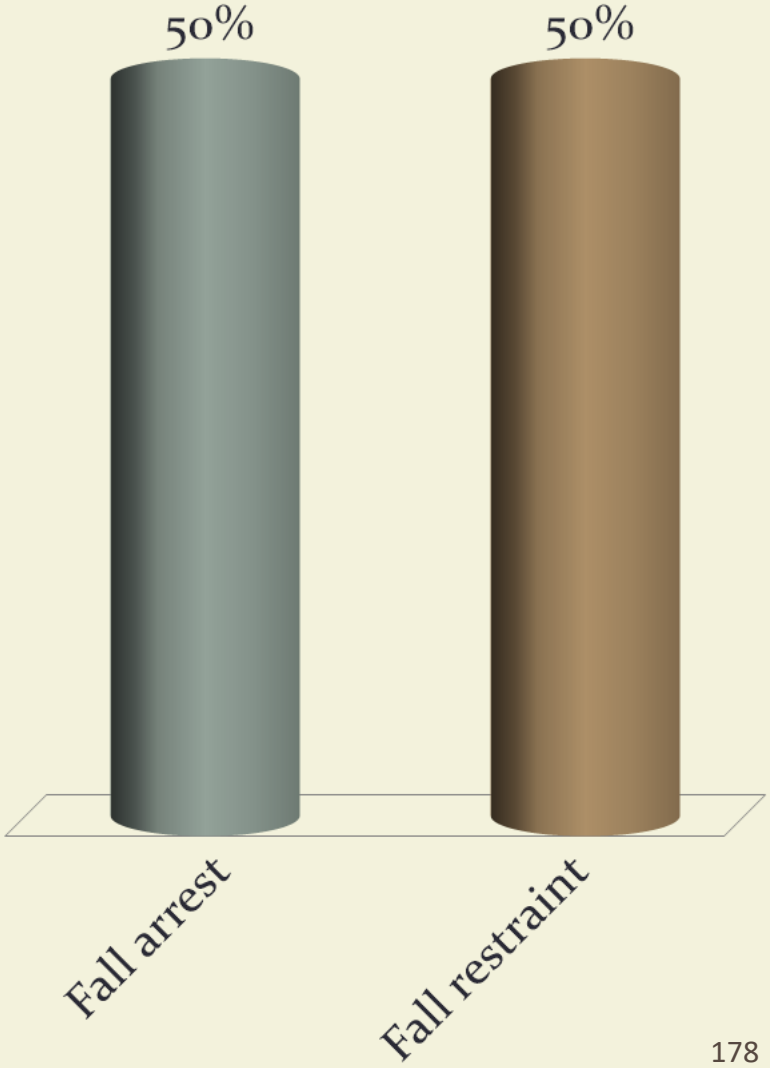


What is the drawing demonstrating?

A. Fall arrest

B. Fall restraint



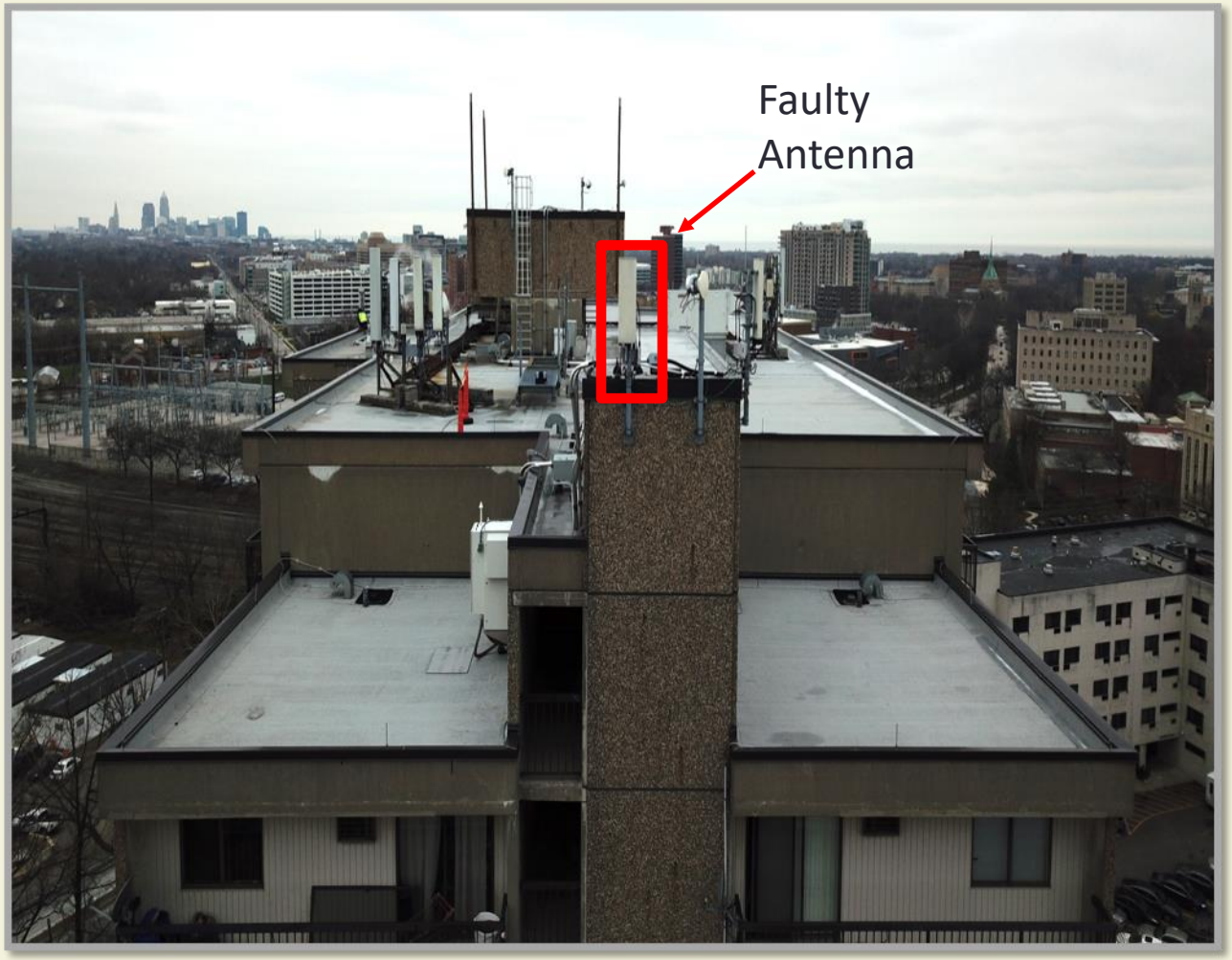


Section 9

Practical Workshop

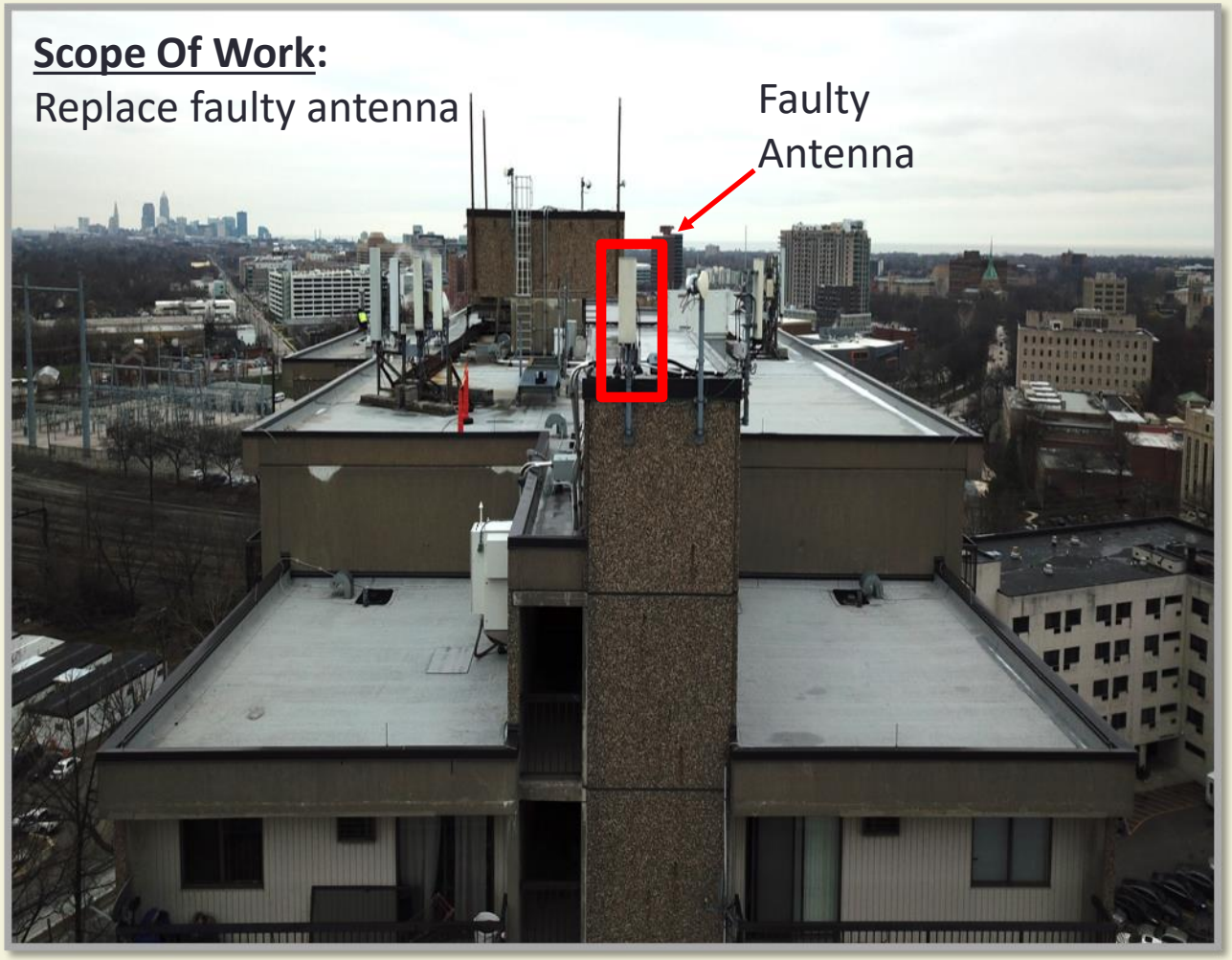
Falls From Elevation Unprotected Edges

Example 1



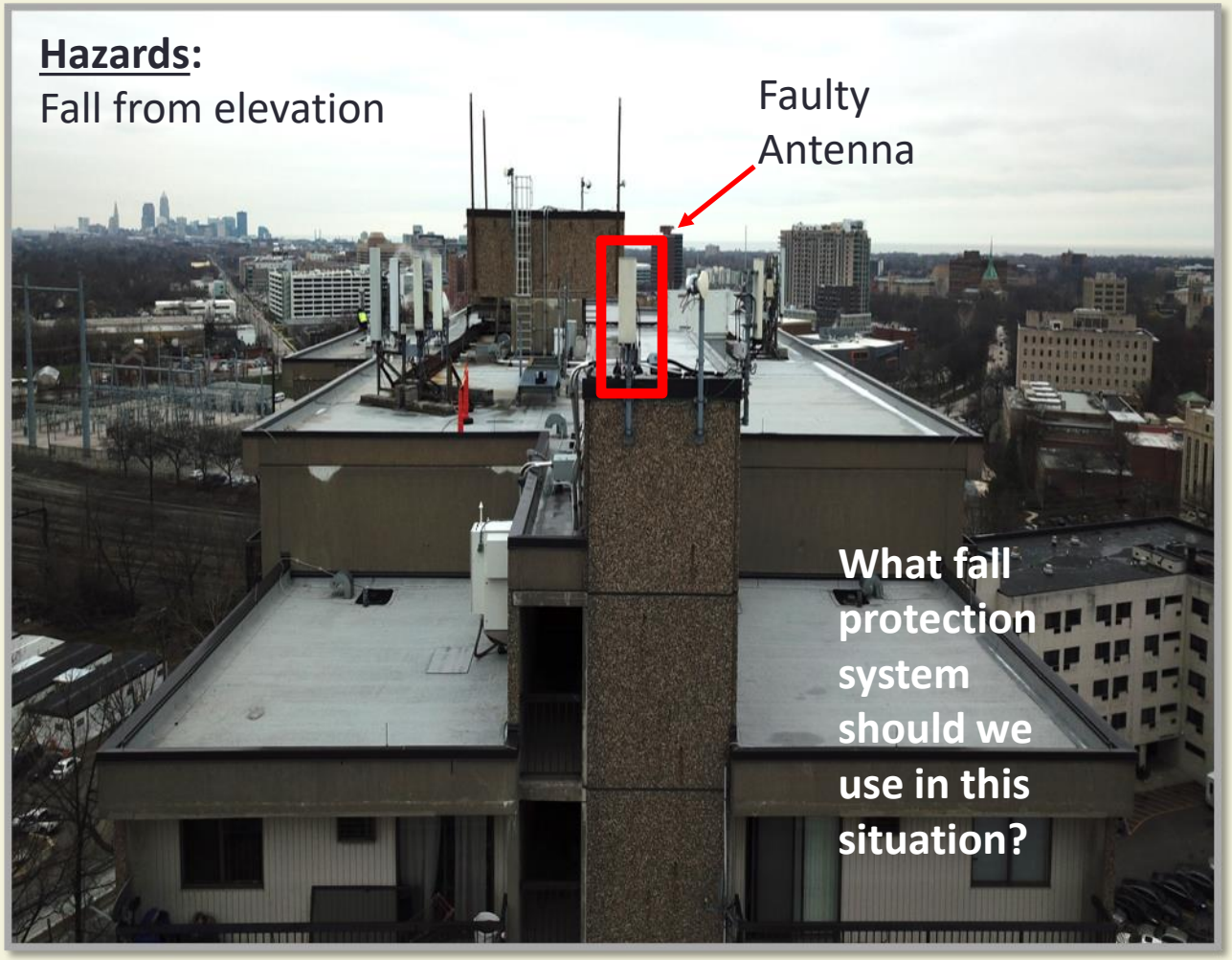
Falls From Elevation Unprotected Edges

Example 1: Scope of Work

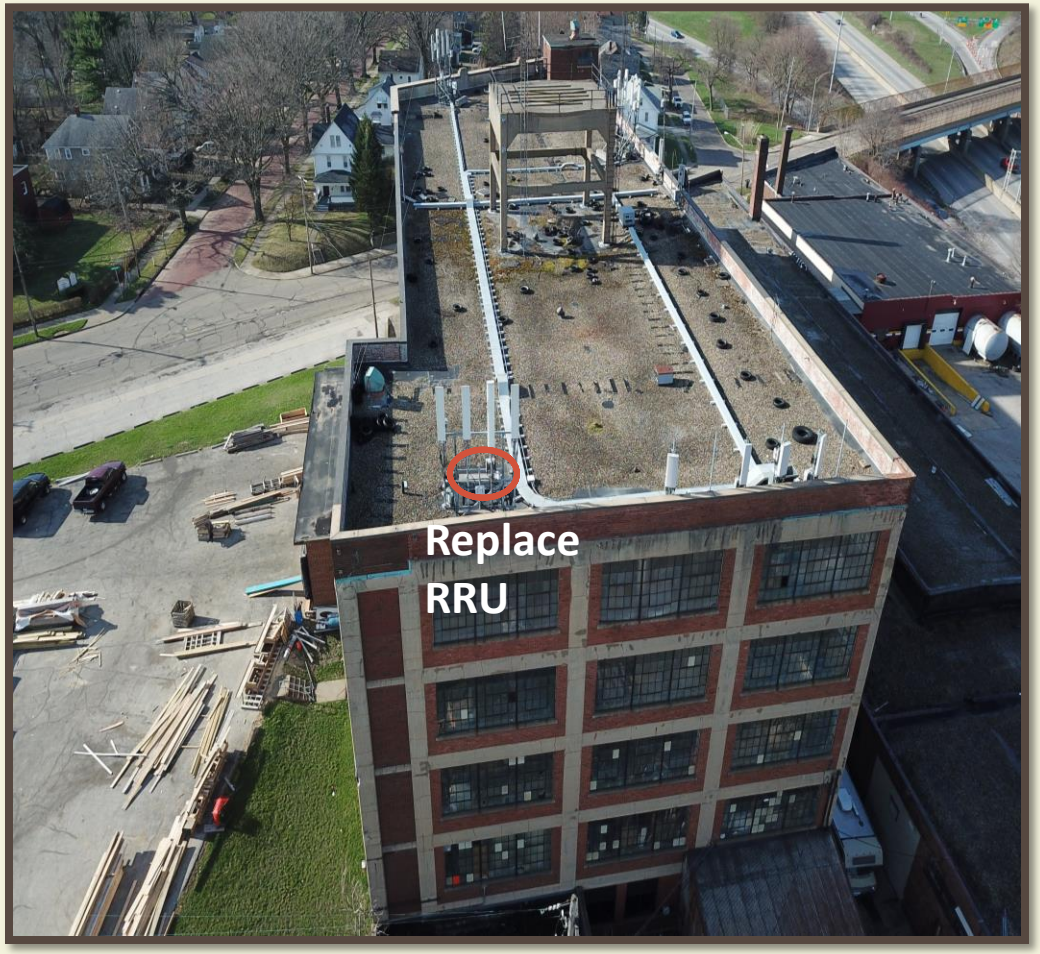


Falls From Elevation Unprotected Edges

Example 1: Hazards



Falls From Elevation Unprotected Edges
Example 2



Falls From Elevation Unprotected Edges

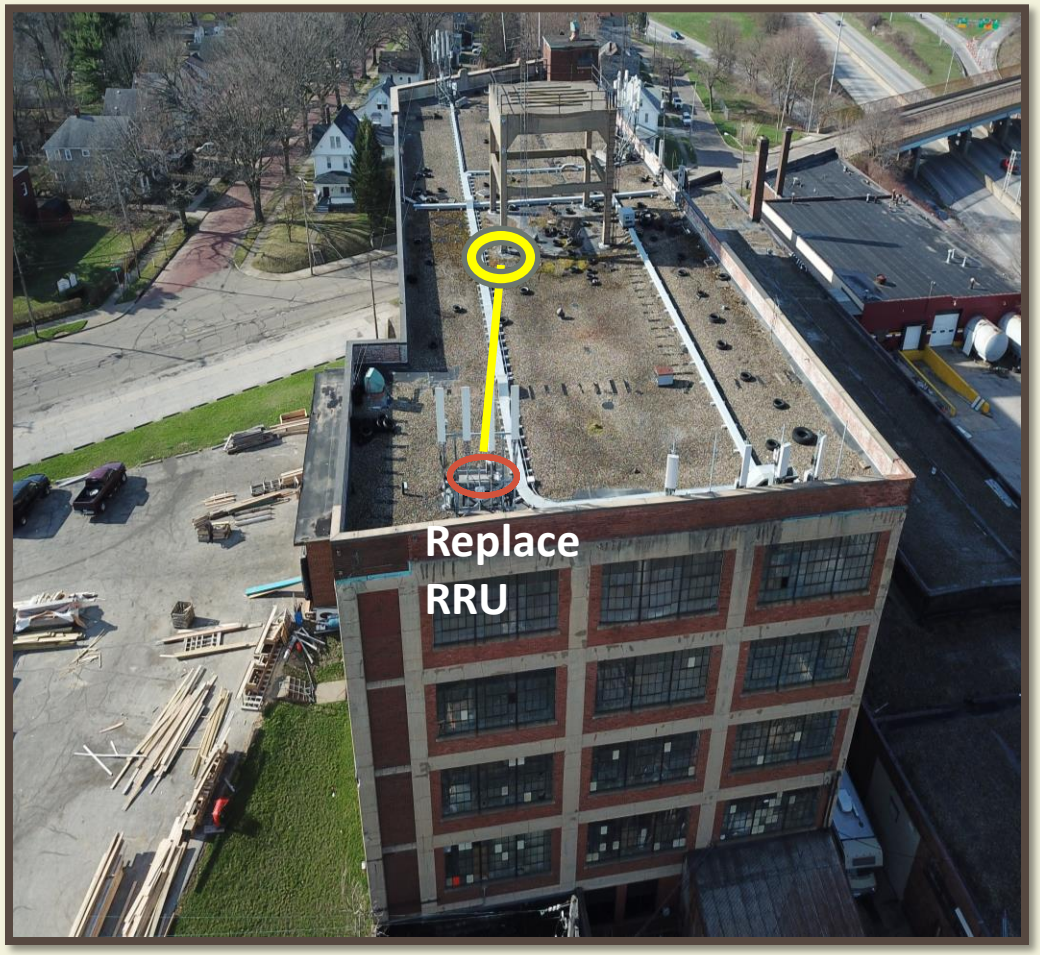
Example 2: Scope of Work

Scope Of Work:
Replace RRU

Falls From Elevation Unprotected Edges

Example 2: Hazards

Hazards:
Fall from elevation



What fall protection system should we use in this situation?

Fall Restraint Demonstration

- Anchor point
- Body holding device
- Fall restraint system
- How to use fall restraint system
- Limitations
- Compatibility

Thank You!