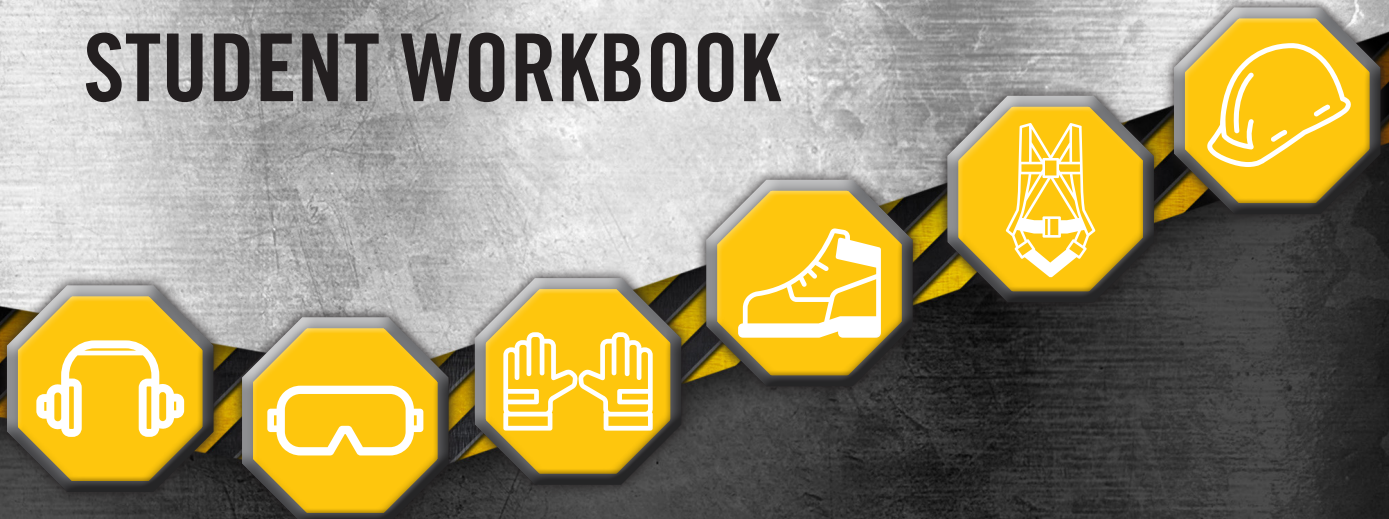




# STUDENT WORKBOOK



## PPE for Telecom Workers: Hazard ID, Selection, and Use Training Course

*This material was produced under grant number SH-000003-SH3 from the Occupational Safety and Health Administration, 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.*

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# PPE for Telecom Workers: Hazard ID, Selection, and Use

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U.S. Department of Labor – OSHA

Susan Harwood Grant

SH-000003-SH3



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# Acknowledgement

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This material was produced under a **2023 Susan Harwood Grant (SH-000003-SH3)** 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.

# Disclaimer

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After the completion of this course and for additional training please refer to your company policies and procedures.



It is not the intent of the content developers to provide compliance-based training in this presentation, the intent is to address personal protective equipment awareness in the telecom industry and may not cover all types of PPE.



It is the responsibility of the employer, its subcontractors, and its employees to comply with all pertinent rules and regulations in the jurisdiction in which they work.



Copies of all OSHA regulations are available from your local OSHA office, and many pertinent regulations and supporting documents have been provided with this presentation in printed format.

# Course Objective

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In an effort to improve safety within the telecommunications industry this course was developed to elevate awareness of hazard identification, selection, and proper use of Personal Protective Equipment (PPE). The objective is to provide a solid foundation for selection of PPE, increase knowledge, and bring awareness to telecommunication industry workers as a means to reduce incidents and associated hazards.

# Section 1

## Introduction

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About NATE

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About OSHA

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Responsibilities of the Employer Under OSHA

---

Employee Rights Under OSHA

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OSHA Whistleblower Protection



## About NATE

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- Global leader in industry safety and best practices for 28 years,
- Voice of tower and communications infrastructure, construction, service, and maintenance industries, and
- Diverse membership make-up consisting of over 1,000 member companies.

# About OSHA

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On December 29, 1970, President Nixon signed the **Occupational Safety and Health Act of 1970 (OSH Act)** into law.

## **An Act**

“To assure safe and healthful working conditions for working men and women; by authorizing enforcement of the standards developed under the ACT; by assisting and encouraging the States in their efforts to assure safe and healthful working conditions; by providing for research, information, education, and training in the field of occupational safety and health.”

Source: [www.osha.gov/laws-regs/oshact/completeoshact](http://www.osha.gov/laws-regs/oshact/completeoshact)

# What Does OSHA Do?

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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 multiple consensus standards, including API, IIAR, ASME, and 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.



Conducts a variety of inspections to include accidents, fatalities, complaints, and programmed inspections.

# Employers Must

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- 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/sites/default/files/publications/osh3021.pdf](http://www.osha.gov/sites/default/files/publications/osh3021.pdf)

# Workers Have the Right to:

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- Safe and healthy working conditions.
- File a confidential complaint with OSHA regarding 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.
- Right to access employee exposure records, employee medical records, and analyses based upon employee exposure records or medical records.
- Obtain copies of their medical records.



Source: OSHA 3021-02R 2023, <https://www.osha.gov/sites/default/files/publications/osha3021.pdf>

# OSHA Worker Rights and Protections

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[Know Your Rights](#)

[When to File a Complaint](#)

[Contact OSHA](#)

Source: OSHA 3021-09R 2011, [www.osha.gov/workers](http://www.osha.gov/workers)

# OSHA Whistleblower Protection

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- If you believe that you have been retaliated against, call 800-321-OSHA (6742).
- 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).
- For more information, visit OSHA's Whistleblower page at [www.whistleblowers.gov](http://www.whistleblowers.gov).

Source: OSHA 3021-09R 2011, [www.osha.gov/workers](http://www.osha.gov/workers)

# SECTION 2: Statistics

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- I. Bureau of Labor Statistics
- II. Private Industry Injuries, Illness Statistics
- III. NATE STAR Initiative Audit Findings
- IV. Proper Planning
- V. According to OSHA

# Bureau of Labor Statistics

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## According to the Bureau of Labor Statistics (BLS) in 2021

- Total Recordable cases: **2,607,900**
- Cases involving days away from work: **1,062,700**
- Cases involving sprains, strains, and tears: **266,530**
- Cases involving injuries to the back: **128,220**
- Cases involving slips trips and falls: **211,640**
- Fatalities: **5,190**

# NATE STAR Initiative Audit Findings

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<u>Type of Deficiency</u>	<u>Percentage of Total Found</u>	<u>BLS Injuries</u>
Lower Extremities (boots)	6%	2%
Upper Extremities (gloves)	20%	16%
Hard Hat Deficiencies	33%	13%
Safety Glasses Deficiencies	27%	2%



# Proper Planning Prevents ~~Poor Performance~~ **INJURIES**

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# According to OSHA

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- The proper use of PPE can prevent 37.6% of occupational injuries and diseases.
- About 15% of injuries resulting in total disability are caused by failure to wear proper PPE.
- About 60% of workers use PPE during work.



# PPE Non-Use

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The most common reported reasons by non-users were:

- Uncomfortable,
- Lack of knowledge on how to use PPE,
- Poor fit/falling off,
- Feels too hot,
- Unavailability, and
- PPE is not obligatory.

# **SECTION 3:**

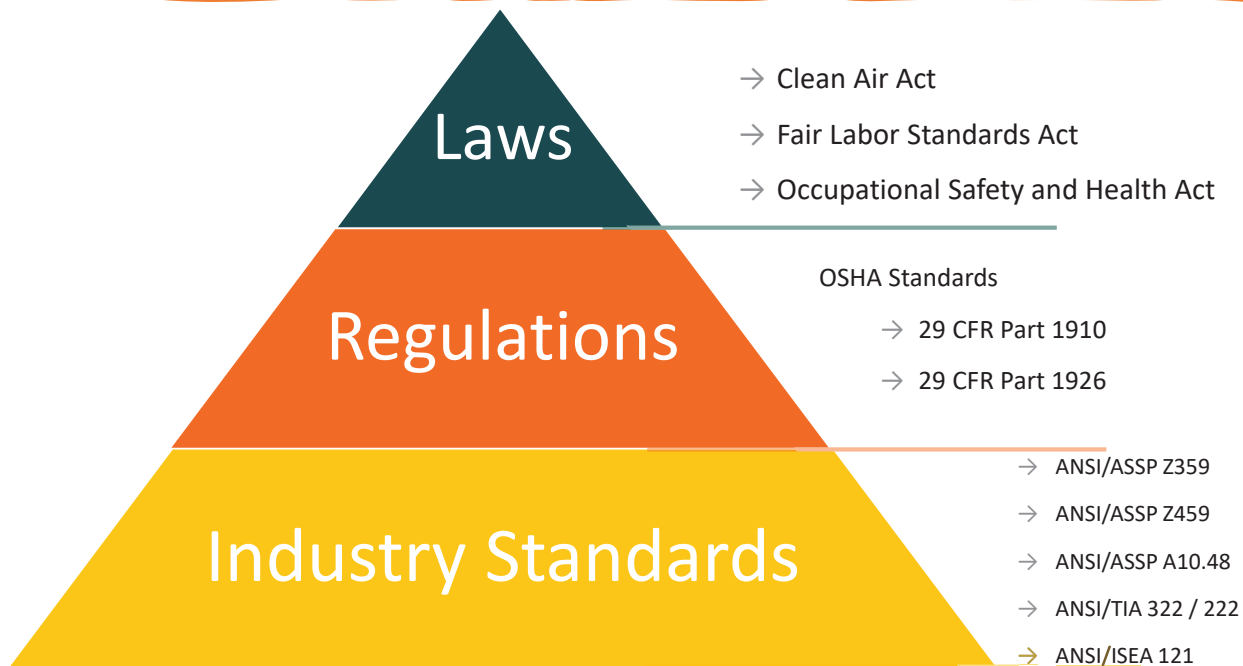
## **Laws, Regulations, Industry Standards, & Industry Best Practices**

---

- I. Laws, Regulations, & Industry Standards
  - A. Hierarchy of Laws, Regulations, & Industry Standards
  - B. Laws
  - C. Regulations
  - D. Industry Standards
    - 1. Industry Safety Standards
    - 2. Evolution of Industry Standards
    - 3. Applicable Telecommunication Industry Standards
- II. Industry Best Practices
  - A. NATE: The Communications Infrastructure Contractors Association
  - B. NATE: Safety Equipment Manufacturers Committee (SEMC)
  - C. NATE: Climber/Rescuer Training Standard (CRTS)

# Hierarchy of Laws, Regulations, & Industry Standards

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# Laws

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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.





# Regulations

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Regulations are standards and rules adopted by administrative agencies that govern how laws will be enforced.

## Occupational Safety and Health Act (OSHA) Standards:

	29 CFR Part 1910	• Safety and Health Regulations for General Industry
	29 CFR Part 1926	• Safety and Health Regulations for Construction

## Occupational Safety and Health Act (OSHA) Directive:

	<a href="#"><u>CPL 02-01-056</u></a>	• Inspection Procedures for Accessing Communication Towers
---	--------------------------------------	--

# Industry Standards

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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.'



This Photo by Unknown Author is licensed under CC BY-ND

# Industry Safety Standards

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## Standard

ANSI/ASSP Z359

## Title

The Fall Protection and Arrest Standards Package

## Application

The standards included in the Z359 Fall Protection and Arrest Package provide organizations with a comprehensive resource for protecting workers at heights.

## Standard

ANSI/ASSP Z459.1-2021

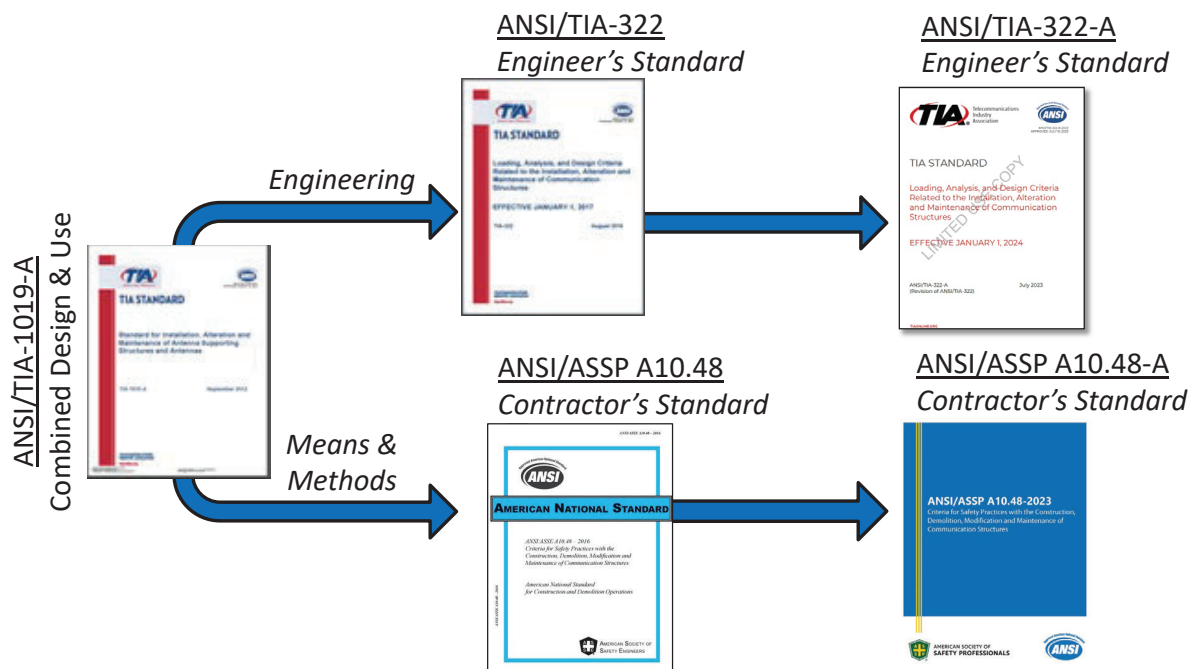
## Title

Requirements for Rope Access Systems

## Application

The standards for rope access work in any environment where ropes are suspended from or connected to a structure or natural feature and used as the primary means of access, egress, or support and as the primary means of secondary protection against a fall.

# Evolution of Industry Standards



# Applicable Telecommunications Industry Standards

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## Standard

ANSI/ASSP A10.48-2023

## Title

Criteria for Safety Practices with Construction, Demolition, Modification, and Maintenance of Communication Structures

## Application

Means and methods for working on communications structures.

## Standard

ANSI/TIA 322-A

## Title

Loading Criteria, Analysis, and Design Related to the Installation, Alteration, and Maintenance of Communication Structures

## Application

Standard for engineers to verify structural loading during construction and gin pole loading. Modifying and introducing forces into a structure (engineering).

# Applicable Telecommunications Industry Standards (continued)

---

Standard  
ANSI/TIA 222

Title  
Structural Standard for Antenna Supporting Structures, Antennas, and Small Wind Turbine Support Structures

Application  
Communications structures engineering and maintenance standard. International Building Code (IBC) recognized standard for structures and maintenance of those structures.

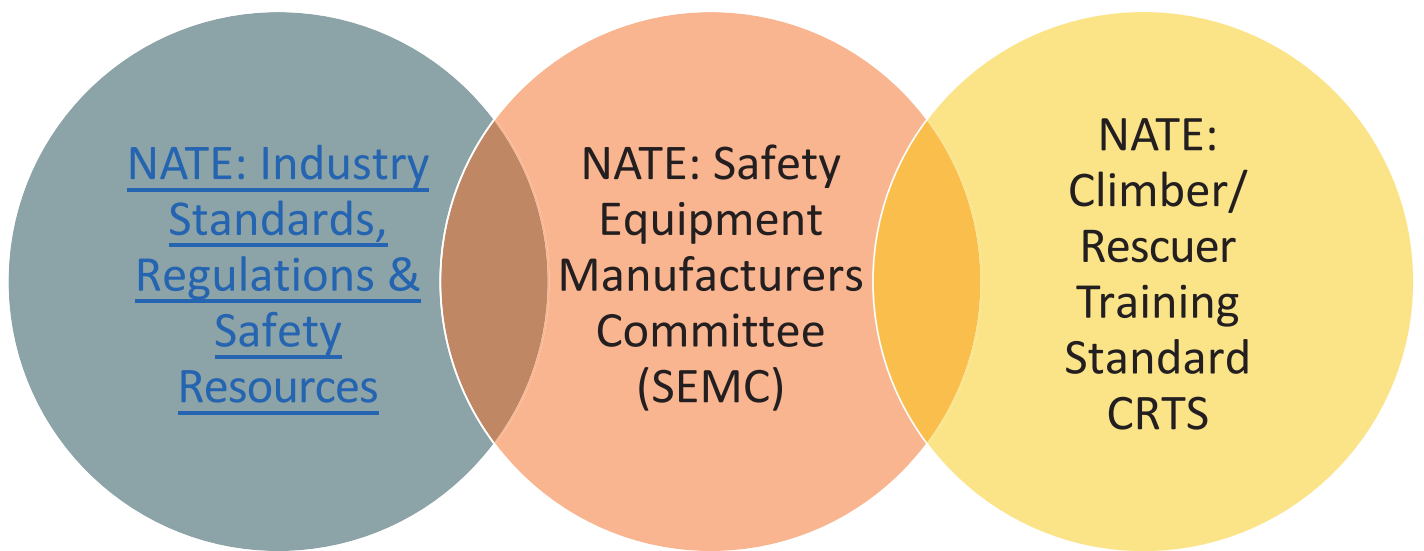
Standard  
ANSI/ISEA 121

Title  
Standard for Dropped Object Prevention Solutions

Application  
Manufacturers standard for hoist buckets and tool tethering devices.

# Industry Best Practices

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# Industry Standards, Regulations & Safety Resources

Category	Standard / Regulation	Title	Notes	Web Link
AISC	AISC	American Institute of Steel Construction	To serve the structural steel design community and construction industry in the United States.	<a href="https://www.aisc.org/">https://www.aisc.org/</a>
ALI	ALI	American Ladders Institute	Developer of safety standards for the ladder industry.	<a href="https://www.americanladderinstitute.org/">https://www.americanladderinstitute.org/</a>
ALI	ANSI/ASC A14.3	Ladders - Fixed - Safety Requirements	Standard prescribes minimum requirements for the design, construction, and use of fixed ladders, and sets forth requirements for cages, wells, and ladder safety systems used with fixed ladders, in order to minimize personal injuries.	<a href="https://webstore.ansi.org/Standards/ALI/ANSI-ASCA142008R2018-1719324">https://webstore.ansi.org/Standards/ALI/ANSI-ASCA142008R2018-1719324</a>
ANSI	ANSI	American National Standards Institute	Creates standards and promotes their use worldwide in the U.S.	<a href="https://ansi.org/">https://ansi.org/</a>
ANSI	ANSI Z49.1:2012	Safety in Welding, Cutting and Allied Processes	Foot protection.	<a href="https://webstore.ansi.org/Standards/AWS/ANSI-Z492012">https://webstore.ansi.org/Standards/AWS/ANSI-Z492012</a>
ASME	ASME	The American Society of Mechanical Engineers	Focuses on the science and technology of mechanical engineering and allied sciences around the globe.	<a href="https://www.asme.org/">https://www.asme.org/</a>
ASME	ANSI/ASME B30.12	Handling Loads Suspended from Rotorcraft	Applies to the construction, installation, operation, inspection, testing, maintenance, and use of cranes and hoisting and material movement related equipment.	<a href="https://webstore.ansi.org/Standards/ASME/ASMEB30122011">https://webstore.ansi.org/Standards/ASME/ASMEB30122011</a>
ASME	ANSI/ASME B30.20	Below the Hook Lifting Devices	Safety standard for cableways, cranes, derricks, hoists, hooks, jacks, and slings.	<a href="https://www.asme.org/codes-standards/find-codes-standards/b30-20-hook-lifting-devices">https://www.asme.org/codes-standards/find-codes-standards/b30-20-hook-lifting-devices</a>
ASME	ANSI/ASME B30.23	Personnel Lifting Systems	Applies to hoisting equipment used to lift, lower or transport personnel.	<a href="https://webstore.ansi.org/Standards/ASME/ASMEB30232016?gclid=CjwKCAjw7J6EBhBDEiwA5UUM2iqFBBeYac23c9FNpFPNvE-RVJdz2a5ZwgxqtUSY-YoWS6iBr4A0tXoCogQQAvD_BwE">https://webstore.ansi.org/Standards/ASME/ASMEB30232016?gclid=CjwKCAjw7J6EBhBDEiwA5UUM2iqFBBeYac23c9FNpFPNvE-RVJdz2a5ZwgxqtUSY-YoWS6iBr4A0tXoCogQQAvD_BwE</a>
ASME	ANSI/ASME B30.26	Rigging Hardware	Construction, installation, operation, inspection and maintenance of rigging hardware used for load handling activities. Standard for any hardware component used while hoisting within the industry.	<a href="https://global.ihc.com/doc_detail.cfm?&amp;item_s_key=00454787&amp;item_key_date=840224&amp;input_doc_number=ANSI%20ASME%20B30%2F26&amp;input_doc_title=">https://global.ihc.com/doc_detail.cfm?&amp;item_s_key=00454787&amp;item_key_date=840224&amp;input_doc_number=ANSI%20ASME%20B30%2F26&amp;input_doc_title=</a>
ASME	ANSI/ASME B30.30	Ropes	Selection, installation, attachment, testing, inspection, maintenance, repair, use, and replacement of all types of rope. Ropes used in rigging configuration.	<a href="https://global.ihc.com/doc_detail.cfm?&amp;item_s_key=00778410&amp;item_key_date=801231&amp;input_doc_number=ANSI%20ASME%20B30%2E30&amp;input_doc_title=">https://global.ihc.com/doc_detail.cfm?&amp;item_s_key=00778410&amp;item_key_date=801231&amp;input_doc_number=ANSI%20ASME%20B30%2E30&amp;input_doc_title=</a>

# Safety Equipment Manufacturers Committee (SEMC)

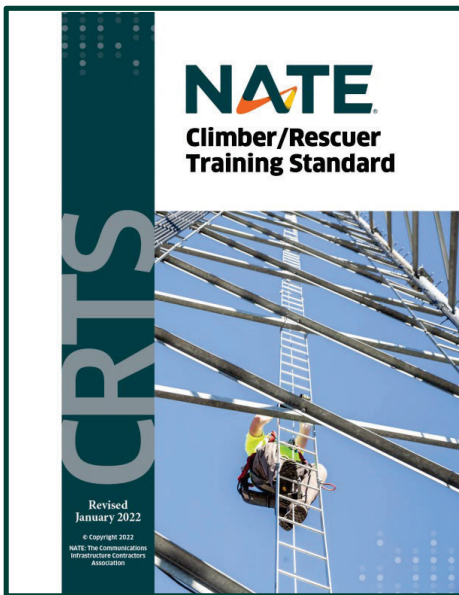
*“The SEMC Ad Hoc Committee’s objective is to conduct real-world testing and provide detailed information applicable to the performance of safety equipment and related components utilized within the communications infrastructure industry. The SEMC is tasked with enhancing worker safety and personal protection through research initiatives that include all industry stakeholders.”*

## SEMC Initiatives

- 2021 NATE SEMC Wire Rope Safety Sleeve Testing Report II
- 2022 Guide for Powered Ascender Use of Antenna Supporting Structures
- NATE Safety Sleeve Testing Final Report
- Guide for Wire Rope Safety Climbs on Antenna Supporting Structure



# NATE Climber Rescue Training Standard (CRTS)



- Assist in standardizing fall protection and rescue training for climbers in the tower and communications infrastructure construction, service, and maintenance industries.
- Establish a minimum baseline of knowledge and skill that a climber should possess.
- Assist employers in designating personnel initially as authorized climbers/rescuers, and for personnel with sufficient knowledge, skills, and experience, as competent climbers/rescuers.
- Guidelines to support an employer's development and maintenance of its fall protection program to comply with the ANSI/ASSP A10.48 standard and regulations where work is conducted.

# **SECTION 4**

## **JHA to Identify PPE Requirements**

---

- I. Job Hazard Analysis – Example
- II. Site Specific Plans – Fall Protection, Rescue, RF, Etc.
- III. Site Related Hazards
- IV. Telecom Climb Facility Hazards

# Job Hazard Analysis - Example

A Job Hazard Analysis is a document that can be utilized to assist in the identification of types of PPE that can be utilized to provide protection to workers.

**Job Hazard Assessment**

Identification of Job Site Hazards		
<b>Physical Hazards</b>	<b>Health Hazards</b>	<b>Other Hazards</b>
<input type="checkbox"/> Confined Space <input type="checkbox"/> Electrical <input type="checkbox"/> Elevation/Site Terrain <input type="checkbox"/> Falls from Elevations <input type="checkbox"/> Sips, Trips, Falls <input type="checkbox"/> Heavy Equipment Usage <input type="checkbox"/> Vehicular Traffic <input type="checkbox"/> Flammable Material <input type="checkbox"/> Open Excavations	<input type="checkbox"/> Heat Stress <input type="checkbox"/> Cold Stress <input type="checkbox"/> Chemical Exposure <input type="checkbox"/> EME/RF Exposure <input type="checkbox"/> Noise Exposure-C8S o8A <input type="checkbox"/> Silica Exposure <input type="checkbox"/> Asbestos Exposure <input type="checkbox"/> Lead Exposure <input type="checkbox"/> Welding Fume Exposure <input type="checkbox"/> Environmental	<input type="checkbox"/> Equipment/Material Security <input type="checkbox"/> Employee Security
Required PPE for Job Task		
<input type="checkbox"/> Hard Hat <input type="checkbox"/> Safety Glasses <input type="checkbox"/> Ear Plugs	<input type="checkbox"/> Fall Protection <input type="checkbox"/> Gloves (Type) <input type="checkbox"/> RC Monitor	<input type="checkbox"/> RF Suit <input type="checkbox"/> Other (specify):
Hazard Analysis (Hazards and PPE identified above should be addressed below)		
Sequence of Job/Task	Potential Hazards	Hazard Mitigation Measures
<b>Employee Acknowledgement of JSA (All personnel entering jobsite must read and sign, add additional to reverse side of this form)</b>		
Printed Name:		Signature:
<b>Supervisor Acknowledgement of JSA and Site Personnel</b>		
Supervisor Name:		Supervisor Signature:

# 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.		<input type="checkbox"/> Yes <input type="checkbox"/> No
The rescue plan is good for the complete job.		<input type="checkbox"/> Yes <input type="checkbox"/> No
<b>Type of Structure</b>		
<input type="checkbox"/> Monopole <input type="checkbox"/> Self Support Tower <input type="checkbox"/> Guyed <input type="checkbox"/> Rooftop <input type="checkbox"/> Water Tank <input type="checkbox"/> Other		
<b>Method(s) Used To Rescue A Fallen Climber</b>		
Manual Rope Rescue <input type="checkbox"/> Capstan Hoist <input type="checkbox"/> Base Mounted Hoist <input type="checkbox"/> Crane/Boom Truck <input type="checkbox"/> Bucket Truck <input type="checkbox"/> Aerial Lift Equipment <input type="checkbox"/>		
<b>Check List</b>		
The Emergency Data Sheet is filled out and posted?		<input type="checkbox"/> Yes <input type="checkbox"/> No
The Job Safety Analysis is complete and on-site?		<input type="checkbox"/> Yes <input type="checkbox"/> No
The appropriate First Aid individuals are on-site?		<input type="checkbox"/> Yes <input type="checkbox"/> No
The appropriate Rescue individuals are on-site?		<input type="checkbox"/> Yes <input type="checkbox"/> No
The appropriate Rescue Equipment is on-site for the rescue plan.		<input type="checkbox"/> Yes <input type="checkbox"/> No
If there are any special obstructions or conditions that need to be discussed, ensure you document them in the comments.		<input type="checkbox"/> Yes <input type="checkbox"/> 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.		<input type="checkbox"/> Yes <input type="checkbox"/> No
<b>Descriptive Comments</b>		
<b>Reminders</b>		
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
	<input type="checkbox"/> Yes <input type="checkbox"/> No	
	<input type="checkbox"/> Yes <input type="checkbox"/> No	
	<input type="checkbox"/> Yes <input type="checkbox"/> No	
	<input type="checkbox"/> Yes <input type="checkbox"/> No	
	<input type="checkbox"/> Yes <input type="checkbox"/> No	
	<input type="checkbox"/> Yes <input type="checkbox"/> 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		

# Site Related Hazards

Hole in Platform



Trip Hazard



Electrocution



# Telecom Climb Facility Hazards

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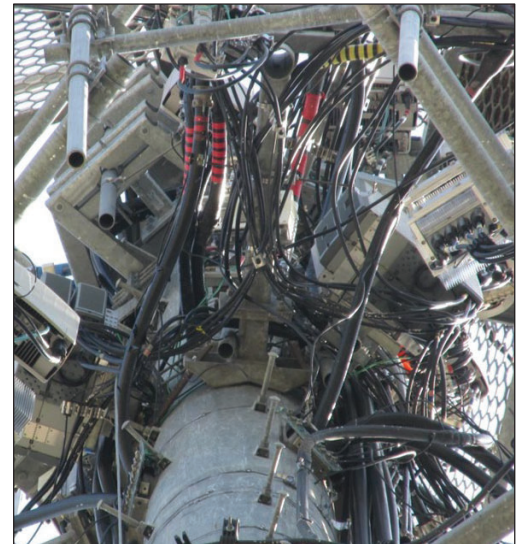
Rusty Cable



Trapped Cable



Congestion – Causing coax to rub



# Various Telecom Climb Facility Hazards

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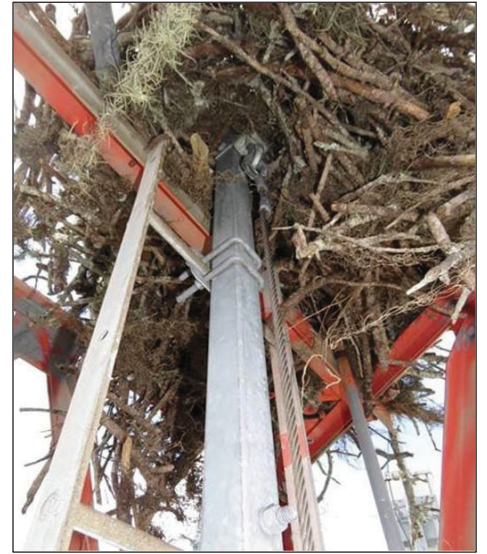
Cable Safe Climb No Tension



Weather



Animals/Birds/Insects



# Section 5

## Hierarchy of Controls

---

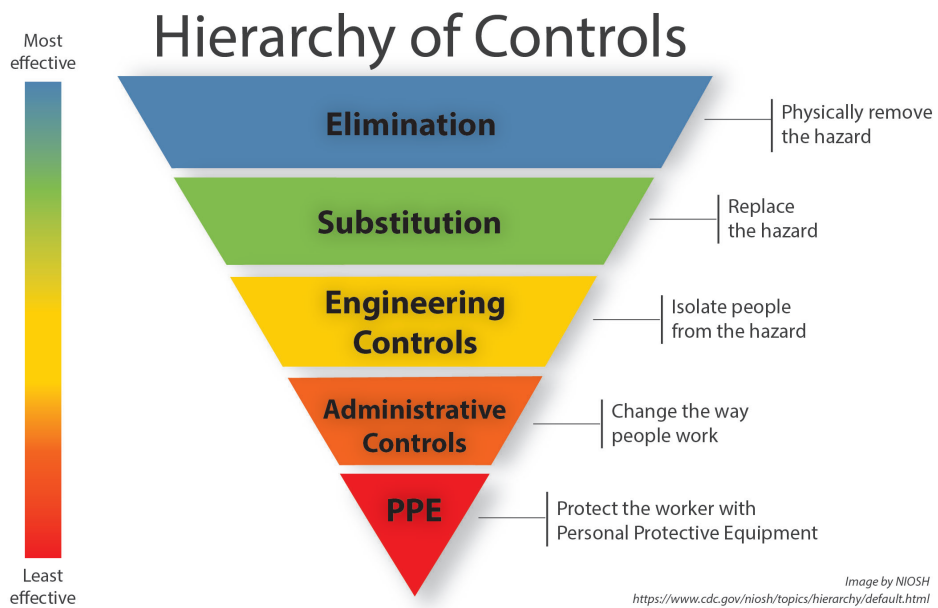
Elimination

Substitution

Engineering Controls

Administrative Controls

# Hierarchy of Controls



# Elimination

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- Trip hazards
- Troubleshooting from the ground
- Drone inspection may eliminate the need for tower access



# Substitution

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Battery Powered vs Gas

Battery Powered removes toxic fumes from exhaust.



# Engineering Controls

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- Railing
- Fall protection anchor points
- Guards for moving parts



# Administrative Controls

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- Controlled access zones
- Two-way communications
- Lockout/Tagout
- Safety Monitor/Spotter
- Warning lines
- Written procedures for controlling site specific hazards



# SECTION 6

## Personal Protective Equipment (PPE)

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- I. Requirements for PPE
- II. Selection of PPE
- III. PPE Types



# Requirements for PPE

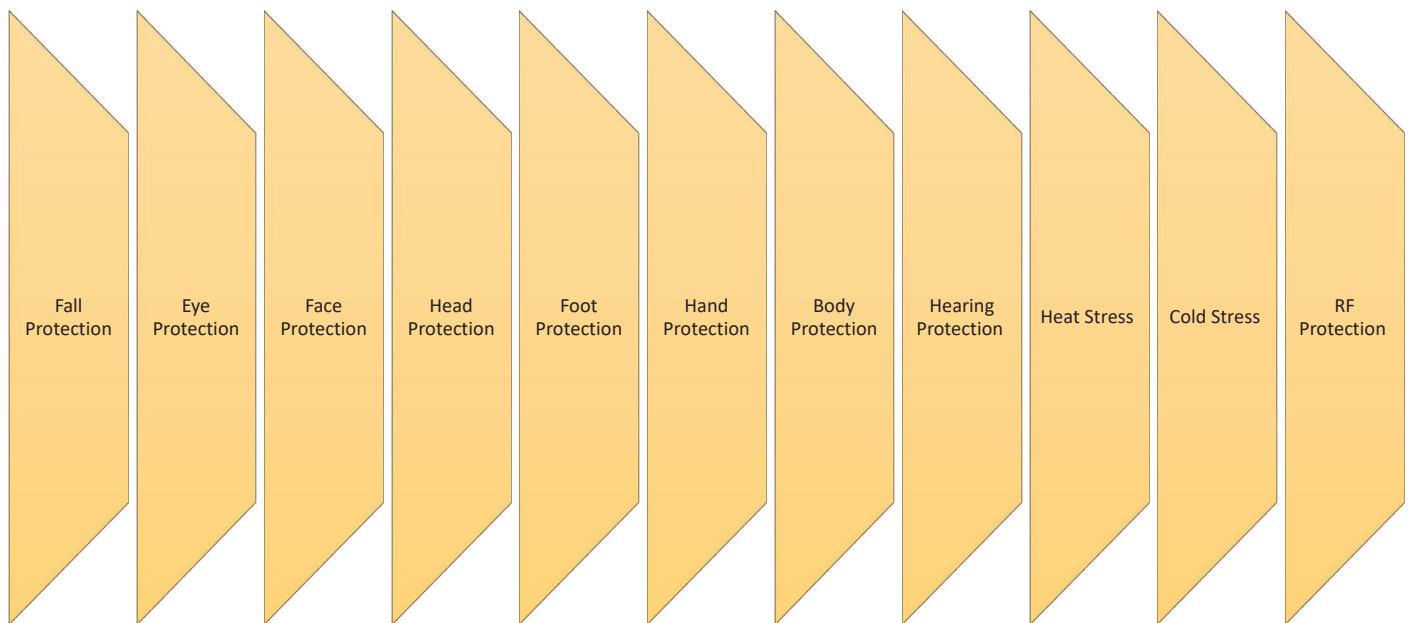
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To ensure the greatest possible protection for employees in the workplace, the cooperative efforts of both employers and employees will help in establishing and maintaining a safe and healthful work environment. In general, employers are responsible for:

- Performing a “hazard assessment” of the workplace to identify and control physical and health hazards.
- Identifying and providing appropriate and adequate PPE for employees.
- Training employees in the use and care of the PPE.
- Inspection program at regularly scheduled intervals.
- Maintenance including replacing worn or damaged PPE.
- Periodically reviewing, updating, and evaluating the effectiveness of the PPE program.

# PPE Types

---



# Selecting PPE

---

- All PPE clothing and equipment must be of safe design and construction and be maintained in a clean and reliable fashion.
  - Employers shall take the fit and comfort of PPE into consideration when selecting appropriate items for their workplace.
- PPE that fits well and is comfortable to wear will encourage employee use.
  - Most protective devices are available in multiple sizes and care should be taken to select the proper size for each employee.
  - If several different types of PPE are worn together, make sure they are compatible.
  - If PPE does not fit properly, it can make the difference between being safely covered or dangerously exposed.
  - It may not provide the level of protection desired and may discourage employee use.

# SECTION 7

## Fall Protection Systems

---

Fall Protection Systems

(Travel, Positioning, Personal Fall Arrest)

Fall Protection Description

(Anchor Straps & Brackets, Full\_Body Harness, PPE\_Connectors)

Fall Protection and  
Components Systems

(Energy Absorbing Lanyards, Self-Retracting Devices,  
Positioning Lanyards)

Other Protection  
Components and Systems

(Vertical Lifelines, Wire Rope Safety Climbs, Rail Ladder  
Systems, Horizontal Lifelines, Rope Access Systems)

Evolution of Equipment

# Fall Protection Systems

---

- If a workplace hazard assessment reveals that employees face potential injury from fall hazards, and engineering controls cannot be used to eliminate the hazard, personal fall protection systems are another option for employers.
- Personal fall protection system (PFPS) means a system (including all components) an employer uses to provide protection from falling or to safely arrest an employee's fall if one occurs.
- Examples of personal fall protection systems include personal fall arrest systems, positioning systems, and travel restraint systems.
- 29 CFR 1910.140 sets forth requirements for personal fall protection systems for general industry (maintenance).
- 29 CFR 1926.502 sets forth requirements for personal fall protection systems for construction.

# Fall Protection Systems – Travel Restraints

---

Travel restraint systems consist of a combination of an anchorage, anchorage connector, lanyard (or other means of connection), and body support that an employer uses to eliminate the possibility of an employee going over the edge of a walking-working surface.

(Example: rooftop)

# Fall Protection Systems – Positioning Systems

---

A positioning system is a system of equipment and connectors that, when used with a body harness allows an employee to be supported on an elevated vertical surface, such as a structure, tower, or appurtenance, and work with both hands free. Positioning systems also are called “positioning system devices” and “work-positioning equipment.”

# Fall Protection Systems – Personal Fall Arrest System

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A personal fall arrest system is a system used to arrest an employee in the event of a fall. It consists of an anchorage, body harness, and connector(s). The means of connection may include a lanyard, deceleration device, lifeline, or a combination of these.

# Fall Protection Description

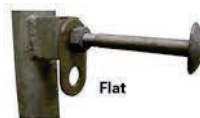
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- Fall protection can come in many forms, for this training we will focus on the equipment portion used as a personal fall arrest system when working at heights.
- This includes:
  - Ancor straps & brackets
  - Body (harness)
  - Connectors (lanyards, carabineers, sleeves, etc.)

# Anchor Straps & Brackets

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- Anchor requirement
  - ANSI Z359.18 Safety Requirements For Anchorage Connectors For Active Fall Protection Systems
  - 3600-pound minimum requirement for engineered systems
    - 2:1 Safety factor based on maximum arresting forces of 1800 lbs. (OSHA)
  - 5000-pound minimum requirement for non-engineered systems



# Full Body Harness

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- Types of harnesses used in the industry and application
  - 1 & 3 point - Bucket truck / MEWP
  - 6 point - Tower
  - H style - Tower
  - Y style - Rope Access
  - X style - General Use
- Specialized materials for different applications (welding/hot work)
- D-Ring utilization
  - Sternal - Limited fall arrest
  - Ventral - Positioning
  - Dorsal - Fall arrest
  - Hip & Seat - Positioning / Fall restraint
- Standard: ANSI Z359.11

# PPE Connectors - Carabiners

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- Carabiners
  - Shapes, locking mechanisms, materials
  - Applicable standard: ANSI Z359.12
  - Fall protection use



# PPE Connectors – Snap Hooks

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- Snap Hooks
  - Shapes, locking mechanisms, materials
  - Applicable standard: ANSI Z359.12



# PPE Connectors – Rings

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- Rings
  - Shapes (D, O, half-moon, etc.)
  - Engineered to lessen the likelihood of roll-out



# Fall Protection Components & Systems

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- Energy absorbing lanyards



# Energy Absorbing Lanyards

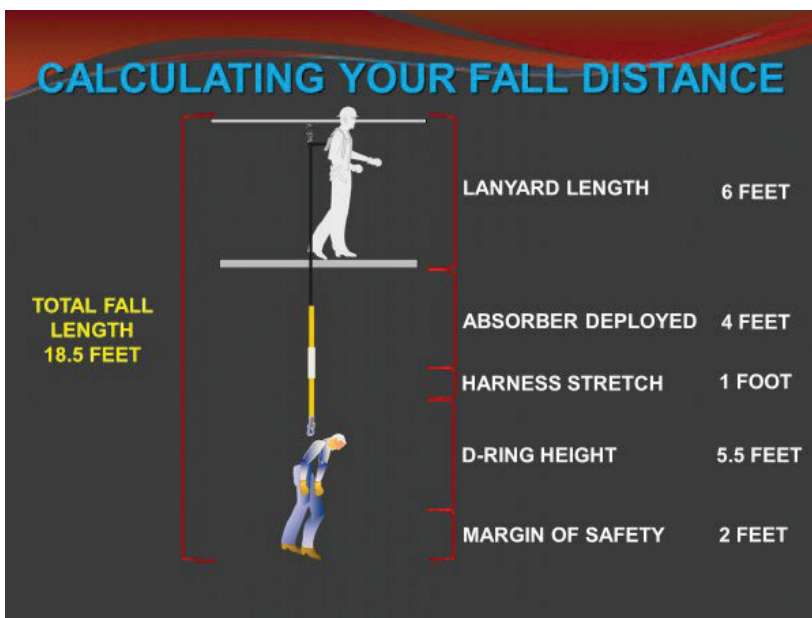
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- Shock pack location
- Number of legs
- Connector shapes
- Fall factor 1 vs 2
- SEMC testing data forces

## Standard

- ANSI Z359.13

# Clearance Calculation for Lanyards



## Standard

- Z359.13

# Self-Retracting Devices (SRD's)

---

- Classifications
  - Class 1 / Class 2
  - Leading Edge
- Harness integrated

## **Standard**

- ANSI Z359.14

# Clearance Calculations for SRD's

## Standard

- Z359.14



In both the 2012 and 2014 revisions of Z359.14, overhead performance criteria was defined by SRD class: Class A or Class B. In 2021, overhead performance was standardized across all SRDs. The performance requirements are summarized in the table below:

SRD Class	"Old" ANSI/ASSP Z359.14-2014		"New" ANSI/ASSP Z359.14-2021
	Class A	Class B	Class 1 & Class 2
<b>Maximum Arrest Force</b>	1,800 pounds		1,800 pounds
<b>Average Arrest Force*</b>	1,350 pounds*	900 pounds*	1,350 pounds*
<b>Maximum Arrest Distance</b>	24 inches	54 inches	42 inches

\*Note: During Hot, Cold, & Wet Conditioned Tests, Average Arrest Force limit is increased.

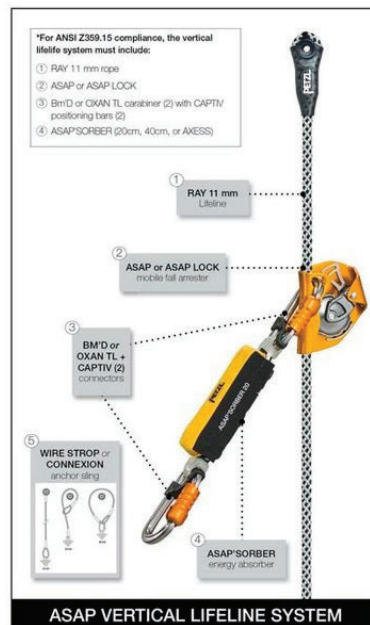
# Other Fall Protection Components & Systems

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- Vertical Lifelines
- Positioning Lanyards
- Wire Rope Safety Climbs
- Rail Ladder Systems
- Horizontal Lifelines
- Rope Access Systems

# Vertical Lifelines

## ANSI Z359.15 Single Anchor Lifeline and Fall Arrestors



# Positioning Lanyards

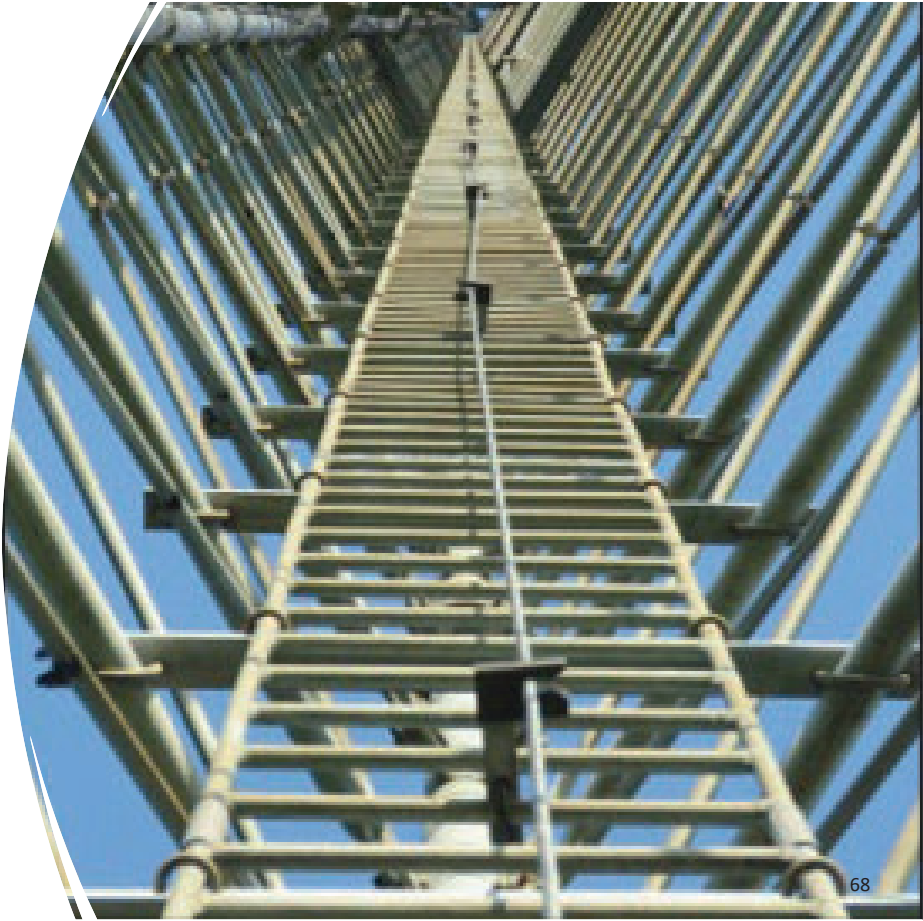
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- Types
  - Fixed
  - Adjustable
  - Material construction
    - Rope, web, chain
- Spreader bar use (where applicable)
  - Tri-axial loading elimination
- Applicable standard: ANSI Z359.3 – 3.4.3



# Wire Rope Safety Climbs

ANSI Z359.16



# Rail Ladder Systems

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ANSI Z359.16 Climbing Ladder Fall Arrest Systems



# Horizontal Lifelines

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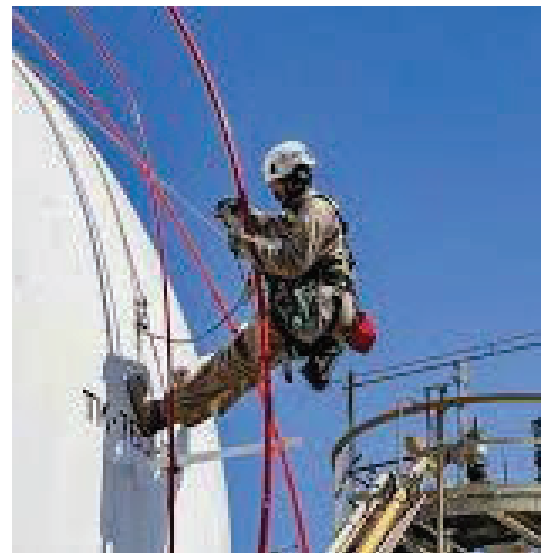
ANSI Z359.17 Safety Requirements for Horizontal Lifelines



# Rope Access Systems

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- ANSI Z459.1
- Powered Ascender White Paper (NATE)



# Section 8

## Eye and Face Protection

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Eye and Face  
Protection



Potential Eye or  
Face Hazards



Evolution



Standard

# Eye and Face Protection

According to the National Institute for Occupational Safety and Health (NIOSH) reports that approximately 2,000 U.S. workers sustain job-related eye injuries that require medical treatment each day.

The Occupational Safety and Health Administration (OSHA) requires workers to use eye and face protection whenever there is a reasonable probability of injury that could be prevented by such equipment. Personal protective eyewear, such as goggles, face shields, safety glasses or full-face respirators must be used when an eye hazard exists. The necessary eye protection depends upon the type of hazard, the circumstances of exposure, other protective equipment used, and individual vision needs.

Workers experience eye injuries on the job for two major reasons:

1. They were not wearing proper eye protection.
2. They were wearing the wrong kind of protection for the job.

(<https://www.aoa.org/healthy-eyes/caring-for-your-eyes/protecting-your-vision?sso=y#:~:text=The%20National%20Institute%20for%20Occupational,injuries%20that%20require%20medical%20treatment>).

# Eye and Face Protection

## Standard Number: 1910.133

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### 1910.133(a) General Requirements

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[1910.133\(a\)\(1\)](#) The employer shall ensure that each affected employee uses appropriate eye or face protection when exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation.

---

[1910.133\(a\)\(2\)](#) The employer shall ensure that each affected employee uses eye protection that provides side protection when there is a hazard from flying objects. Detachable side protectors (e.g. clip-on or slide-on side shields) meeting the pertinent requirements of this section are acceptable.

---

[1910.133\(a\)\(3\)](#) The employer shall ensure that each affected employee who wears prescription lenses while engaged in operations that involve eye hazards wears eye protection that incorporates the prescription in its design, or wears eye protection that can be worn over the prescription lenses without disturbing the proper position of the prescription lenses or the protective lenses.

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[1910.133\(a\)\(4\)](#) Eye and face PPE shall be distinctly marked to facilitate identification of the manufacturer.

---

1910.133(a)(5) The employer shall ensure that each affected employee uses equipment with filter lenses that have a shade number appropriate for the work being performed for protection from injurious light radiation.

# Potential Eye Hazards at Work

## Work Eye Hazards:

- Projectiles (dust, concrete, metal, wood and other particles).
- Chemicals (splashes and fumes).
- Radiation (especially visible light, ultraviolet radiation, heat or infrared radiation, and lasers).
- Bloodborne pathogens (hepatitis or HIV) from blood and body fluids.

## Types of Safety Eye Protection – depends on hazards in the workplace:

- If you are working in an area that has particles, flying objects or dust, you must at least wear safety glasses with side protection (side shields).
- If you are working with chemicals, you must wear goggles.
- If you are working near hazardous radiation (welding, lasers, or fiber optics) you must use special-purpose safety glasses, goggles, face shields or helmets designed for that task.

(<https://www.aoa.org/healthy-eyes/caring-for-your-eyes/protecting-your-vision?sso=y#:~:text=The%20National%20Institute%20for%20Occupational,injuries%20that%20require%20medical%20treatment>).

# Potential Eye or Face Hazard

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## **Hazard:**

- Dust, dirt, metal , or wood chips contacting or entering the eye from activities such as chipping, grinding, sawing, hammering, using power tools, or from sources such as strong winds.

## **Solution:**

- Safety glasses, goggles, or face shield.

# Potential Eye or Face Hazard

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## **Hazard:**

- Objects swinging into the eye or face, such as tree limbs, chains, tools, or ropes.

## **Solution:**

- Safety glasses, goggles, or face shield.

# Potential Eye or Face Hazard

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## **Hazard:**

- Chemical splashes from corrosive substances, paint, solvents, or other hazardous solutions.

## **Solution:**

- Safety goggles or face shield.
  - There are two types of safety goggles:
    - With indirect vents
    - With pinhole vents
  - For protection from a chemical splash, only indirect vented goggles should be worn.

# Potential Eye or Face Hazard

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## **Hazard:**

- Radiant energy from torch cutting, welding, harmful rays from the use of lasers or other radiant light (as well as heat, glare, sparks, splash, and flying particles).

## **Solution:**

- Welding
  - Welding helmet or goggles with correct filter lines (1910.133(a)(5))
- Lasers
  - Tinted glasses that meet ANSI Z136.1 for appropriate lens

# Evolution of Equipment

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# Standard

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Any new eye and face protective devices must comply with ANSI Z87.1.



For eye protection against the following hazards: sand, dust particles, flying fragments, large chips or objects, the lenses must meet the impact ANSI rating for Z87-2+ (Rx frame), Z87+ (Plano frame), Z87+ (all other lenses) which includes hipping, grinding, machining, masonry work, riveting, and sanding.

# Side Shields

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Glasses with side shields (built in or add on) offer additional protection.



# Prescription Glasses

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Safety glasses (tinted and clear) are available with prescription lenses through most optical providers. Over The Glasses (OTG) safety glasses are available as well.



# Lenses

Safety glasses are available with a wide variety of lenses for specific applications.



**Clear**  
Highest visual acuity and color recognition.



**Gray**  
Reduces overall brightness of visual light.



**Amber**  
Increases contrast by filtering hazy and blue-colored light.



**Indoor/Outdoor**  
Slightly reduces overall brightness of visible light.



**Blue (excl. "sodium blue")**  
Reduces brightness and glare from yellow light sources. Not intended for use in glass blowing.



**Polarized**  
Reduces overall brightness, glare and reflected light.



**Mirrored**  
Reflects light sources, helping reduce brightness.



**Photochromic**  
Darkens when exposed to UV light (outdoors) and lightens when UV light is reduced (indoors).



**Infrared Filters**  
Reduces infrared radiation.



**Brown**  
Reduces overall brightness, typically allowing color recognition.



**Vermillion**  
Helps improve visual acuity and contrast.



**Orange**  
Reduces blue light in specific applications, e.g., blue light curing.

# Section 9

## Head Protection

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- I. Head Protection
- II. Types and Categories
- III. Hard Hats
- IV. Standards

# Head Protection

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Protecting employees from potential head injuries is a key element of any safety program.

- A head injury can impair an employee for life, or it can be fatal.
- Wearing a safety helmet or hard hat is one of the easiest ways to protect an employee's head from injury.
- Hard hats can protect employees from impact and penetration hazards as well as from electrical shock and burn hazards.

Employers must ensure that their employees wear head protection if any of the following apply:

- Objects might fall from above and strike them on the head.
- They might bump their heads against fixed objects, such as exposed pipes or beams.
- There is a possibility of accidental head contact with electrical hazards.

# Types and Categories

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- There are many types of hard hats available in the marketplace today.
- Hard hats are divided into two categories:
  - Type 1 – Top impact only
  - Type 2 – Top, front, back, and side impact
- Hard hats are divided into three classes:
  - Class E – Electrical
  - Class C – Conductive (offers no protection from electricity)
  - Class G – General

# Hard Hats

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- It is essential to check the type of hard hat employees are using to ensure that the equipment provides appropriate protection.
  - Each hat should bear a label inside the shell that lists the manufacturer, the ANSI designation and the class of the hat.
- Another class of protective headgear on the market is called a “bump hat,” designed for use in areas with low head clearance.
  - They are recommended for areas where protection is needed from head bumps and lacerations.
  - These are not designed to protect against falling or flying objects and are not ANSI approved.

# Hard Hats

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# What Standards Apply

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- ANSI Z89.1 - current revision
- OSHA 29 CFR 1910.135 - safety helmet requirements (general industry)
- OSHA 29 CFR 1926.100 - head protection requirements for construction, demolition, and renovation



# Inspection

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- Per manufacturer guidelines
- Typical to see:
  - **Physical damage** caused by impacts, penetrations, abrasions, or rough treatment such as dents, nicks, cracks, tears, cuts, gouges, or holes.
  - **Brittleness, dullness, flaking, discoloration, chalkiness, fading, or anything else that appears out of the norm**, indicating degradation caused by excessive exposure to the sun, chemicals, or temperature extremes. A crazing pattern, or network of fine cracks, is another serious concern. Outdoor workers who rely on hard hats in high-visibility colors to be spotted by colleagues or oncoming motorists should especially monitor signs of fading.



# Inspection

## Visually inspect the suspension system for:

- Frays, tears, cuts, or damaged stitching in suspension straps. Cracks, tears, or loss of pliability throughout the system.
- Make sure all keys in the suspension system fit tightly in their slots. Give a gentle tug to ensure the suspension is securely attached to the shell.

## Perform an overall visual check for:

- Printed dates on shells and suspensions that have exceeded the maximum life specified by the manufacturer. Depending on the manufacturer, the recommended replacement period is calculated from the day of first use or the date of manufacture. It's often the former, so inscribing the date you receive your helmet on a label ensures a useful hard hat isn't replaced too soon.
- Missing pieces, wear, or damage to a chin strap or its plastic clips. Tug lightly on the chin strap clasps after clipping them together to make sure they don't pull apart.

## Check for shell degradation with a simple field test:

- Use both hands to squeeze your hard hat's shell inward from the sides about 1".
- Release pressure but don't drop the shell.
- Repeat the test on a new hard hat and compare its elasticity with your hard hat.
- If your hard hat's shell mimics the new shell and bounces back to its original shape quickly with no residual deformation, your equipment is in good condition. If your hard hat does not exhibit similar elasticity to the new shell or cracks because of brittleness, it must be replaced immediately.

# SECTION 10

## Foot Protection

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- I. Foot Protection
  - A. Why Use Foot Protection?
  - B. Who Should Use Foot Protection?
  - C. When to Use Foot Protection
- II. Foot Protection Best Practices
- III. Types of Foot Protection
- IV. Evolution of Footwear Protection
- V. Foot Protection Standards
  - A. OSHA 1910.136
  - B. ASTM F2413-18



# Why Use Foot Protection

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Injuries causing crushing, sprains, and lacerations which account for up to 10% of work-related injuries



Injuries related to slipping, tripping, and falling account for 15% of work-related injuries



Feet have 26 bones, 33 joints, & over 100 muscles, tendons, and ligaments surrounded by blood vessels and nerves

# Who Should Use Foot Protection

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# When to Use Foot Protection

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Examples of situations in which an employee should wear foot and/or leg protection include:

- When heavy objects such as tower sections or batteries which may roll onto or fall on the employee's feet.
- Working with sharp objects such as nails or spikes that could pierce the soles or uppers of ordinary shoes.
- Exposure to molten metal that might splash on feet or legs.
- Working on or around hot, wet, or slippery surfaces.
- Working when electrical hazards are present.

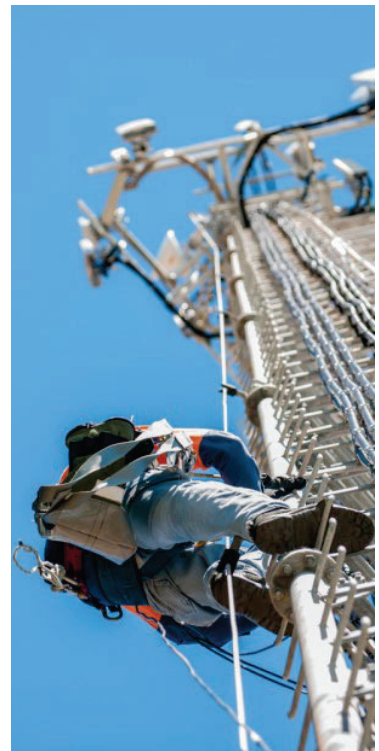


<https://ohsonline.com/Articles/2018/04/01/A-Guide-to-Safety-Footwear-Regulations.aspx?Page=3>




# Foot Protection Best Practices

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- Choose footwear carefully!
  - When climbing rung and rail type ladders or tower sections, consider utilizing footwear that has a well-defined heel that measures at least a ½" from the sole and has a hard sole or shank.
  - Consider safety toe, safety features, and slip resistance.
  - Fit should be snug; heel being gripped firmly.
- Know when to replace footwear!
  - Delamination, cracks/holes, damaged toe, too much flexibility, falling apart at seams.
- Take proper care of footwear!
  - Unlace boots before removing, clean boots regularly, treat leather, store boots properly, alternate boots.



# Foot Protection Types

Sample Activities	Hazard	Foot Protection Examples	
Working around large animals or moving equipment such as forklifts, aerial lifts, pallet jacks, heavy carts, or when moving heavy equipment or materials such as drums, large cylinders, large metal or wood pieces or lumber.	Compression	Safety toe or safety toe with metatarsal protection	
Moving heavy equipment or materials such as drums, large cylinders, large metal or wood pieces or lumber, jackhammering, pavement breaking, steel work.	Impact	Safety toe or safety toe with metatarsal protection	
Electrical maintenance work greater than 50V AC or DC, installing electrical equipment, equipment grounding, foot contact with live conductors.	Electrical shock	Electrical hazard (EH) safety toe shoes, waterproof shoes	

# Foot Protection Types

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Sample Activities	Hazard	Foot Protection Examples
Operating a snowplow, snow clearing, animal care workers (outside activities), working with molten metal.	Extreme Heat/Cold	Insulated Safety Toe Thermal Boots
Use of chainsaw, pole saw, blade/string trimmer, axe, or mattock.	Cutting tools	Logging boots, Kevlar, or cut resistant boots



# Foot Protection Types



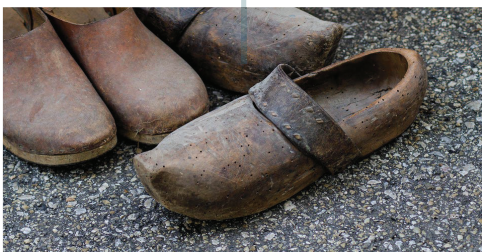
# Foot Protection Standards – OSHA 1910.136

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- Pertains to PPE in regard to foot and leg protection, in efforts to protect employees from physical, ballistic, and human factor hazards.
- “The employer shall ensure that each affected employee uses protective footwear when working in areas where there is a **danger of foot injuries due to falling or rolling objects, or objects piercing the sole**, or when the use of protective footwear will protect the affected employee from **an electrical hazard, such as a static-discharge or electric-shock hazard**, that remains after the employer takes other necessary protective measures.”



# Evolution of Protective Footwear



# Foot Protection Standards – ASTM F2413-18

*ASTM F2413-18 – Relates to performance, function, and fit of toe cap footwear*

u

- be resistant to impact and compression in toe area
- protect the metatarsal bones
- contain conductive properties
- contain static dissipative (SD) properties
- have puncture-resistant bottoms
- have the ability to resist being cut by a chainsaw
- have dielectric insulation



<https://tyndaleusa.com/blog/2021/11/05/what-are-the-changes-to-astm-f2413-18/>

# SECTION 11

## Hand Protection

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- I. Hand Protection
- II. Where and How Gloves are Used in the Industry
- III. Different Types
- IV. Evolution of Hand Protection
- V. Standards

# Hand Protection

## WATERPROOF

FULLY COATED LATEX DIP  
KEEPS HANDS DRY AND WARM



## EXTREME CUT-RESISTANT HANDLING GLOVES

FOR OPTIMAL GRIP AND HEAVY DUTY CUT  
PROTECTION WHEN WORKING WITH  
INCREDIBLY SHARP MATERIALS

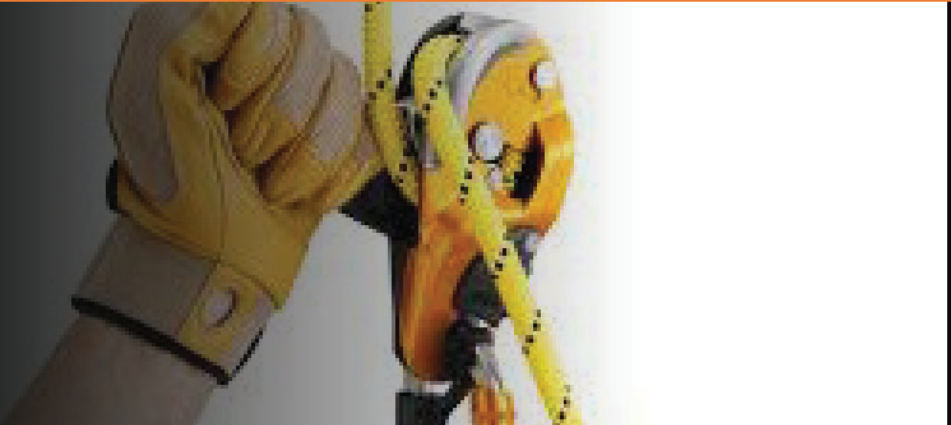


**⚠ CAUTION**  
**PLEASE REVIEW**  
**JOB HAZARD ANALYSIS**  
**AT THIS WORK STATION**



# Where and How Gloves are Used in the Industry

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# Different Types

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- Welding
- Cut resistant
- Insulated (warm)
- Hot steel protection
- Electrical resistant (non-conductive)
- Impact resistant
- Vibration resistant



# Applications

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- Rope work
- Climbing
- Potential impact
- Using knives



# Evolution of Hand Protection



# What Standards Apply

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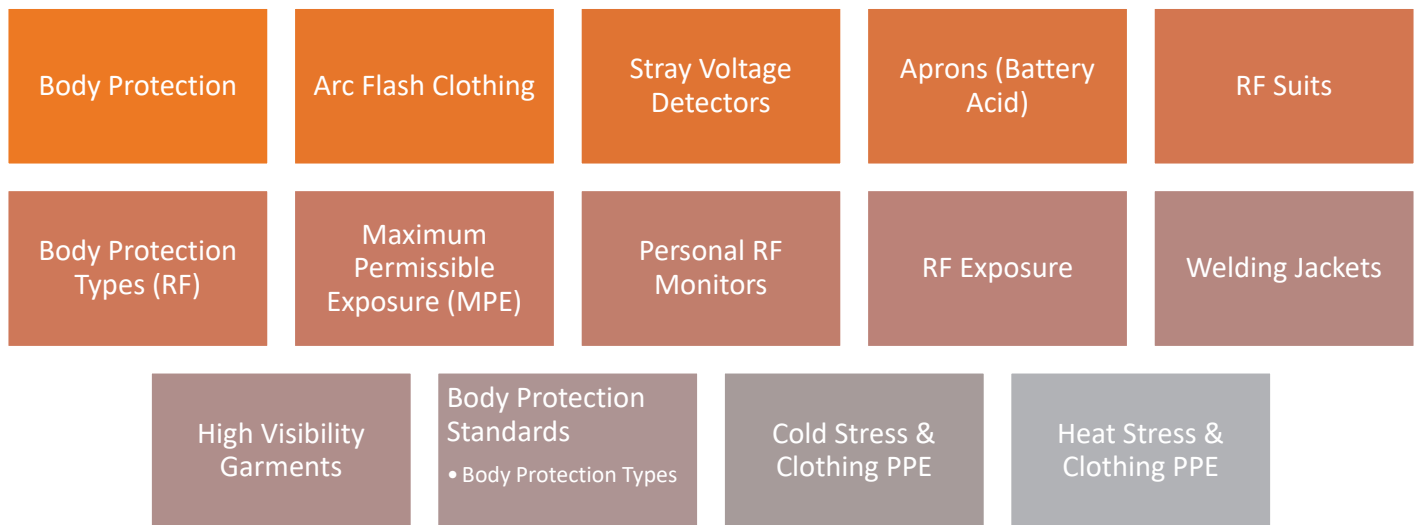
- ANSI/ISEA 105 – Hand Protection
- ANSI/ISEA 138 – American National Standard For Performance And Classification For Impact-Resistant Gloves
- OSHA 1910.138 – Hand Protection



# SECTION 12

## Body Protection

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# Various Body Protection



# Body Protection

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If a hazard assessment indicates a need for full body protection against toxic substances or harmful physical agents, carefully inspect the PPE before each use, ensure proper fit and that it properly functions for the purpose for which it is intended.

Protective clothing comes in a variety of materials, each effective against particular hazards, such as:

- Paper-like fiber is used for disposable suits to provide protection against paint, dust and splashes.
- Treated wool and cotton adapts well to changing temperatures, is comfortable and fire-resistant and protects against dust, abrasions and rough and irritating surfaces.
- Duck is a closely woven cotton fabric that protects against cuts and bruises when handling heavy, sharp, or rough materials.
- Leather is often used to protect against dry heat and flames.
- Rubber, rubberized fabrics, neoprene and plastics protect against certain chemicals and physical hazards. When chemical or physical hazards are present, check with the clothing manufacturer to ensure that the material selected will provide adequate protection against the specific hazard.

# Arc Flash Clothing (Flame Resistant)

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Since flash fires can occur quickly without warning, workers may not have a chance to escape the flames. Arc flash clothing prevents the fire from spreading and the person's clothes from burning until they can reach safety.

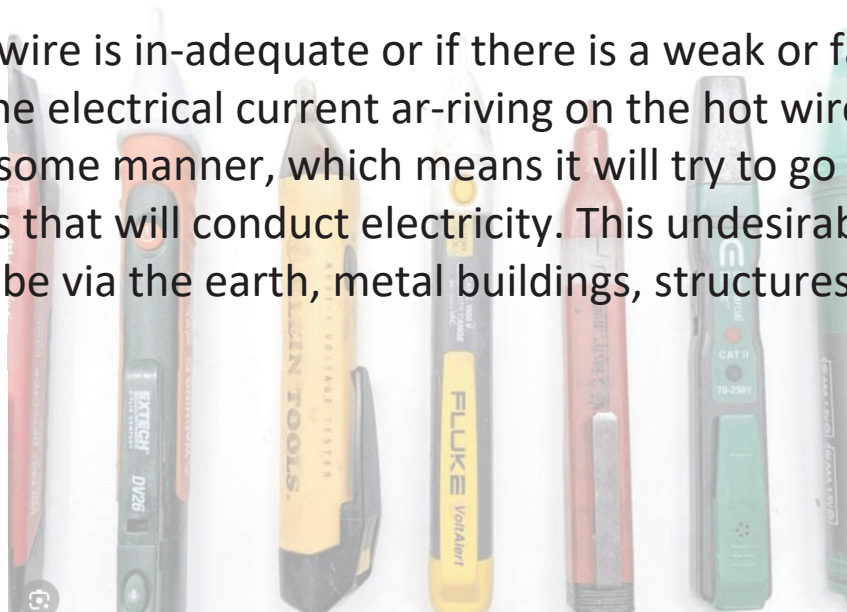
## **Standards:**

- ASTM-F 1506-22 – Flame resistant, electric arc flash rated clothing
- NFPA 70E – Standard for electrical safety in the workplace
- Appendix E to 1910.269 – Protection from flames and electric arcs
- NFPA 2112 – Standard on flame resistant clothing against short-duration thermal exposures from fire

# Stray Voltage Detectors

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If the neutral wire is in-adequate or if there is a weak or failed connection, the electrical current ar-riving on the hot wire must return to the source in some manner, which means it will try to go through any and all objects that will conduct electricity. This undesirable flow of electrons can be via the earth, metal buildings, structures, fences, or other objects.



# Aprons (Battery Acid) 1910.268

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## Workers must wear:

- PPE when handling or using batteries or electrolyte (acid).
- Rubber gloves and overalls, or apron protective equipment, if the battery is cracked or otherwise damaged.
- Safety goggles or a face shield when working on, moving, or charging batteries.

## Standard

- NFPA 70E- Standard for Electrical Safety in the Workplace.

# RF Suits

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- Personal protective clothing along with a monitor should only be used if there is no alternative but to work in an area that exceeds the FCC's maximum permissible exposure limit, and if use of the clothing is part of an overall safety program. Such a situation would arise when an antenna cannot be turned off or is utilized under intermittent operation that cannot be locally controlled. If these conditions exist, a full RF protective suit should be used, including an integrated hood, overshoes, socks, and gloves.
- When worn with a personal monitor, the monitor should be worn on the outside of the protective suit. Otherwise, the monitor will not work properly. It is important to be aware that use of protective clothing may impede mobility.

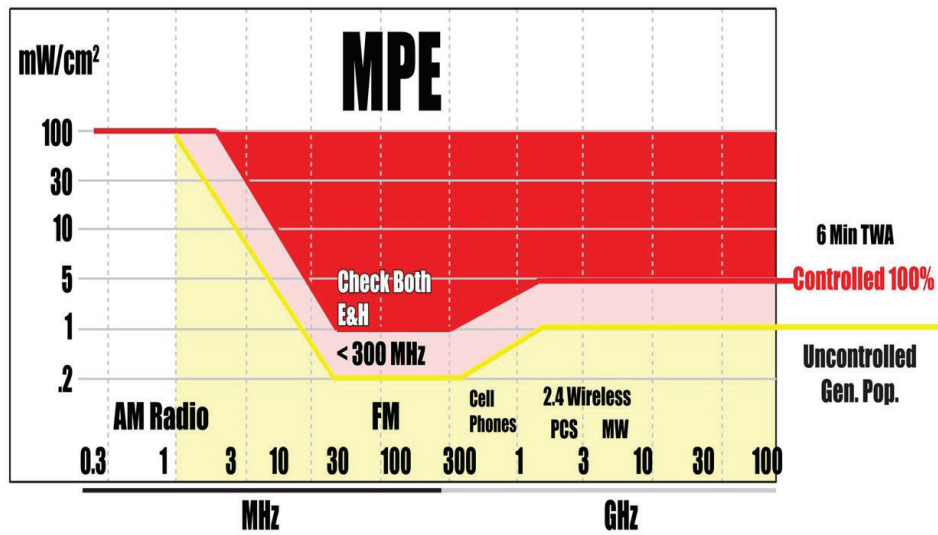
# Body Protection Types

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RF Suits



# Maximum Permissible Exposure (MPE)



# Personal RF Monitors



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.



Provide monitoring for areas where RF may be present.



# RF Exposure

## Telecom Climb Facility Hazards



# Welding Jackets

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Welding jackets protect workers from sparks, spatter, slag, and flame. Garments are made from leather, cotton, or composite materials that resist burning and melting. Jackets cover the arms and torso, extending to the hip.

## Standards

- ASTM F1506
- ANSI Z49.1
- OSHA 1910.132-135
- ISO 11612: 2015
- ISO 13688:2013
- ISO 14116:2015
- ISO 14877:2002



# High Visibility Garments

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- Construction workers, road-workers, utility workers, and transportation workers need to stand out so that drivers and equipment operators can see them. That's why they are required by law to wear high-visibility clothing.
- All workers within the right-of-way of a Federal-aid highway who are exposed either to traffic (vehicles using the highway for purposes of travel) or to construction equipment within the work area shall wear high-visibility safety apparel, (DOT 23 CFR 634).

\*Always verify with local jurisdiction for requirements.

# Body Protection Types

Garment Type	Type "O" (Off-Road)	Type "R" (Roadway)	Type "R" (Roadway)	Type "P" (Fire, Police, EMS Personnel)	Type "P" (Fire, Police, EMS Personnel)	Supplemental Items (Garments with Legs, including Gaiters)
Performance Class	Class 1	Class 2	Class 3	Class 2	Class 3	Class E
Background Material Amounts	217 in <sup>2</sup>	775 in <sup>2*</sup>	1240 in <sup>2**</sup>	450 in <sup>2</sup>	775 in <sup>2</sup>	465 in <sup>2</sup>
Retroreflective Material Amounts	155 in <sup>2</sup>	201 in <sup>2</sup>	310 in <sup>2</sup>	201 in <sup>2</sup>	310 in <sup>2</sup>	109 in <sup>2</sup>
Width Minimums of Retroreflective Materials	1"	1.38" (1" for split trim designs)	2" (1" for split trim designs)	2" (1" for split trim designs)	2" (1" for split trim designs)	2" (1" for split trim designs)

# Body Protection Standards

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## Standards:

- ANSI/ISEA 107-2020
  - Type O – Off-road
  - Type R – Roadway
  - Type P – Public
  - Class 1,2,3
- ANSI/ISEA 207
- MUTCD part 6
- OSHA 23 CFR 634 US DOT (traffic workers)



# Cold Stress & Clothing PPE

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In a cold environment, most of the body's energy is used to keep the internal core temperature warm. Over time, the body will begin to shift blood flow from the extremities (hands, feet, arms, and legs) and outer skin to the core (chest and abdomen). This shift allows the exposed skin and the extremities to cool rapidly and increases the risk of frostbite and hypothermia.

# Dressing Properly

Dressing properly is extremely important to preventing cold stress and the type of fabric worn also makes a difference.

- Cotton loses its insulation value when it becomes wet.
- Wool, silk, and most synthetics retain their insulation even when

The following are recommendations for working in cold environments:

- Layering provides better insulation (base, middle, and outer layers) are key.
  - A base layer of wool, silk, or synthetic to keep moisture away from the body.
  - A middle layer of wool, fleece, or synthetic to provide insulation even when wet.
  - An outer wind and rain protection layer that allows some ventilation to prevent overheating.
- Avoid wearing wet clothes.
- Wear a hat to help keep your whole-body warmer. Hats reduce the amount of body heat that escapes from your head.
- Use a knit mask to cover the face and mouth (if needed).
- Carry extra socks, gloves, hats, jacket, and a change of clothes.
- Use insulated gloves to protect the hands (water resistant if necessary).
- Wear insulated and waterproof boots (or other footwear).

# Safety Tips for Workers

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- Your employer should ensure that you know the symptoms of cold stress.
- Monitor your physical condition and that of your coworkers.
- Take regular breaks to warm up when needed.
- Dress properly for the cold.
- Stay dry in the cold because moisture or dampness, e.g. from sweating, can increase the rate of heat loss from the body.
- Keep extra clothing (including underwear) handy in case you get wet and need to change.
- Drink warm sweetened fluids (no alcohol).
- Avoid touching cold metal or wet surfaces with bare skin.
- Use proper engineering and administrative controls.

# Heat Stress & Clothing PPE

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Workers may be required to work in hot environments, and sometimes for extended periods. Heat stress is a common problem encountered in these types of situations. A heat index above 104 degrees Fahrenheit is considered a dangerous heat day.

# Heat Stress

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## Heat Stress Engineering Controls

- Air conditioning, fans + increased ventilation
- Natural shade + portable shelters
- Reflective shields to redirect radiant heat
- Sealing steam leaks by insulating water vapor pressure



## Heat Stress Administrative Controls

- Risk, symptom + first-aid training
- Acclimatization
- Regular hydration
- Scheduling + pacing of work based on time of day
- Frequent breaks
- Reduced physical demands

# Heat Stress PPE

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- Cooling towels, vests, head-wear + hard hat accessories
- Moisture-wicking or absorbing sweatbands, head-wear + other accessories
- Polarized safety glasses
- Sunscreen
- UPF rated apparel



# Protecting Workers from Heat Stress

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OSHA's National Emphasis Program for Heat is the agency's first nationwide enforcement measure to protect millions of outdoor and indoor workers from the increasing threat of heat-related illness.



## Protecting Workers from Heat Stress

### Heat Illness

Exposure to heat can cause illness and death. The most serious heat illness is heat stroke. Other heat illnesses, such as heat exhaustion, heat cramps and heat rash, should also be avoided.

There are precautions that can be taken any time temperatures are high and the job involves physical work.

[www.osha.gov/heat/employer-responsibility](http://www.osha.gov/heat/employer-responsibility)

# Heat Stress Standards and Documents

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OSHA - National Emphasis Program (NEP) CPL\_03-00-024



## OSHA INSTRUCTION

U.S. DEPARTMENT OF LABOR

Occupational Safety and Health Administration

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**DIRECTIVE NUMBER:** CPL 03-00-024

**EFFECTIVE DATE:** April 8, 2022

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**SUBJECT:** National Emphasis Program – Outdoor and Indoor Heat-Related Hazards

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# Section 13

## Hearing Protection

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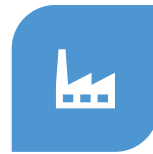
HEARING  
PROTECTION



TYPES OF HEARING  
PROTECTION



NOISE LEVELS



WHERE AND HOW  
IT IS USED IN THE  
INDUSTRY



STANDARDS

# Hearing Protection

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Certain operations generate noise requiring hearing protection.

Employee exposure to excessive noise depends upon a number of factors, including:

- The noise level, as measured in decibels (dB).
- The duration of each employee's exposure to the noise.
- Whether employees move between work areas with different noise levels.
- Whether noise is generated from one or multiple sources.
- Generally, the louder the noise, the shorter the exposure time before hearing protection is required.

# Types of Hearing Protection

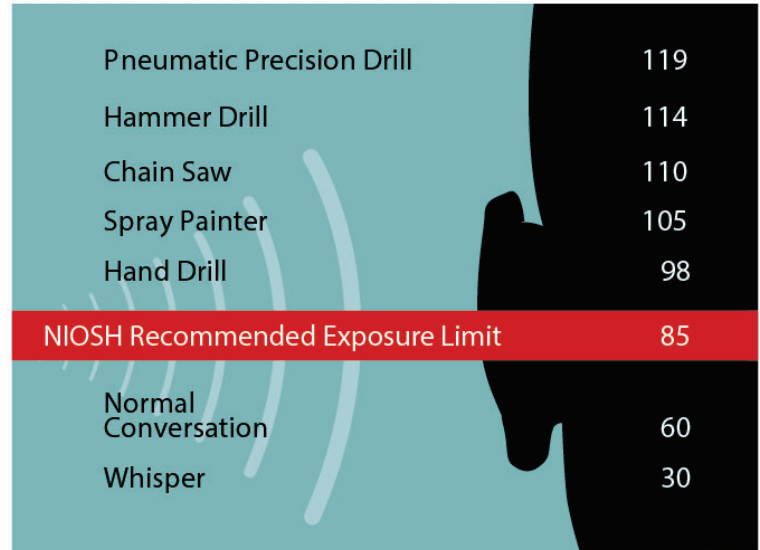
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- Single-use earplugs are made of waxed cotton, foam, silicone rubber.
  - They are self-forming and, when properly inserted, they work as well as most molded earplugs.
- Pre-formed or molded earplugs must be individually fitted by a professional and can be disposable or reusable.
  - Reusable plugs should be cleaned after each use.
- Earmuffs require a perfect seal around the ear.
  - Glasses, facial hair, long hair or facial movements such as chewing may reduce the protective value of earmuffs.

# Noise Levels

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## NOISE LEVELS BY DECIBELS



Pneumatic Precision Drill	119
Hammer Drill	114
Chain Saw	110
Spray Painter	105
Hand Drill	98
<b>NIOSH Recommended Exposure Limit</b>	<b>85</b>
Normal Conversation	60
Whisper	30



Sources: NIOSH Noise Meter [http://www.cdc.gov/niosh/topics/noise/noisemeter\\_html/hp98.htm](http://www.cdc.gov/niosh/topics/noise/noisemeter_html/hp98.htm)  
NIOSH Power Tools Data Base <http://www.cdc.gov/niosh-sound-vibration/>

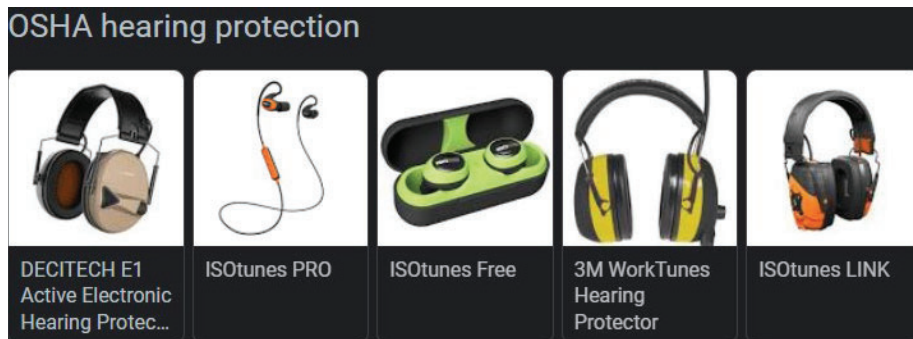
CPWR  THE CENTER FOR CONSTRUCTION  
RESEARCH AND TRAINING

# Where and How it is Used

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Under the promulgated regulation [29 CFR 1910.95(i)(1)], OSHA requires that:

- Employers shall make hearing protectors available to all employees exposed to an 8-hour time-weighted average of 85 decibels or greater at no cost to the employees.
- Hearing protectors shall be replaced, as necessary.



# How to Use Formable Earplugs

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# Standard

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OSHA 1910.95(b) – Occupational Noise Exposure (general industry)

OSHA 1926.101 – Hearing Protection (construction)

**Permissible Noise Exposures**

<b>Duration per day, hours</b>	<b>Sound level dBA slow response</b>
8	90
6	92
4	95
3	97
2	100
1	105
½	110
¼ or less	115

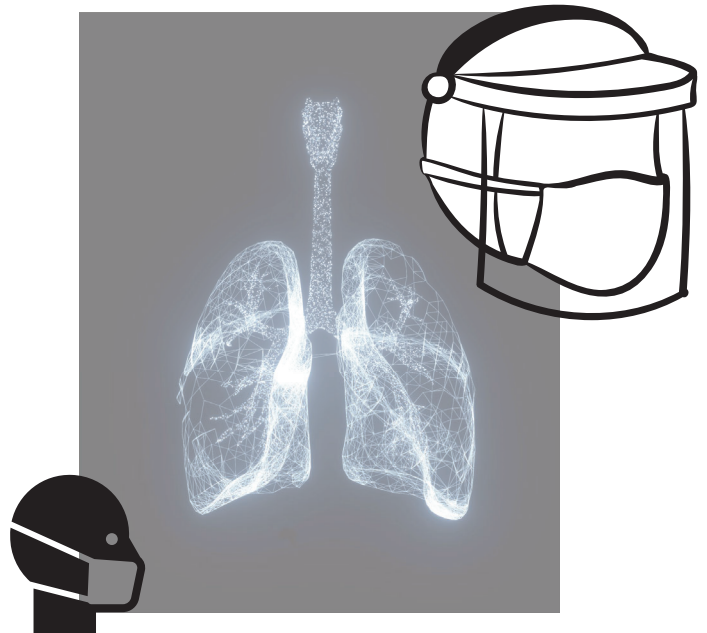
[www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.95](http://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.95)

# Section 14

## Respiratory Protection

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- I. Respiratory Hazards
- II. Types of Respiratory Protection



# Respiratory Hazards

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Gases, dusts, mists, and fumes may be present at construction worksites and are referred to as respiratory hazards.

More examples of respiratory hazards in construction include:

- Lead dust and fumes from grinding, welding, cutting, or brazing surfaces coated with lead-based paint.
- Silica dust from cutting concrete or sandblasting.
- Solvent vapors from adhesives, paints, strippers, cleaning solvents, and spray coatings, and
- Isocyanate vapors from spray foam insulation and certain spray paints or coatings.

# Types of Respiratory Protection

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There are two main types of respiratory protection:

1. Air-Purifying Respirators (APRs)
2. Atmosphere-Supplying Respirators (ASRs)

Each respirator type provides a different level of protection based on its design.

- It is important to choose the right type of respirator for the specific exposure.
  - Identify all respiratory hazards in your environment, and
  - the amount of exposure.

Each type of respirator has an assigned protection factor (APF).

- This indicates the level of protection you can expect to receive from that respirator.

# TYPES OF RESPIRATORY PROTECTION



**Elastomeric Half Facepiece Respirators** are reusable and have replaceable cartridges or filters. They cover the nose and mouth and provide protection against gases, vapors, or particles when equipped with the appropriate cartridge or filter.



**Elastomeric Full Facepiece Respirators** are reusable and have replaceable canisters, cartridges, or filters. The facepiece covers the face and eyes, which offers eye protection.



**Filtering Facepiece Respirators** are disposable half facepiece respirators that filter out particles such as dusts, mists, and fumes. They do NOT provide protection against gases and vapors.



**Powered Air-Purifying Respirators (PAPRs)** have a battery-powered blower that pulls air through attached filters, canisters, or cartridges. They provide protection against gases, vapors, or particles, when equipped with the appropriate cartridge, canister, or filter. Loose-fitting PAPRs do not require fit testing and can be used with facial hair.



**Supplied-Air Respirators** are connected to a separate source that supplies clean compressed air through a hose. They can be lightweight and used while working for long hours in environments not immediately dangerous to life and health (IDLH).



Example of an open-circuit SCBA

**Self-Contained Breathing Apparatus (SCBAs)** are used for entry into or escape from environments considered to be IDLH. They contain their own breathing air supply and can be either open circuit or closed circuit.



Example of an SAR/SCBA

**Combination Respirators** can be either a supplied-air/SCBA respirator or supplied-air/air-purifying respirator. The SCBA type has a self-contained air supply if primary airline fails and can be used in IDLH environments. The air-purifying type offers protection using both a supplied-air hose & an air-purifying component and cannot be used for entry into IDLH environments.



Centers for Disease Control and Prevention  
National Institute for Occupational Safety and Health

September 2019

# Selection of Respirators

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- Selected based on respiratory hazard worker(s) is exposed to.
- Only NIOSH (National Institute of Safety and Health) certified respirators should be used.
- Selected from different models and sizes so it properly fits employee.

## **For Non-IDLH Atmospheres:**

- Employer provides a respirator that is adequate for the protection of employee health.
- Dust mask, full face piece.

# Evaluation Requirements

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- Must work in an environment that requires a respirator.
- Medical evaluation is provided by the employer to determine the employee's ability to use a respirator.
- A medical evaluation questionnaire is mandatory.

# Fit Tested Requirements

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- Must be fit tested with same brand, model, and size that will be used.
  - Perform a user seal check to determine if the respirator is being properly worn.
    - Can be completed by:
      - Positive Pressure Check
      - Negative Pressure Check
- Must be tested before first use and each time the respirator is put on.
- **NOTE:**
  - Facial hair may not be permitted if employee will use a respirator that requires a tight seal.
  - Corrective glasses, dentures, or any condition that interferes with a tight seal.
  - Not every respirator can be checked using both positive and negative pressure.
  - Refer to the manufacturer's instructions on the box or individual respirator packaging, for conducting user seal checks on any specific respirator.

# Respirator Seal Check

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# Maintenance Requirements

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- Respirators should:
  - Be clean and disinfected as:
    - Often as necessary if used by one employee
    - After each use if used by more than one employee
  - Stored and protected from damage, dust, and sunlight
  - Inspected before use and if found defective **DO NOT USE** and notify supervisor

# Section 15

## Climbing Facilities

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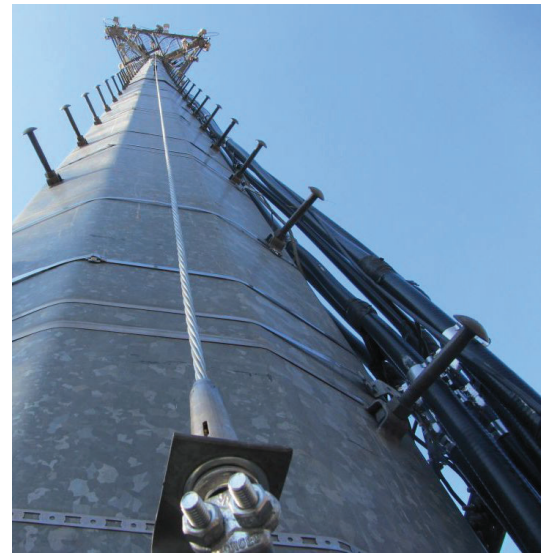
- I. What is a Climbing Facility?
- II. Inspection Requirements to Determine Proper PPE Selection
- III. Telecom Climb Facility Types
- IV. Safety Climbs
  - A. TIF White Paper: Climbing Facilities
- V. Climbing Path Obstructions
  - A. Wire Rope Safety Climbs
  - B. Fall Arrest Lanyard Testing
  - C. Safety Sleeve Testing
- VI. Step Bolts & Anchor Brackets
  - A. Step Bolt Testing
  - B. Planning Advisory Notice: Step Bolts

# What is a Climbing Facility?

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ANSI/TIA-222-I (2024): A climbing facility intended to provide access by a climber to a location on a structure such as:

- steps, rung and rail, or step bolts which are attached to the structure
- members which form an integral part of the structure
- fall protection anchorages
- climber platforms and support rails



# Inspection Requirements to Determine Proper PPE Selection

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Per ANSI/ASSP A10.48-20:

*Inspection of the climbing facility, including attachments to the structure, shall be inspected prior to use for corrosion, damage, deformations, and/or deterioration. All visible connections, including welds, shall be secure and in good condition before use.*

Inspection may determine what PPE will be utilized for the fall protection plan.



Before Repair



After Repair

# Inspection Requirements to Determine PPE

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## Per ANSI/TIA 222-I:

- When a safety climb device is not continuous over the entire height, climber attachment anchorages shall be available at a maximum spacing of 4 ft [1.2 m] over the height not equipped with a safety climb device.
- A safety climb device is not required for each climbing facility when multiple climbing facilities are provided. The safety climb device shall be provided for the climbing facility that is continuous over the height of the structure.
- Ladder cages and hoops are not recommended for communication structures due to the need to service the structure at various locations. If provided, a separate safety climb device is required for structures over 30 ft. [9 m] in height.

# Inspection Requirements to Determine PPE (continued)

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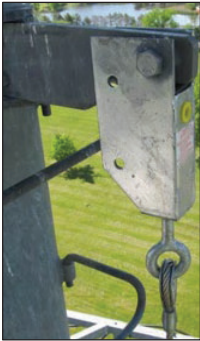


Per ANSI/TIA 222-I:

- Climbing and safety climb devices need not be installed over the entire height of a structure when their installation would adversely affect the performance of an antenna. In such case, the structure shall be equipped with a warning sign or climber attachment anchorages shall be provided.
- Structures not designed for nor equipped with a climbing facility over their entire height (i.e., structures not intended to be climbed that are maintained by other access means), need not have warning signs.

# Telecom Climb Facility Types

Monopole Step Bolts



Monopole Drop-In Steps



# Telecom Climb Facility Types (continued)

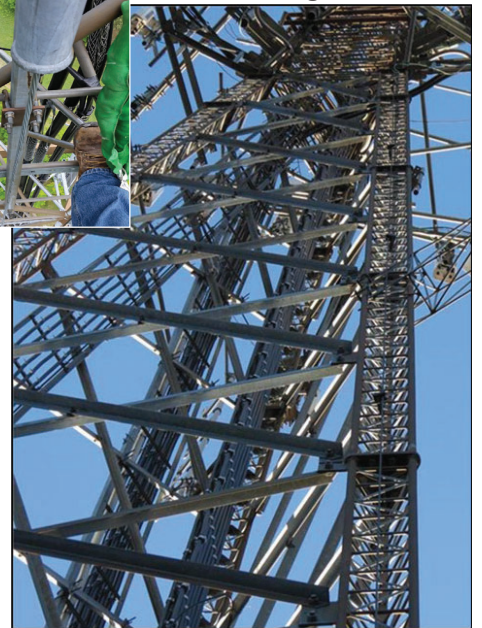
Face Climb



Ladder

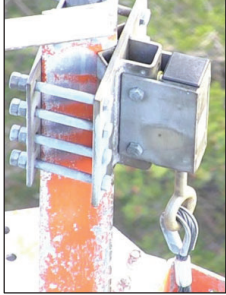


Lattice Leg Climb



# Telecom Climb Facility Types (continued)

Angle Leg Climb



Round Climb Leg



# Safety Climbs

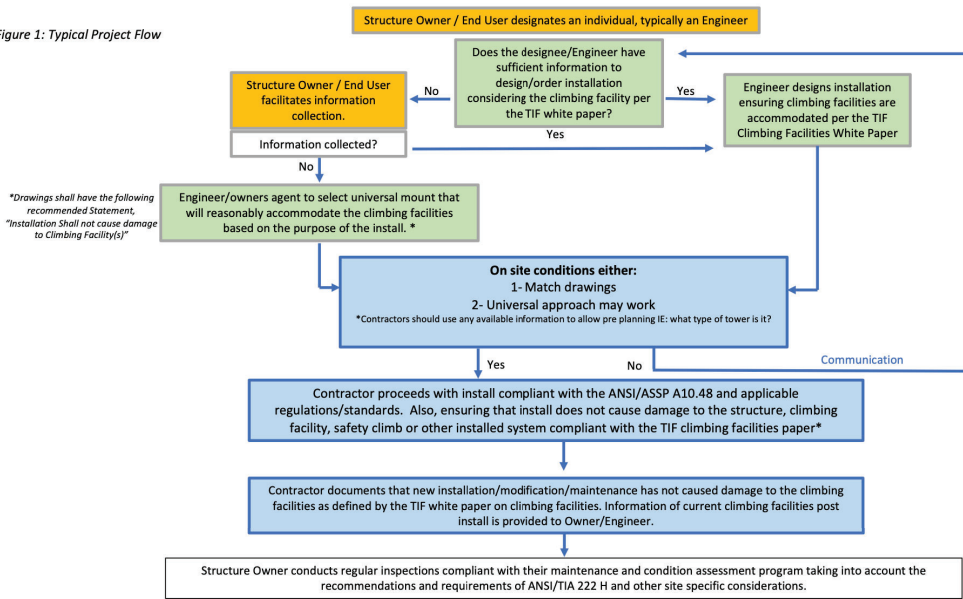
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- Never assume
- Have a place to tie off
- Non-releasing keeper must be installed
- Do no harm



# TIF White Paper: Climbing Facilities

Figure 1: Typical Project Flow



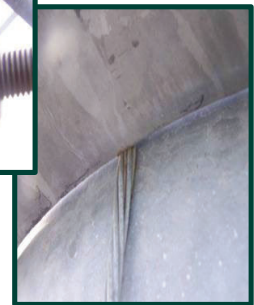
Note: Process shown is typical for the installation/modification/maintenance of towers and appurtenances and consideration of the climbing facilities as defined in the TIF Climbing Facilities White Paper. End user, contractor shall report final configuration of the climbing facilities.

# Climbing Path Obstructions

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## ***What is a climbing path obstruction?***

Obstructions are allowed per ANSI/TIA-222 and is any appurtenance and/or structural modification that physically blocks the climbing facility, as necessary, for the antenna supporting structure's primary purpose.



## ***What is a confined safety climb?***

Occurs when the safety climb wire rope is physically trapped behind an appurtenance, feed lines and/or structural modification, without adverse impact to the wire rope, and the competent climber must use alternate means of fall protection to navigate the obstacle.

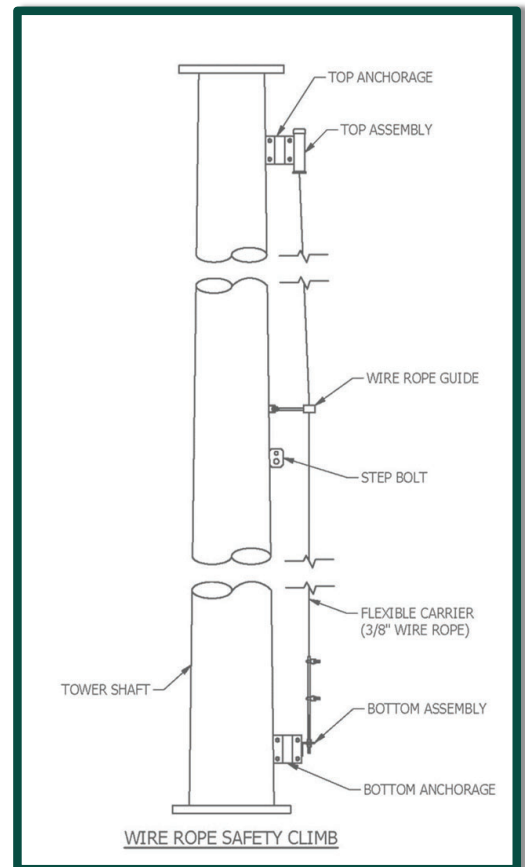
## ***What is a wire rope safety climb obstruction?***

Any appurtenance and/or structural modification that diverts the safety climb (horizontally or vertically), and shall not harm the wire rope, or affect the function of the top assembly.

# Wire Rope Safety Climbs

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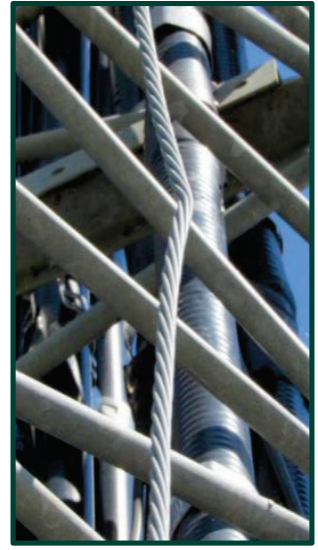
- Wire rope condition meets or exceeds requirements as specified by ASME B30.30.
- Wire rope is pre-tensioned. Environmental conditions may impact wire rope safety climb tensions throughout the day.
- Size (3/8 in. diameter wire rope) and type (1x7 or 7x19) are compatible with the safety sleeve.



# Wire Rope Safety Climbs

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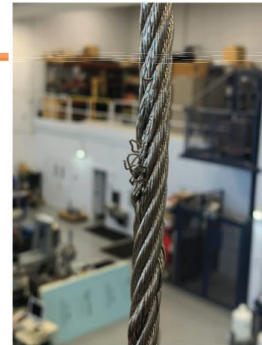
- For obstructed wire rope paths, the obstruction(s) have not damaged the wire rope or affected the function of the system.
- Wire rope is secured by wire rope safety climb guides at minimum intervals of 40 feet (12.2 m), unless otherwise specified by the manufacturer.
- The safety climb, including the top and bottom assemblies, shall be visually inspected to ensure proper installation and anchorage or load tested under controlled conditions.



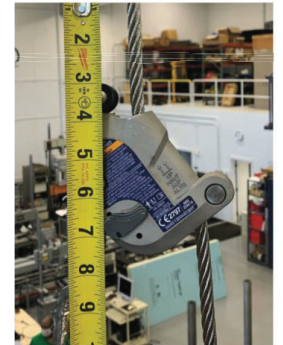
# SEMC Wire Rope Safety Climbs

Drop #	Wire Rope Safety Sleeve	Initial Wire Rope Tension (lbf)	Arrested Test Torso	Wire Rope Safety Sleeve Travel Distance (Inches)	Post Drop Wire Rope Condition	Post Drop Wire Rope Tension (lbf)	Notable Post Drop Wire Rope Safety Sleeve Condition	Post Drop Climbing Facility Condition
1	TUF-TUG WG-500	400	Yes	2 3/4"	Broken Individual Wires	40 ***	N/A	**
2	3M Lad-Saf X3	400	Yes	2 3/4"	Flattening	240	N/A	**
3	Skylootec Claw	400	Yes	2 5/8"	**	340	N/A	**
4	Miller Vi-Go (SW)	400	No	*	**	320	Carabiner connecting device gate sheared	**

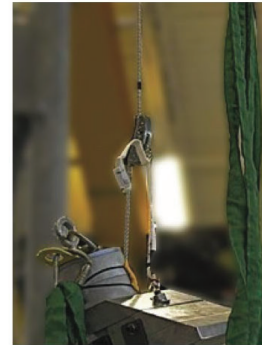
\* Caught by safety sling.  
 \*\* Wire rope safety climb system, including climbing facility, showed no signs of wear or damage during/post drop test.  
 \*\*\* Initial drop test may have affected the top assembly and/or climbing facility, resulting in lower post drop wire rope tensions.



Drop 1



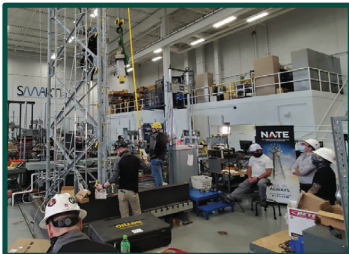
Drop 2



Drop 3



Drop 4



# SEMC Wire Rope Safety Climbs

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The SEMC would like to reiterate the recommendations and user warnings previously listed in the SEMC 2020 Guide for Wire Rope Safety Climbs on Antenna Supporting Structures:

- Do not leave unattended or non-secured wire rope safety sleeves attached to the wire rope safety climb.
- The user shall verify that the wire rope safety sleeve meets and is utilized per the manufacturer's specification and is compatible with the wire rope safety climb to be used, including the wire rope diameter and construction.
- All wire rope safety climbs must be properly tensioned and installed per the manufacturer's instructions.
- Manufacturer supplied carabiners with captive pins must be used in conjunction with the wire rope safety sleeve for proper function.
- User's harness and/or body shall not come in contact with the wire rope safety sleeve while ascending or descending on the wire rope safety climb system.
- Always refer to manufacturer documentation for use and inspection.



# SEMC Fall Arrest Lanyard Testing

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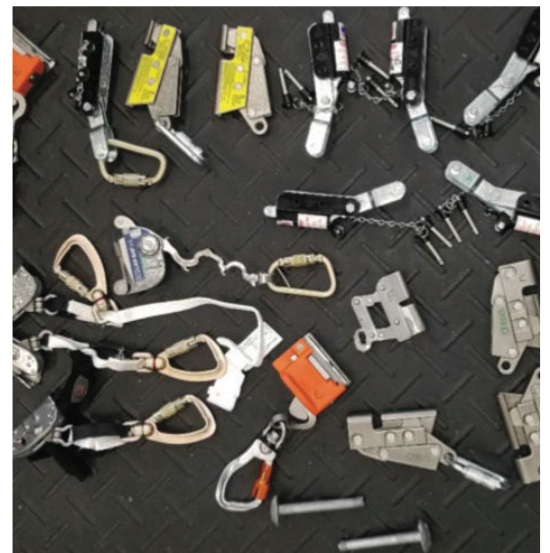


*Video conducts a deep dive on the SEMC's protocols and procedures that were implemented to test fall arrest lanyards by replicating how they are utilized by technicians in the field at tower sites.*

# NATE Safety Sleeve Testing White Paper

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- Over 110 test drops completed to push the design limits and standards of safety sleeves, replicated with real-world use and application in mind.
- Testing results confirmed that the existing ANSI/ASSP Z359 standard testing protocol is not robust enough.
- The results from this test prove that tower climbers who leave the safety sleeve unsupported may come back to find their sleeve has dropped to the bottom of the tower.
  - This test shows that sleeves need to be secured at all times when left attached to the safety climb system.
  - Some sleeves travel more than others, but from the limited testing completed during this event, the results reflect that it is not a best practice to leave the sleeve unsecured on the safety climb system when working at heights.



# Step Bolts

## *Step Bolts Designed According to ANSI/TIA-222-H*

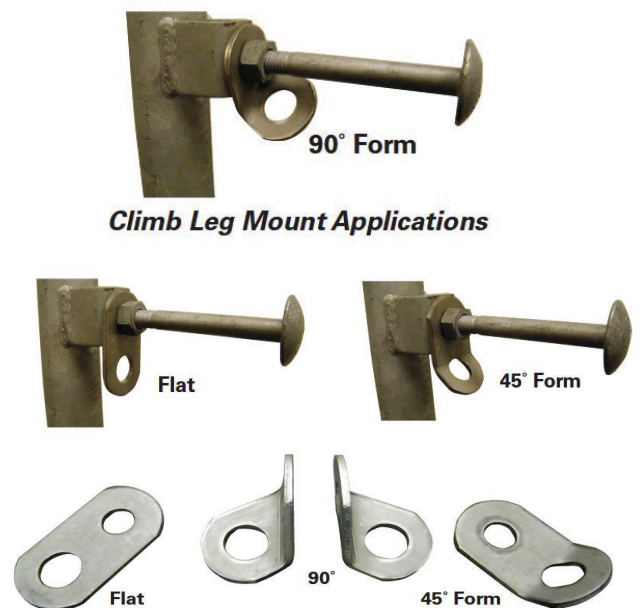


- Load factor of 1.2 applied to dead loads for determining strength requirements
- Designed to support a minimum normal concentrated factored load equal to 600 lbs. applied 2 inches from the inside face of the step bolt head.
- Step bolt clip strength requirements.

***Step bolts are not designed to support appurtenances – including safety climbs!***

# Step Bolts & Anchor Brackets

- Factored strength requirements for clarity.
- Climbing facility strength and dimensional requirements unique to Industry (continuous tie-off for all activity including working on a ladder).
- Step bolt material (toughness), dimensions, strength, installation, reuse, and inspection criteria.
  - Placement for poles at ports, flanges, top and bottom of sections, slip splices.
  - Placement for latticed structures function of face width and distance between panel points of bracing pattern (single or each leg requirement).
- Step bolt clip material requirements.



# SEMC Step Bolt Testing

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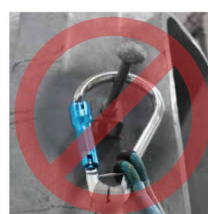
*Video Highlights Key Findings on Step Bolts Designed to Enhance the Safety of Tower Technicians Working at Heights*



# Planning Advisory Notice: Step Bolts

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- **STEP BOLTS ARE NEVER TO BE RELIED UPON AS A FALL PROTECTION ANCHORAGE POINT.**
- Step bolts are specifically designed and intended for access and egress as a part of the climbing facility.
- Proper inspection due to changed conditions will always require a competent person and training that ensures that the inspection and equipment is effective based upon the work to be undertaken.
- Step bolt fall protection engineered anchorages are available from multiple sources and can be utilized provided they are properly installed and inspected, and the correct PPE is selected.
- Manufacturers' design requirements and specifications are to be adhered to.
- Communication is critical as with so much that is undertaken in our industry.



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Thank  
you!

# APPENDIX

## Hand and Arm Protection

If a workplace hazard assessment reveals that employees face potential injury to hands and arms that cannot be eliminated through engineering and work practice controls, employers must ensure that employees wear appropriate protection. Potential hazards include skin absorption of harmful substances, chemical or thermal burns, electrical dangers, bruises, abrasions, cuts, punctures, fractures and amputations. Protective equipment includes gloves, finger guards and arm coverings or elbow-length gloves.

Employers should explore all possible engineering and work practice controls to eliminate hazards and use PPE to provide additional protection against hazards that cannot be completely eliminated through other means. For example, machine guards may eliminate a hazard. Installing a barrier to prevent employees from placing their hands at the point of contact between a table saw blade and the item being cut is another method.

### Types of Protective Gloves

There are many types of gloves available today to protect against a wide variety of hazards. The nature of the hazard and the operation involved will affect the selection of gloves. The variety of potential occupational hand injuries makes selecting the right pair of gloves challenging. It is essential that employees use gloves specifically designed for the hazards and tasks found in their workplace because gloves designed for one function may not protect against a different function even though they may appear to be an appropriate protective device.

The following are examples of some factors that may influence the selection of protective gloves for a workplace.

- Type of chemicals handled.
- Nature of contact (total immersion, splash, etc.).
- Duration of contact.

- Area requiring protection (hand only, forearm, arm).
- Grip requirements (dry, wet, oily).
- Thermal protection.
- Size and comfort.
- Abrasion/resistance requirements.

Gloves made from a wide variety of materials are designed for many types of workplace hazards. In general, gloves fall into four groups:

- Gloves made of leather, canvas or metal mesh;
- Fabric and coated fabric gloves;
- Chemical- and liquid-resistant gloves;
- Insulating rubber gloves (See 29 CFR 1910.137 and the following section on electrical protective equipment for detailed requirements on the selection, use and care of insulating rubber gloves).

### **Leather, Canvas or Metal Mesh Gloves**

Sturdy gloves made from metal mesh, leather or canvas provide protection against cuts and burns. Leather or canvas gloves also protect against sustained heat.

- Leather gloves protect against sparks, moderate heat, blows, chips and rough objects.
- Aluminized gloves provide reflective and insulating protection against heat and require an insert made of synthetic materials to protect against heat and cold.
- Aramid fiber gloves protect against heat and cold, are cut- and abrasive-resistant and wear well.
- Synthetic gloves of various materials offer protection against heat and cold, are cut- and abrasive-resistant and may withstand some diluted acids. These materials do not stand up against alkalis and solvents.

## **Fabric and Coated Fabric Gloves**

Fabric and coated fabric gloves are made of cotton or other fabric to provide varying degrees of protection.

- Fabric gloves protect against dirt, slivers, chafing and abrasions. They do not provide sufficient protection for use with rough, sharp or heavy materials. Adding a plastic coating will strengthen some fabric gloves.
- Coated fabric gloves are normally made from cotton flannel with napping on one side. By coating the unnapped side with plastic, fabric gloves are transformed into general-purpose hand protection offering slip-resistant qualities. These gloves are used for tasks ranging from handling bricks and wire to chemical laboratory containers. When selecting gloves to protect against chemical exposure hazards, always check with the manufacturer or review the manufacturer's product literature to determine the gloves' effectiveness against specific workplace chemicals and conditions.

## **Chemical- and Liquid-Resistant Gloves**

Chemical-resistant gloves are made with different kinds of rubber: natural, butyl, neoprene, nitrile and fluorocarbon (viton); or various kinds of plastic: polyvinyl chloride (PVC), polyvinyl alcohol and polyethylene. These materials can be blended or laminated for better performance. As a general rule, the thicker the glove material, the greater the chemical resistance, but thick gloves may impair grip and dexterity, having a negative impact on safety.

Some examples of chemical-resistant gloves include:

- Butyl gloves are made of a synthetic rubber and protect against a wide variety of chemicals, such as peroxide, rocket fuels, highly corrosive acids (nitric acid, sulfuric acid, hydrofluoric acid and red-fuming nitric acid), strong bases, alcohols, aldehydes, ketones, esters and nitro compounds. Butyl gloves also resist oxidation, ozone corrosion and

abrasion, and remain flexible at low temperatures. Butyl rubber does not perform well with aliphatic and aromatic hydrocarbons and halogenated solvents.

- Natural (latex) rubber gloves are comfortable to wear, which makes them a popular general-purpose glove. They feature outstanding tensile strength, elasticity, and temperature resistance. In addition to resisting abrasions caused by grinding and polishing, these gloves protect employees' hands from most water solutions of acids, alkalis, salts, and ketones. Latex gloves have caused allergic reactions in some individuals and may not be appropriate for all employees. Hypoallergenic gloves, glove liners and powderless gloves are possible alternatives for employees who are allergic to latex gloves.
- Neoprene gloves are made of synthetic rubber and offer a range of protection against hydraulic fluids, gasoline, alcohols, organic acids and alkalis. They generally have chemical and wear resistance properties superior to those made of natural rubber.
- Nitrile gloves are made of a copolymer and provide protection from chlorinated solvents such as trichloroethylene and perchloroethylene. Although intended for jobs requiring dexterity and sensitivity, nitrile gloves stand up to heavy use even after prolonged exposure to substances that cause other gloves to deteriorate. They offer protection when working with oils, greases, acids, caustics and alcohols but are generally not recommended for use with strong oxidizing agents, aromatic solvents, ketones and acetates.

**Table 4** from the U.S. Department of Energy (Occupational Safety and Health Technical Reference Manual) rates various gloves protective qualities against specific chemicals. This table will help you select the most appropriate gloves to protect your employees. The rating abbreviations are as follows: VG: Very Good; G: Good; F: Fair; P: Poor (not recommended). Chemicals marked with an asterisk (\*) are for limited service.

**Table 4: Chemical Resistance Selection Chart for Protective Gloves**

<b>Chemical</b>	<b>Neoprene</b>	<b>Latex/Rubber</b>	<b>Butyl</b>	<b>Nitrile</b>
Acetaldehyde*	VG	G	VG	G
Acetic acid	VG	VG	VG	VG
Acetone*	G	VG	VG	P
Ammonium hydroxide	VG	VG	VG	VG
Amyl acetate*	F	P	F	P
Aniline	G	F	F	P
Benzaldehyde*	F	F	G	G
Benzene*	P	P	P	F
Butyl acetate	G	F	F	P
Butyl alcohol	VG	VG	VG	VG
Carbon disulfide	F	F	F	F
Carbon tetrachloride*	F	P	P	G
Castor oil	F	P	F	VG
Chlorobenzene*	F	P	F	P
Chloroform*	G	P	P	F
Chloronaphthalene	F	P	F	F
Chromic acid (50%)	F	P	F	F
Citric acid (10%)	VG	VG	VG	VG
Cyclohexanol	G	F	G	VG
Dibutyl phthalate*	G	P	G	G
Diesel fuel	G	P	P	VG
Diisobutyl ketone	P	F	G	P
Dimethylformamide	F	F	G	G
Diocetyl phthalate	G	P	F	VG
Dioxane	VG	G	G	G
Epoxy resins, dry	VG	VG	VG	VG
Ethyl acetate*	G	F	G	F
Ethyl alcohol	VG	VG	VG	VG
Ethyl ether*	VG	G	VG	G

<b>Chemical</b>	<b>Neoprene</b>	<b>Latex/Rubber</b>	<b>Butyl</b>	<b>Nitrile</b>
Ethylene dichloride*	F	P	F	P
Ethylene glycol	VG	VG	VG	VG
Formaldehyde	VG	VG	VG	VG
Formic acid	VG	VG	VG	VG
Freon 11	G	P	F	G
Freon 12	G	P	F	G
Freon 21	G	P	F	G
Freon 22	G	P	F	G
Furfural*	G	G	G	G
Gasoline, leaded	G	P	F	VG
Gasoline, unleaded	G	P	F	VG
Glycerin	VG	VG	VG	VG
Hexane	F	P	P	G
Hydrazine (65%)	F	G	G	G
Hydrochloric acid	VG	G	G	G
Hydrofluoric acid (48%)	VG	G	G	G
Hydrogen peroxide (30%)	G	G	G	G
Hydroquinone	G	G	G	F
Isooctane	F	P	P	VG
Kerosene	VG	F	F	VG
Ketones	G	VG	VG	P
Lacquer thinners	G	F	F	P
Lactic acid (85%)	VG	VG	VG	VG
Lauric acid (36%)	VG	F	VG	VG
Lineolic acid	VG	P	F	G
Linseed oil	VG	P	F	VG
Maleic acid	VG	VG	VG	VG
Methyl alcohol	VG	VG	VG	VG
Methylamine	F	F	G	G

<b>Chemical</b>	<b>Neoprene</b>	<b>Latex/Rubber</b>	<b>Butyl</b>	<b>Nitrile</b>
Methyl bromide	G	F	G	F
Methyl chloride*	P	P	P	P
Methyl ethyl ketone*	G	G	VG	P
Methyl isobutyl ketone*	F	F	VG	P
Methyl methacrylate	G	G	VG	F
Monoethanolamine	VG	G	VG	VG
Morpholine	VG	VG	VG	G
Naphthalene	G	F	F	G
Napthas, aliphatic	VG	F	F	VG
Napthas, aromatic	G	P	P	G
Nitric acid*	G	F	F	F
Nitric acid, red and white				
fuming	P	P	P	P
Nitromethane (95.5%)*	F	P	F	F
Nitropropane (95.5%)	F	P	F	F
Octyl alcohol	VG	VG	VG	VG
Oleic acid	VG	F	G	VG
Oxalic acid	VG	VG	VG	VG
Palmitic acid	VG	VG	VG	VG
Perchloric acid (60%)	VG	F	G	G
Perchloroethylene	F	P	P	G
Petroleum distillates				
(naphtha)	G	P	P	VG
Phenol	VG	F	G	F
Phosphoric acid	VG	G	VG	VG
Potassium hydroxide	VG	VG	VG	VG
Propyl acetate	G	F	G	F
Propyl alcohol	VG	VG	VG	VG

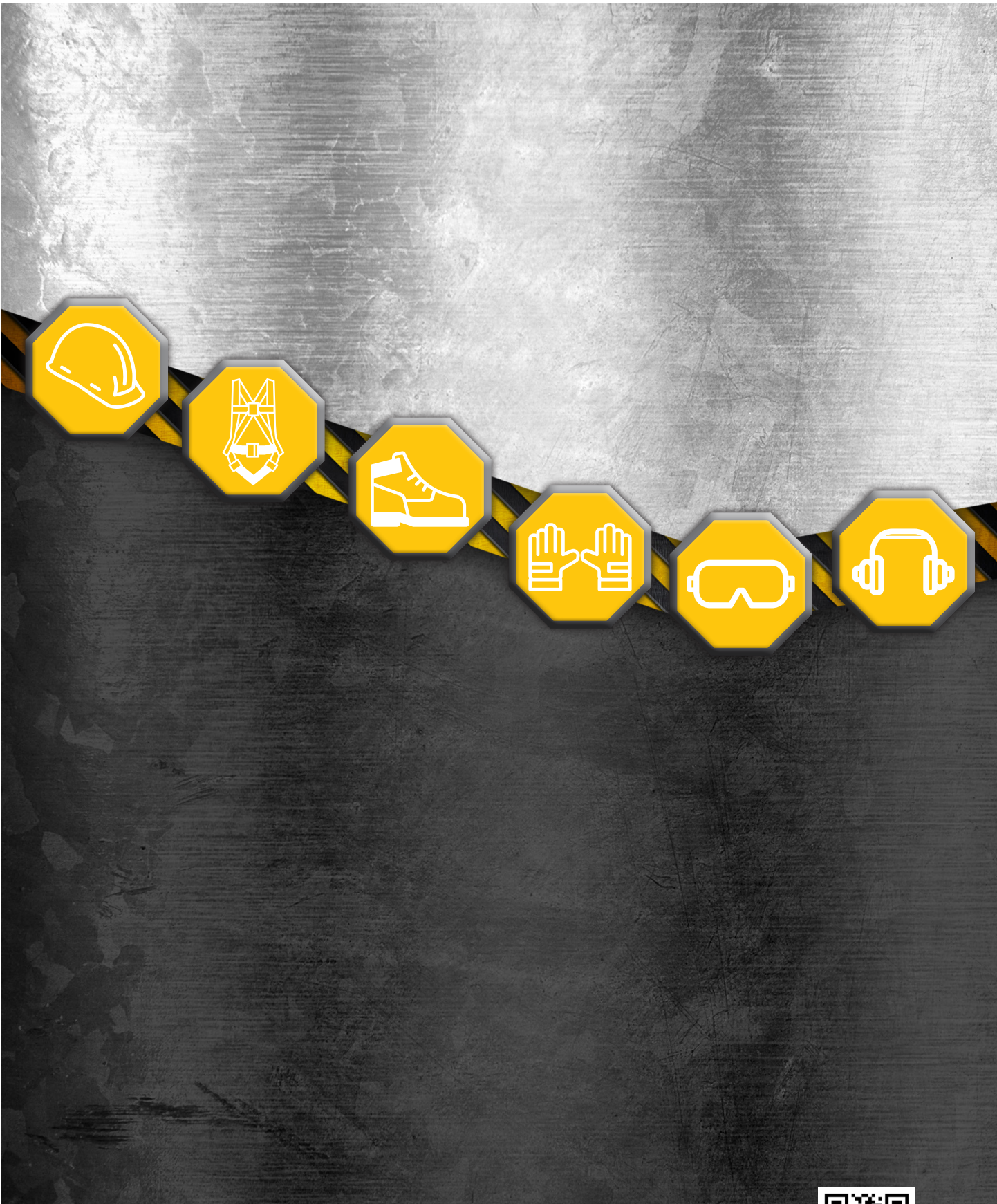
<b>Chemical</b>	<b>Neoprene</b>	<b>Latex/Rubber</b>	<b>Butyl</b>	<b>Nitrile</b>
Propyl alcohol (iso)	VG	VG	VG	VG
Sodium hydroxide	VG	VG	VG	VG
Styrene	P	P	P	F
Styrene (100%)	P	P	P	F
Sulfuric acid	G	G	G	G
Tannic acid (65)	VG	VG	VG	VG
Tetrahydrofuran	P	F	F	F
Toluene*	F	P	P	F
Toluene diisocyanate (TDI)	F	G	G	F
Trichloroethylene*	F	F	P	G
Triethanolamine (85%)	VG	G	G	VG
Tung oil	VG	P	F	VG
Turpentine	G	F	F	VG
Xylene*	P	P	P	F

Note: When selecting chemical-resistant gloves be sure to consult the manufacturer's recommendations, especially if the gloved hand(s) will be immersed in the chemical.

## Care of Protective Gloves

Inspect protective gloves before each use to ensure that they are not torn, punctured or made ineffective in any way. A visual inspection will help detect cuts or tears but a more thorough inspection - by filling the gloves with water and tightly rolling the cuff towards the fingers - will help reveal any pinhole leaks. Gloves that are discolored or stiff may indicate deficiencies caused by excessive use or degradation from chemical exposure.

Discard and replace any gloves with impaired protective ability. Carefully evaluate any reuse of chemical-resistant gloves, taking into consideration the absorptive qualities of the gloves. A decision to reuse chemically-exposed gloves should take into consideration the manufacturer's recommendation for proper use and storage.



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