NATE
THE COMMUNICATIONS INFRASTRUCTURE CONTRACTORS ASSOCIATION

NATE WIN
WIRELESS INDUSTRY NETWORK

INSTRUCTOR MANUAL

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

U.S. Department of Labor – OSHA

Susan Harwood Grant

SH-000003-SH3

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Acknowledgement

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Acknowledge that funding for the development and delivery of this training was provided by the Department of Labor through a Susan Harwood Grant.

Disclaimer

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.

- Employers shall make sure that each employee demonstrates an understanding of the PPE training (i.e., in a language they understand) as well as the ability to properly wear and use PPE before they are allowed to perform work requiring the use of the PPE.
- If an employer believes that a previously trained employee is not demonstrating the proper understanding and skill level in the use of PPE, that employee should receive retraining.
- Other situations that require additional or retraining of employees include changes in the workplace or in the type of required PPE that make the prior training obsolete.

Course Objective

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

About NATE

About OSHA

Responsibilities of the Employer Under OSHA

Employee Rights Under OSHA

OSHA Whistleblower Protection

Talk about OSHA being established during Nixon Administration after Congress passed the OSH Act.

About NATE

- 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.

Talk about the vital role NATE plays in the wireless and broadcast infrastructure industries.

Share your personal connection to NATE and how you have worked with NATE through the years.

Mission Statement:

- To pursue, formulate and adhere to uniform standards to ensure the continued well-being of tower and communications infrastructure personnel.
- To educate the general public, applicable government agencies, Congress, and clients on policy priorities and continued progress toward safer standards and practices within the industry.
- To keep all members informed of issues relevant to the industry.
- To provide a unified voice for tower and communications infrastructure construction, service and maintenance companies.
- To facilitate effective safety training for the industry.

About OSHA

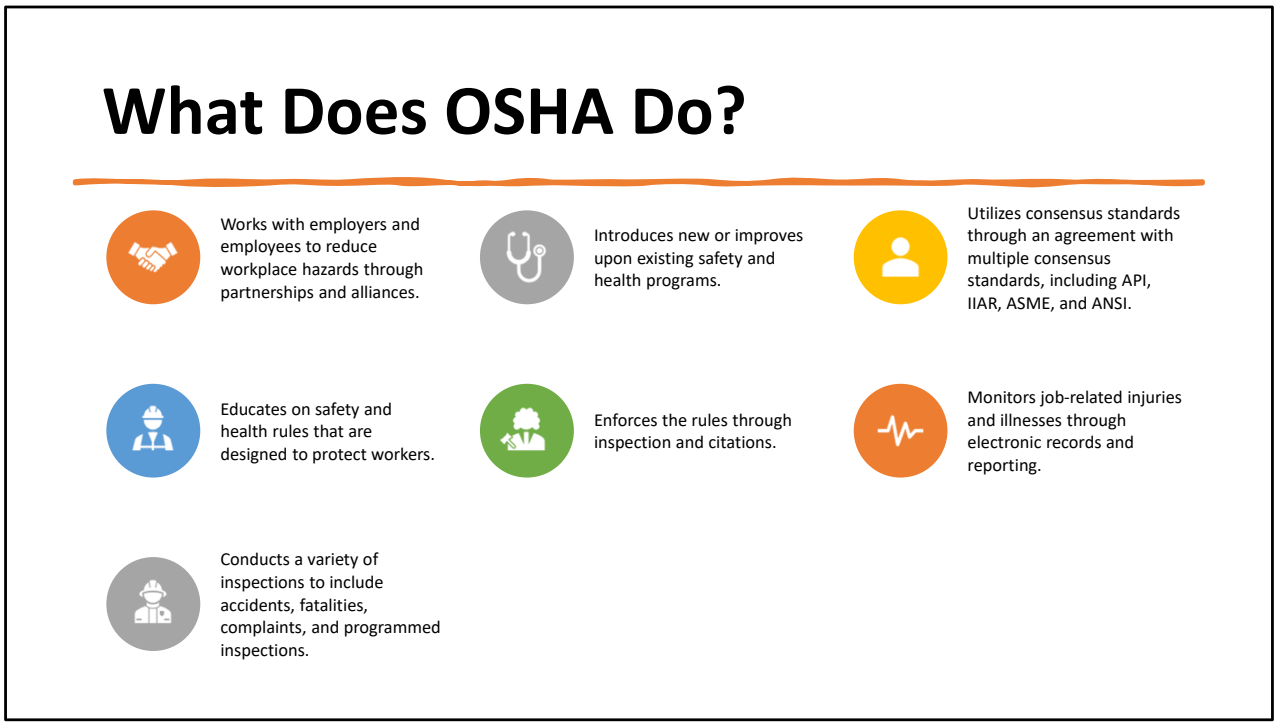
On December 29, 1970, President Nixon signed the **Occupational Safety and Health Act of 1970 (OSH Act)** into law.

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

Talk about OSHA being established during Nixon Administration after Congress passed the OSH Act.



Note that OSHA (the Occupational Safety and Health Administration) is a regulatory agency of the federal government that has been established to ensure that the Law is adhered to by regulating employers. This is accomplished by developing standards consistent with the law, educating employers and employees, and enforcing the standards on employers.

Employers Must

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

Source: OSHA 3021-09R 2011, www.osha.gov/sites/default/files/publications/osha3021.pdf

Point out the employer's responsibilities to protect their employees.

Workers Have the Right to:

- 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

Describe this protection in simple terms or by example. This provision advocates for workers who report complaints which provide a hazard in the environment in which they work. The protection protects them from each of the bulleted points.

OSHA Worker Rights and Protections

Know Your Rights | When to File a Complaint | Contact OSHA

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

OSHA Whistleblower Protection

- 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.

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

May outline the Whistle-blower Protection protocol for employees to follow with OSHA. The website and phone number should be emphasized on this slide to educate workers on how to report this information.

- Being fired or laid off
- Being blacklisted
- Demotion
- Being denied promotion or overtime
- Pay reduction
- Reassignment
- Benefits denial

SECTION 2: Statistics

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

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**

Injuries happen. These cases are just the major ones that were reported. One can assume there are millions of minor injuries that happen annually that could have been avoided.

NATE STAR Initiative Audit Findings

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

Data based on collected audits from NATE members from 2017 to 2022. A quick reminder that these do not include the items that are not reported, thousands of near-misses and minor incidents happen daily.

Private Industry Injuries, Illnesses Statistics




According to the Bureau of Labor Statistics in 2021

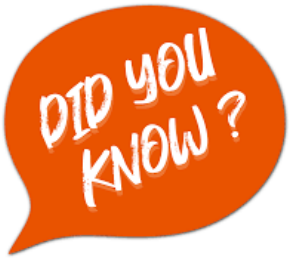
Industry(1)	NAICS code(2)	Total cases	Head		Neck	Trunk		Upper extremities					Lower extremities				Body systems	Multiple body parts	All other body parts(3)
			Total	Eye		Total	Back	Total	Shoulder	Arm	Hand	Wrist	Total	Knee	Ankle	Foot			
Power and communication line and related structures construction	237130	1,720	250	30	40	190	120	460	50	60	270	40	550	200	90	40	50	170	-
Percentage of total:			**15%**		**2%**	**11%**		**27%**			**16%**		**32%**				**3%**	**10%**	

Self explanatory.

Proper Planning Prevents ~~Poor Performance~~ INJURIES

According to OSHA

- 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

The most common reported reasons by non-users were:

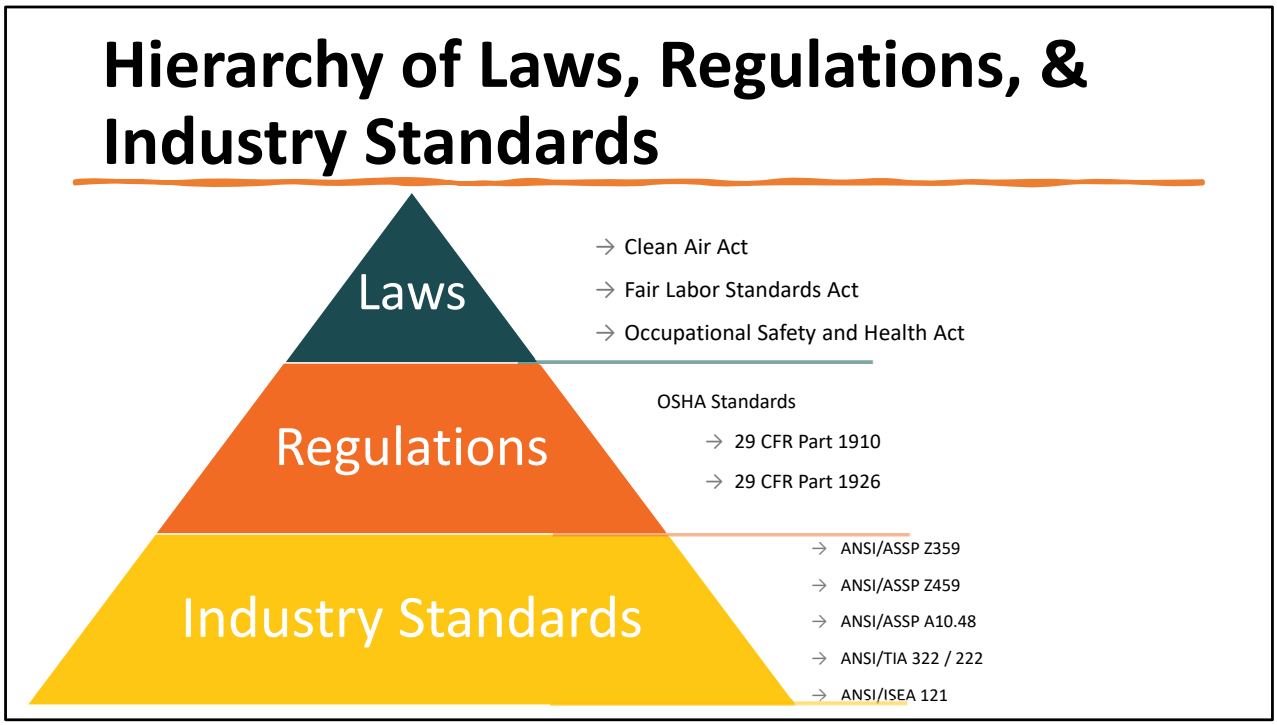
- Uncomfortable,
- Lack of knowledge on how to use PPE,
- Poor fit/falling off,
- Feels too hot,
- Unavailability, and
- PPE is not obligatory.

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)

Introduce the hierarchy of laws, regulations, and industry standards.



Introduce the hierarchy of laws, regulations, and industry standards.

Explain the OSHA Standards

- OSHA 29 CFR 1910 regulations details general industry safety regulations and apply to most worksites (servicing and maintenance).
- OSHA 29 CFR 1926 standards focus on the construction industry and identifies the specific work-related risks associated with it (erecting a new tower).
- Directive: CPL 02-01-056 – Inspection Procedures for Accessing Communication Towers

  Standard Number: 1926.550

This is a guidance document on how OSHA enforces a standard or how OSHA handles a particular subject.

Laws

Laws are the products of written statutes, passed by either the U.S. Congress or State Legislatures. The legislatures create bills that, when passed by a vote, become statutory law.

Laws are typically introduced from an accident or near miss, while standards exist for consistency. 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.

Examples of laws:

- Clean Air Act
- Fair Labor Standards Act, and
- Occupational Safety and Health Act – OSHA

Regulations

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:

CPL 02-01-056	• Inspection Procedures for Accessing Communication Towers

- Regulations, on the other hand, are standards and rules adopted by administrative agencies that govern how laws will be enforced.
- Occupational Safety and Health Act (OSHA) Standards:
  - 29 CFT Part 1910 – (general industry)
  - 29 CRF Part 1926 – (construction)
- Directive
  - CPL 02-01-056 – Inspection Procedures for Accessing Communication Towers
    - "This instruction provides general enforcement guidance and procedures for use by compliance officers during inspections involving hazards associated with using a hoist to take employees to or from workstations on communication towers. This directive applies to all work activities on communication towers that involve the use of a personal hoist." OSHA, CPL 02-01-056, 2014.

Industry Standards

Voluntary standards are standards established generally by private-sector bodies and that are available for use by any person or organization; private or government. The term includes what are commonly referred to as ‘industry standards’ as well as ‘consensus standards.’

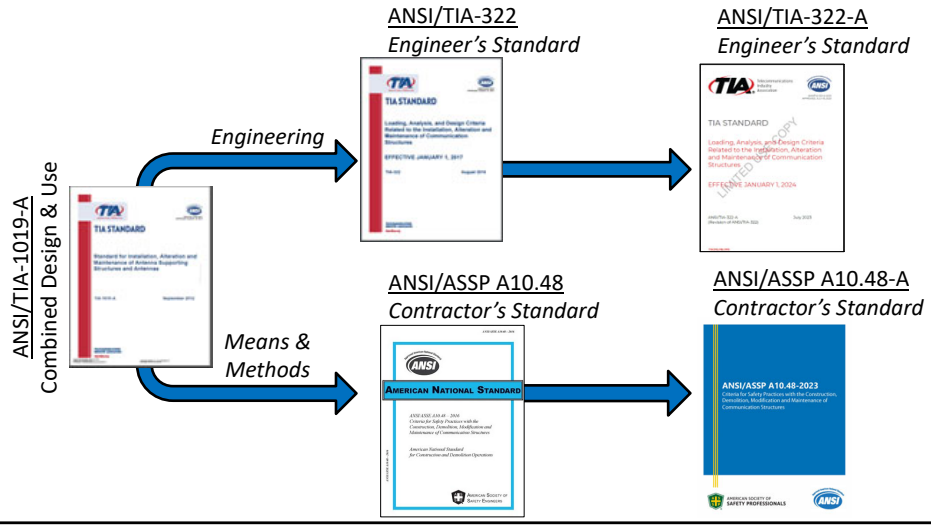
Reiterate above statement.

Industry Safety Standards

Standard	Standard
ANSI/ASSP Z359	ANSI/ASSP Z459.1-2021
Title	**Title**
The Fall Protection and Arrest Standards Package	Requirements for Rope Access Systems
Application	**Application**
The standards included in the Z359 Fall Protection and Arrest Package provide organizations with a comprehensive resource for protecting workers at heights.	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.

Review ANSI/ASSP Z359 & ANSI/ASSP Z459 standards and applications.

Evolution of Industry Standards



The ANSI/TIA 1019-A was replaced by the TIA-322 and ASSE A10.48 (Effective January 1, 2017)

**NEW TIA-322-A & ASSE A10.48-A EFFECTIVE JANUARY 1, 2024

Applicable Telecommunications Industry Standards

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).

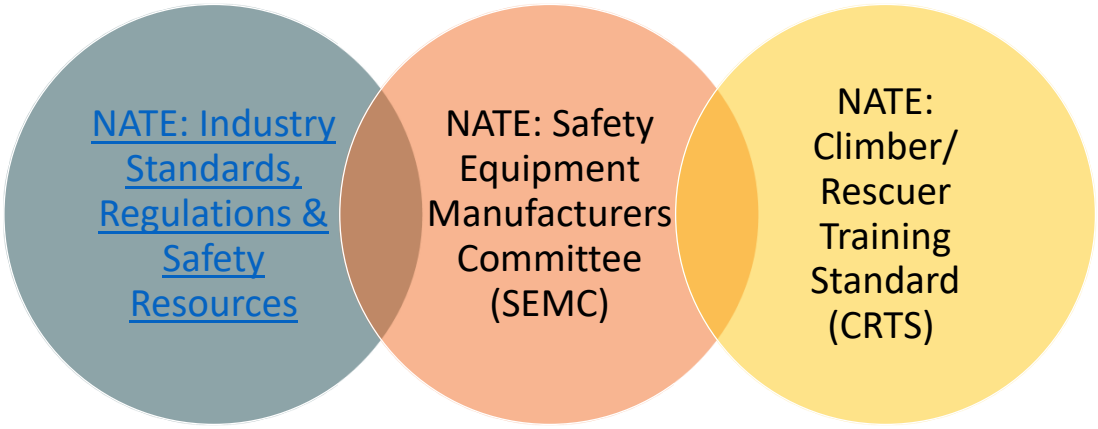
Review ANSI/ASSP A10.48 & ANSI/TIA 322 standards and applications.

Applicable Telecommunications Industry Standards (continued)

Standard	Standard
ANSI/TIA 222	ANSI/ISEA 121
Title	**Title**
Structural Standard for Antenna Supporting Structures, Antennas, and Small Wind Turbine Support Structures	Standard for Dropped Object Prevention Solutions
Application	**Application**
Communications structures engineering and maintenance standard. International Building Code (IBC) recognized standard for structures and maintenance of those structures.	Manufacturers standard for hoist buckets and tool tethering devices.

Review ANSI/TIA 222 & ANSI/ISEA 121 standards and applications.

Industry Best Practices



a. Some of NATE's Industry Standards, Regulations, & Safety Resources were covered previously (ANSI/ASSP Z359 – Fall Protection Standard, ANSI/ASSP Z459 – Rope Access, ANSI/ASSP A10, Scope of A10.48, TR-14, ANSI/TIA – 322, ANSI/TIA – 222) For a complete list visit NATE.com (click on the hyperlink in the blue circle).
https://natehome.com/wp-content/uploads/2021/07/NATE-Industry-Resources-Document-7-23-21-E-FILE.pdf

b. Safety Equipment Manufacturers Committee (SEMC)

c. NATE Climber Rescue Training Standard (CRTS)

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.	https://www.aisc.org/
ALI	ALI	American Ladders Institute	Developer of safety standards for the ladder industry.	https://www.americanladderinstitute.org/
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	https://webstore.ansi.org/Standards/ALI/ANSIASCA142008R2018-1719324
ANSI	ANSI	American Nati	standards	https://ansi.org/
ANSI	ANSI Z49.1:2012	Safety in Welding, Cutting and Allied	Foot protection.	https://webstore.ansi.org/Standards/AWS/ANSIZ492012
ASME	ASME	The Am Mechanical Engineers	engineering and allied sciences around the globe.	https://www.asme.org/
ASME	ANSI/ASME B30.12	Handling Loads Suspended f Rotorcraft	Applies to the construction, installation, operation, and use of cranes and	https://webstore.ansi.org/Standards/ASME/ASMEB30122011
ASME	ANSI/ASME B30.20	Below the Hook Lifting Devices	Safety standard for cableways, cranes, derricks, hoists, hooks, jacks, and slings.	https://www.asme.org/codes-standards/find-codes-standards/b30-20-hook-lifting-devices
ASME	ANSI/ASME B30.23	Personnel Lifting Systems	Applies to hoisting equipment used to lift, lower or transport personnel.	https://webstore.ansi.org/Standards/ASME/ASMEB30232016?gclid=CjwKCAjw7J6EBhBDEiwA5UUM2iqFBBeyaCc23c9ENpFPNvE-RVJdz2a5ZwgxqtUSYYoWS6iBr4AOtxoCog0QAvD_BwE
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.	https://global.ihs.com/doc_detail.cfm?&item_s_key=00454787&item_key_date=840224&input_doc_number=ANSI%20ASME%20B30%2F26&input_doc_title=
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.	https://global.ihs.com/doc_detail.cfm?&item_s_key=00778410&item_key_date=801231&input_doc_number=ANSI%20ASME%20B30%2E30&input_doc_title=

Review of NATE Industry Standards, Regulations, & Safety resources.

***Make sure to mention that the ANSI Z49.1:2012 referenced in the document is now ANSI Z49.1-2021 and this document will be updated.**

Let the attendees know that this document is available as a free download to NATE member companies.

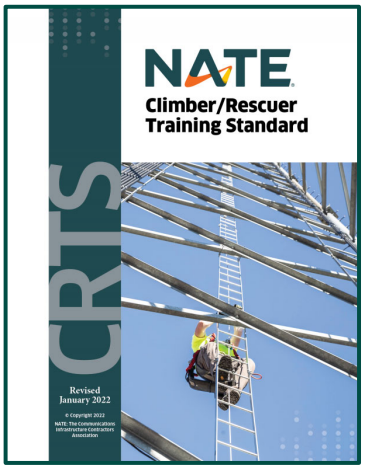
Safety Equipment Manufacturers Committee (SEMC)

"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.

The NATE CRTS is intended to assist in standardizing fall protection and rescue training for climbers in the tower and communications infrastructure construction, service, and maintenance industries. The new, streamlined CRTS document presents a series of training topics, establishing a minimum baseline of knowledge and skill that a climber should possess.

The NATE CRTS training topics include an evaluation, which is intended to assist an employer in designating personnel initially as authorized climbers/rescuers, and for personnel with sufficient knowledge, skills, and experience, as competent climbers/rescuers.

The CRTS also offers 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

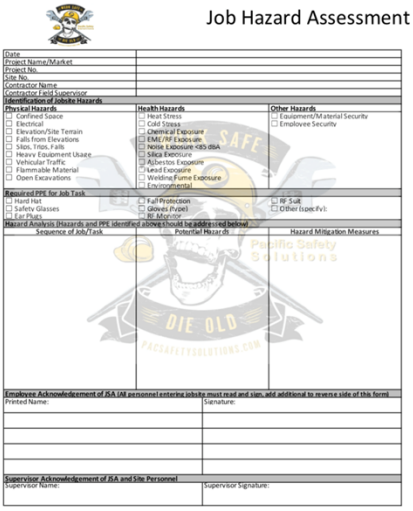
II. Site Specific Plans – Fall Protection, Rescue, RF, Etc.

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

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

Identification of Jobsite Hazards

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

Required PPE for Job Task

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

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

Sequence of Job/Task	Potential Hazards	Hazard Mitigation Measures

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

Printed Name:	Signature:

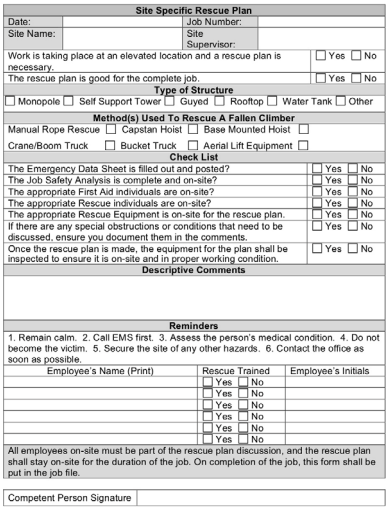
Supervisor Acknowledgement of JSA and Site Personnel

Supervisor Name:	Supervisor Signature:

Rescue Plan (Site Specific)

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

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



Site Specific Rescue Plan

Date:		Job Number:	
Site Name:		Site Supervisor:	

Work is taking place at an elevated location and a rescue plan is necessary.	☐ Yes ☐ No
The rescue plan is good for the complete job.	☐ Yes ☐ No

Type of Structure

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

Method(s) Used To Rescue A Fallen Climber

Manual Rope Rescue ☐ Capstan Hoist ☐ Base Mounted Hoist ☐

Crane/Boom Truck ☐ Bucket Truck ☐ Aerial Lift Equipment ☐

Check List

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

Descriptive Comments

Reminders

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

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

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

Competent Person Signature	

Site Related Hazards

Hole in Platform

Trip Hazard

Electrocution

Hazards exist in every workplace in many different forms: sharp edges, falling objects, flying sparks, chemicals, noise and a myriad of other potentially dangerous situations.

The Occupational Safety and Health Administration (OSHA) requires that employers protect their employees from workplace hazards that can cause injury.

Telecom Climb Facility Hazards

Rusty Cable

Trapped Cable

Congestion – Causing coax to rub

Various Telecom Climb Facility Hazards

Cable Safe Climb No Tension

Weather

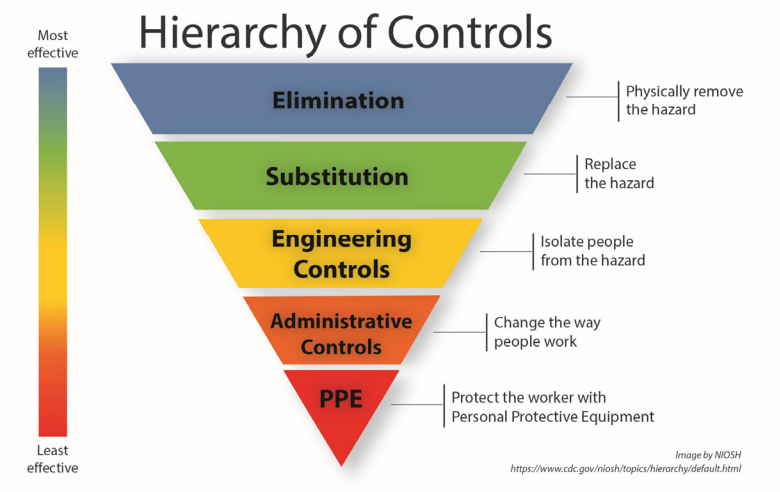
Animals/Birds/Insects

Section 5
Hierarchy of Controls

- Elimination
- Substitution
- Engineering Controls
- Administrative Controls

Controlling a hazard at its source is the best way to protect employees. Depending on the hazard or workplace conditions, OSHA recommends the use of engineering or work practice controls to manage or eliminate hazards to the greatest extent possible. For example, building a barrier between the hazard and employees is an engineering control; changing the way in which employees perform their work, (e.g., through job rotations) is an administrative control.

Hierarchy of Controls



Controlling a hazard at its source is the best way to protect employees. Depending on the hazard or workplace conditions, OSHA recommends the use of engineering or work practice controls to manage or eliminate hazards to the greatest extent possible. For example, building a barrier between the hazard and employees is an engineering control; changing the way in which employees perform their work, (e.g., through job rotations) is an administrative control.

*** Stress – PPE is the last option and is the least protective.**

Elimination

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

Housekeeping can be a simple way to eliminate hazards.

Example: Cleanup trip hazards.

Using drones for tower inspection or close outs and troubleshooting equipment from the ground eliminates the need to climb a tower.

What are some other examples of elimination?

Substitution

Battery Powered vs Gas Powered removes toxic fumes from exhaust.

Cranes or Mobile Elevated Work Platforms can be utilized to prevent the need to climb.

Engineering Controls

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

Bollards protect sensitive equipment from impact by machinery or vehicular traffic. Railing prevents falls or unauthorized entry, and guards can prevent injury from moving parts or cast-off excess materials.

Administrative Controls

- 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)

I. Requirements for PPE

II. Selection of PPE

III. PPE Types

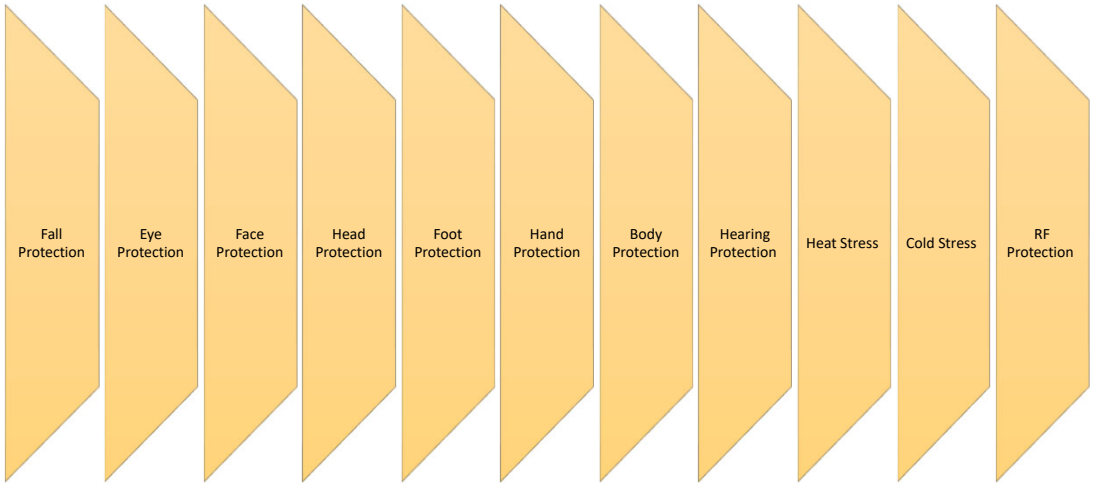
Requirements for PPE

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.

- Where to obtain PPE – must be in company policy for new PPE
- Frequency of replacement of PPE – per company policy, as needed. When dirty, etc.
- Discuss proper storage of PPE so it will not get damaged or contaminated.

PPE Types



I. Fall Protection
II. Eye Protection
III. Face Protection
IV. Head Protection
V. Foot Protection
VI. Hand Protection
VII. Body Protection
VIII. Hearing Protection
IX. Heat Stress
X. Cold Stress
XI. RF Protection

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

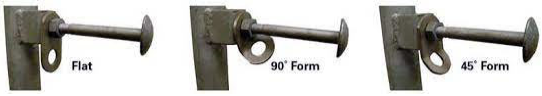
A personal fall arrest system is a system used to arrest an employee in the event of a fall. It consists of an anchorage, body harness, and connector(s). The means of connection may include a lanyard, deceleration device, lifeline, or a combination of these.

Fall Protection Description

- 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:
  - Anchor straps & brackets
  - Body (harness)
  - Connectors (lanyards, carabineers, sleeves, etc.)

Anchor Straps & Brackets

- Anchor requirements
  - 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



Explain difference between FF1 / FF2.

Full Body Harness

- 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

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

Gate strength of 3600 lbs., minimum tensile strength of 5000 lbs. per ANSI 359.12. Must be auto latching / auto locking. (use last 2 on right as examples of non-compliant).

PPE Connectors – Snap Hooks

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

Gate strength of 3600 lbs., minimum tensile strength of 5000 lbs. per ANSI 359.12. Must be auto latching/auto locking.

PPE Connectors – Rings

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

Fall Protection Components & Systems

- Energy absorbing lanyards

Introduce components of the SEMC white paper.

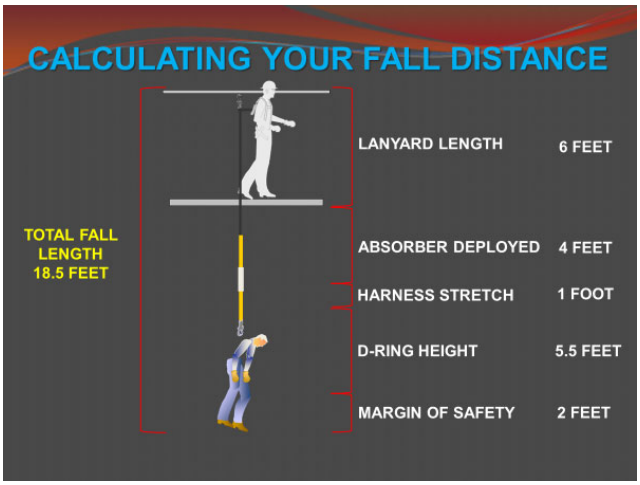
Energy Absorbing Lanyards

- 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:

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

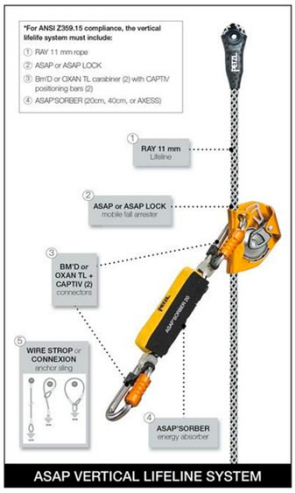
*Note: During Hot, Cold, & Wet Conditioned Tests, Average Arrest Force limit is increased.

Other Fall Protection Components & Systems

- 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



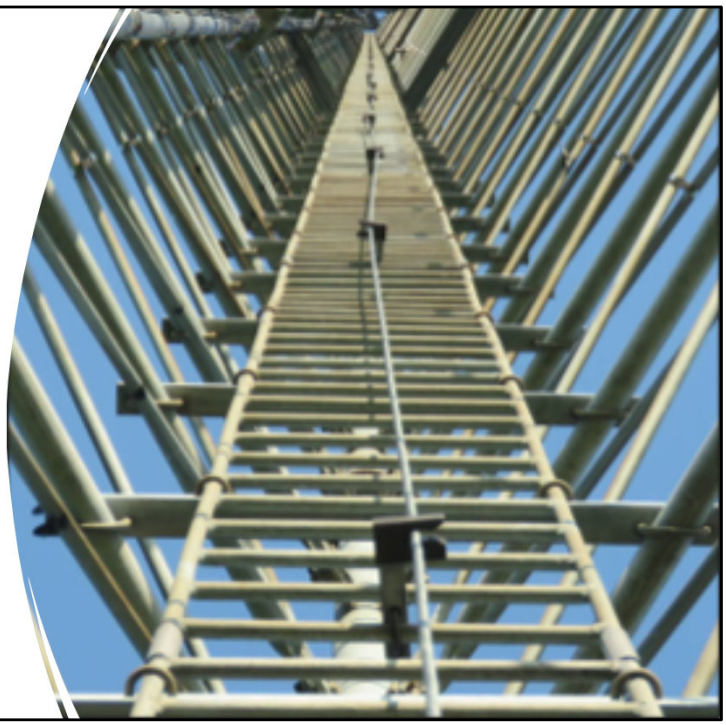
Positioning Lanyards

- 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

Spreader bars and tri-axle loading are not in the standard. Talk about where these are applicable.

Wire Rope Safety Climbs

ANSI Z359.16



Rail Ladder Systems

ANSI Z359.16 Climbing Ladder Fall Arrest Systems

Horizontal Lifelines

ANSI Z359.17 Safety Requirements for Horizontal Lifelines

Rope Access Systems

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

Section 8
Eye and Face Protection

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

1910.133(a) General Requirements

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.

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

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

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

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

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

Standard

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

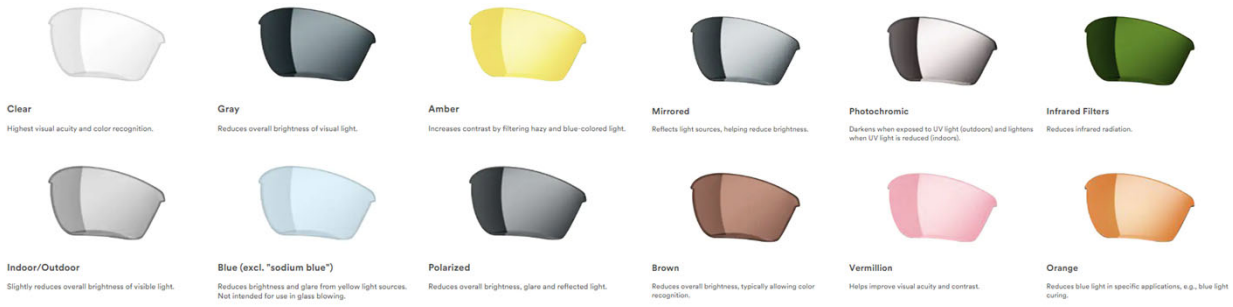
Glasses with side shields (built in or add on) offer additional protection.

Prescription Glasses

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.

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.

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.

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.

Ensure proper lenses are worn at applicable times (example: no tinted lenses at night).

Section 9
Head Protection

I. Head Protection

II. Types and Categories

III. Hard Hats

IV. Standards

Head Protection

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

- 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

In addition to selecting protective headgear that meets ANSI standard requirements, employers should ensure that employees wear hard hats that provide appropriate protection against potential workplace hazards. It is important for employers to understand all potential hazards when making this selection, including electrical hazards. This can be done through a comprehensive hazard analysis and an awareness of the different types of protective headgear available.

Hard Hats

- 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.

In addition to selecting protective headgear that meets ANSI standard requirements, employers should ensure that employees wear hard hats that provide appropriate protection against potential workplace hazards. It is important for employers to understand all potential hazards when making this selection, including electrical hazards. This can be done through a comprehensive hazard analysis and an awareness of the different types of protective headgear available.

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In addition to selecting protective headgear that meets ANSI standard requirements, employers should ensure that employees wear hard hats that provide appropriate protection against potential workplace hazards. It is important for employers to understand all potential hazards when making this selection, including electrical hazards. This can be done through a comprehensive hazard analysis and an awareness of the different types of protective headgear available. Employer must prevent items from being dropped. Hardhats with a chin strap or tether work well for at height applications to ensure a hard had is not dropped.

What Standards Apply

- 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

- 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.

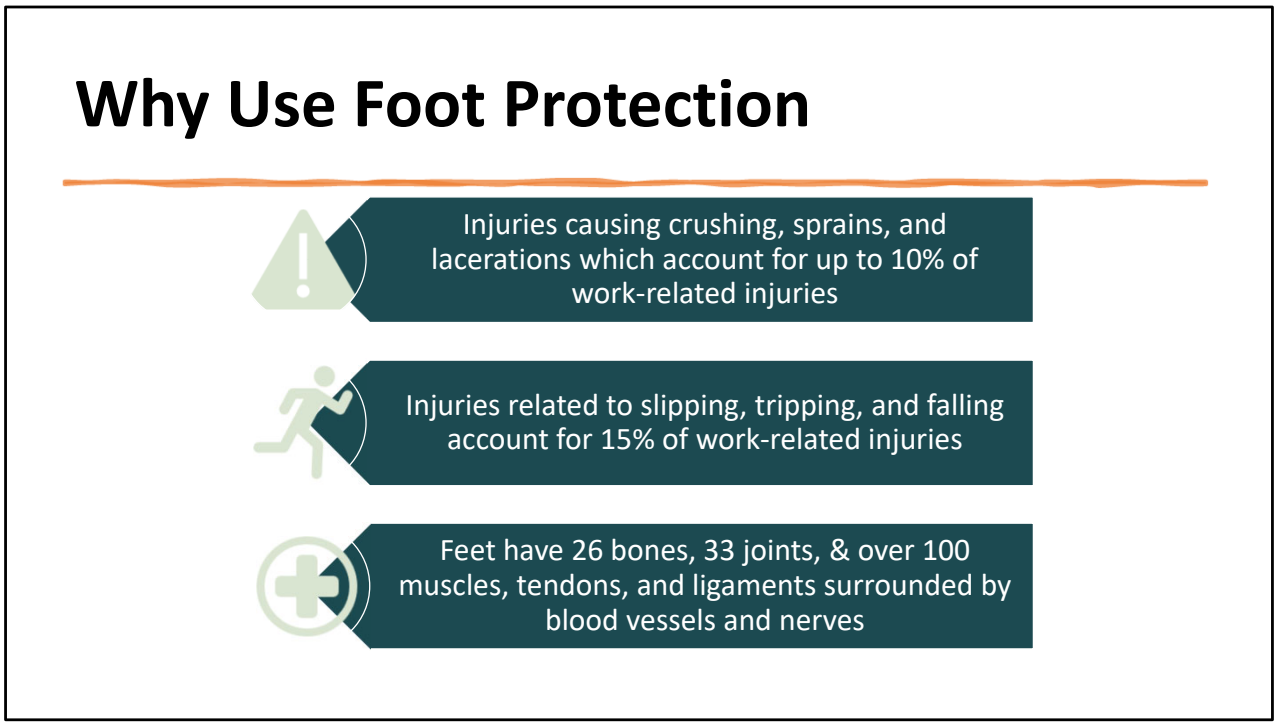
Check for shell degradation with a simple field test:

- 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

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

Don't forget to cover wildlife and terrain issues on a site.

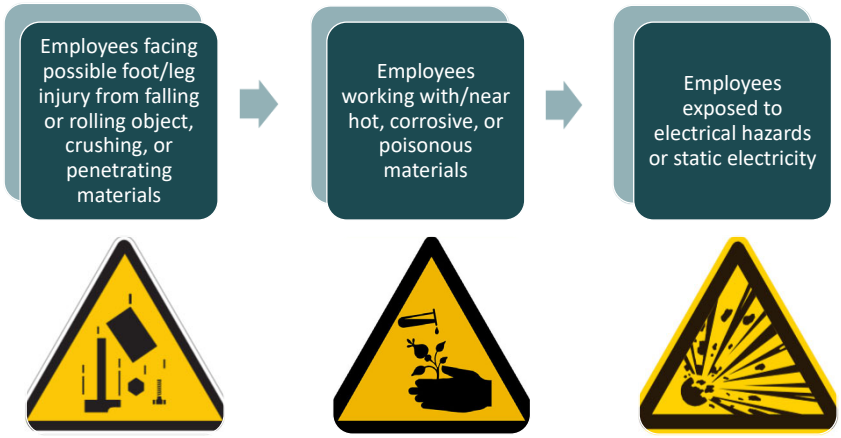


There are different causes of work-related injuries:

- 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 injuries
- Also, your feet have 26 bones, 33 joints, &over 100 muscles, tendons, and ligaments surrounded by blood vessels and nerves. This is why even a stub of your toe or dropping something lightweight on your foot may hurt. Feet are a critical part of your body and everyday movement.

https://mybestworkboots.com/history/

Who Should Use Foot Protection

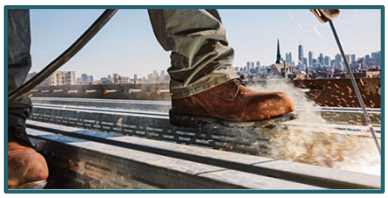


- Employees who face possible foot or leg injuries from falling or rolling objects or from crushing or penetrating materials shall wear protective footwear.
- Employees whose work involves exposure to hot substances, or corrosive or poisonous materials must have protective gear to cover exposed body parts, including legs and feet.
- If an employee's feet may be exposed to electrical hazards, non-conductive footwear should be worn.
- Workplace exposure to static electricity may necessitate the use of conductive footwear.

When to Use Foot Protection

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

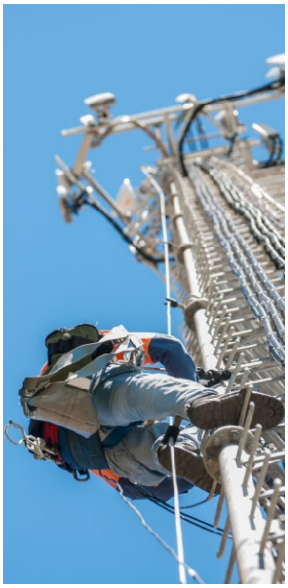
- When heavy objects such as tower sections or batteries which may roll onto or fall on the employee's feet.
- Working with sharp objects such as nails or spikes that could pierce the soles or uppers of ordinary shoes.
- Exposure to molten metal that might splash on feet or legs.
- Working on or around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

- 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.



1. Choose 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.
2. Know when to replace!
    a. Delamination, cracks/holes, damaged toe, too much flexibility, falling apart at seams.
3. Take proper care!
    a. Unlace boots before removing, clean boots regularly, treat leather, store boots properly, alternate boots.

https://ohsonline.com/Articles/2021/10/01/Worn-Well.aspx?Page=3

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	

1. Danner work boot with steel toe.
2. Thorogood work boot with composite safety toe.
3. Keen work boot with EH/ESR (electrical hazard/electric shock resistant) and waterproof.

https://ehs.ncsu.edu/personal-protective-equipment-ppe/foot-and-leg-protection-appendix-c/

Foot Protection Types

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	

1. Keen Insulated work boot, waterproof with carbon-fiber toes.
2. Ariat puncture-resistant work boot.

https://ehs.ncsu.edu/personal-protective-equipment-ppe/foot-and-leg-protection-appendix-c/

Foot Protection Types

Types of Foot Protection	Description
Steel/Composite Safety Toe	▪ Provides protection to the toes where personnel are exposed to a crushing or impact injury. ▪ Slip-on toe caps – short or temporary use.
Metatarsal Guard	▪ Provides protection to the top of the foot (metatarsal bones) as well as the toes. ▪ Guards are available built into the boot when protection is only needed for a short period of time.
Static Dissipative – Electrostatic Discharge – ESD - Conductive	▪ Static dissipative shoes minimize the buildup of electrical charge between a person in motion and the surfaces and environment around them, by conducting the charge through the shoes to the ground. ▪ Commonly used in manufacturing of electronic components, flammable liquids, explosives, and plastics.
Dielectric Electric Overshoes	▪ The soles of these shoes provide a barrier to protect personnel from open electrical sources up to 600 volts. Protection is provided against the touch or stepping on an energized conductor. These are typically used for working on live power or in the area of live power where the current can jump large distances, especially in wet or damp conditions. Typically used when performing equipment grounding near power lines.
Thermal Insulated Shoes	▪ Constructed to resist high heat and cold situations ▪ Provides insulation against hot and cold temperatures and are intended for tough outdoor environments. ▪ Constructed to resist high heat and cold situations.
Waterproof Shoes	▪ Constructed to keep the feet dry and comfortable in wet conditions.
Chemical-Resistant Shoes	▪ Chemical-resistant shoes are constructed of various materials to provide protection against chemical and biological hazards. ▪ Ensure the protective material is compatible with the chemical being used. ▪ Slip-on overshoes or booties can also be used for chemical or biological protection.
Puncture Resistant Shoes	▪ Designed to protect the midsole of the foot where sharp objects can pierce or penetrate the sole of the shoe.
Slip-Resistant Shoes	▪ Provides slip-resistant tread for wet, oily, and/or greasy floors.
Shoe chains, cleats, or spikes are available to fit over existing boots to prevent falls on ice, snow, or other slick surfaces. Never wear ice or snow cleats when walking on hard surfaces other than snow or ice.	

Foot Protection Standards – OSHA 1910.136

- 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."


https://technicalrescuesystems.net/event/2-day-osha-nate-ansi-compliant-tower-climber-safety-rescue-3-spots-open/

Evolution of Protective Footwear

Slide 102
See next page for instructor notes.

Notes for slide 102.

Safety footwear is traced back to the 18th century when PPE was first an industry issue.

1. Sabots were the first “protective shoes” being wooden and hollowed out from a block of wood, traditional to Europe and similar to clogs. They protected workers from falling objects, sharp objects found in fields, and cattle that might have stepped on them. In fact, during the industrial revolution workers threw their sabots into the gears of factories to stop production and that’s how the word sabotage originated. During World War II, leather protective boots were used by civilians and Marschtiefels (marching boots) were worn by the military. Safety boots with steel tips were produced at the end of World War II in Germany, mainly used by engineers.
2. Fast forward to 1934, Red Wing Shoes company began producing large volumes of steel toe boots.
    - Steel toes offer serious impact protection for dangerous work environments
    - They’re resistant to cracking, which can occur in some composite materials
    - Generally, steel toe boots have a larger toe box which can provide more toe room
    - The downsides: steel toes are both electrical and thermal conductors, they will set off metal detectors, and they may not be as comfortable as composite options for long-term wear.
    - (By 1970, OSHA standards for workplace safety were set and enforced, leading to mass production of protective footwear.)
3. In 1987, waterproof outer boot and insulated waterproof inner booties were invented by Red Wing to ensure warm, dry feet.
4. Composite toes are typically made from Kevlar, carbon fiber, carbon nanotubes, plastic, or fiberglass.
    - Composite toes are lighter than traditional steel toe caps, especially nano toes
    - The materials used are poor conductors of electricity, so composite is a popular choice for electricians and builders
    - They’re not a thermal conductor, so you’re less likely to feel the heat or cold, making them ideal for work in extreme weather conditions
    - Boots with non-metal parts make passing through secure job sites and metal detectors easier (just be sure your composite toe boots don’t have a steel shank)
    - The downside: composite toes aren’t typically as impact resistant as metal options
5. Nano toes use nanotechnology, or tiny carbon structures arranged into a beehive pattern and wrapped into a cylinder 10-50 nanometers in diameter. Some of the strongest and lightest safety toes on the market are nano toes.
6. Alloy toe consists of lightweight mixed metals, often aluminum or titanium.
    - Similar to steel toes, alloy toes provide good impact protection but with a lighter weight, making them more comfortable during long shifts
    - The lightweight material also provides even more toe room in your work boots than steel caps
    - The downsides: since they’re also made from metal, alloy toes aren’t ideal for electrical work, extreme temperatures, or on job sites with metal detectors

Foot Protection Standards – ASTM F2413-18

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

To be compliant footwear should:

- 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/

Two new ASTM International standards, F 2412, Test Methods for Foot Protection, and F 2413, Specification for Performance Requirements for Protective Footwear, have replaced the former ANSI Z41 standard, Standard for Personal Protection Protective Footwear, which has now been withdrawn.

Footwear certified as meeting ASTM F2413-18 must primarily meet the protection requirements for (I) impact resistance and (C) compression resistance. Then, additional protection criteria, including (MT) metatarsal protection, (CD) conductive protection, (EH) electrical hazard protection, (SD) static dissipative protection, and (PR) puncture resistance, can be met and labeled accordingly, depending on the specific type of protection required.

a. The footwear's toe area should be resistant to impact and compression
b. The footwear should be able to protect the metatarsal bones
c. The footwear should have conductive properties (these may lessen the chances of dangers that arise due to the accumulation of static electricity, and reduce the odds of unstable chemicals and explosives catching fire because of the aforementioned static electricity)
d. The footwear should have static dissipative (SD) properties (these are meant to lessen the chances of potential risks happening due to protective footwear being worn when required but having a level of resistance that is inappropriately low)
e. The footwear should have bottoms that are resistant to being punctured
f. The footwear should be resistant to being cut by a chainsaw
g. The footwear should have dielectric insulation

SECTION 11
Hand Protection

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

Let students know there is additional information regarding hand and arm protection in the appendix on page 173 taken from Personal Protective Equipment brochure – OSHA 3151-02R 2023. This includes a chemical resistance selection chart for protective gloves. https://www.osha.gov/sites/default/files/publications/osha3151.pdf

Hand Protection

The next part of the body we'll look at is hand protection. We use our hands constantly when working, you may be climbing a structure, gripping a tool, or typing on a keyboard, hand care is all about preventing injuries and the best way to do that is to use the right PPE in the correct environment. Cuts and scrapes are the most common injuries, but there are over 102,000 cases of hand injuries alone according to the US Bureau of Labor Statistics.

If a workplace hazard assessment reveals that employees have a 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 pinch points, skin absorption of harmful substances, chemical or thermal burns, electrical dangers, bruises, abrasions, cuts, crushing, punctures, fractures and cold or heat protection. Protective equipment includes gloves, finger guards and arm coverings or elbow-length gloves.

There are many scenarios where hand protection should be utilized in our industry. A few examples include when climbing a structure, when working with a moving rope, welding or grinding, working in a cold or extremely hot environment. What are some other examples where we would use gloves? What types of gloves work best for you & why? Dexterity during the summer, layering during the winter, waterproof. Durable materials.

Although there are some gloves that can protect a worker from multiple hazards, most gloves are designed for task specific protection.

(Instructor: walk through each type and how it protects the worker).

***Reference appendix on page 173 of student workbook.**

Applications

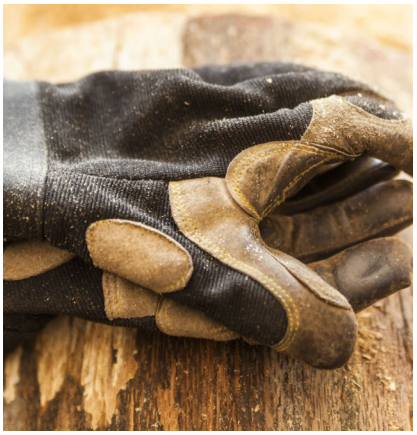
- Rope work
- Climbing
- Potential impact
- Using knives

Evolution of Hand Protection

Like most things that evolve and get better with time, gloves are no different. Glove evolution examples include synthetic materials providing better protection, built in impact resistant material over fragile parts of the hand, to a built-in warming system ran from a battery to provide protection from the cold.

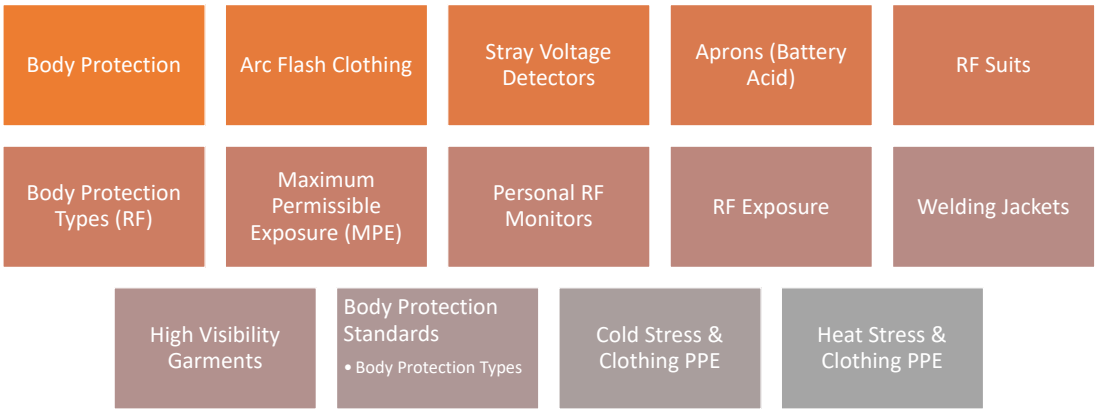
What Standards Apply

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



Falling in line with other areas of body protection, rules, regulations, and standards come into play to ensure workers are not only protected, but standards exist to ensure product reliability to keep our hands protected.

SECTION 12
Body Protection



Various Body Protection

Body Protection

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)

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:

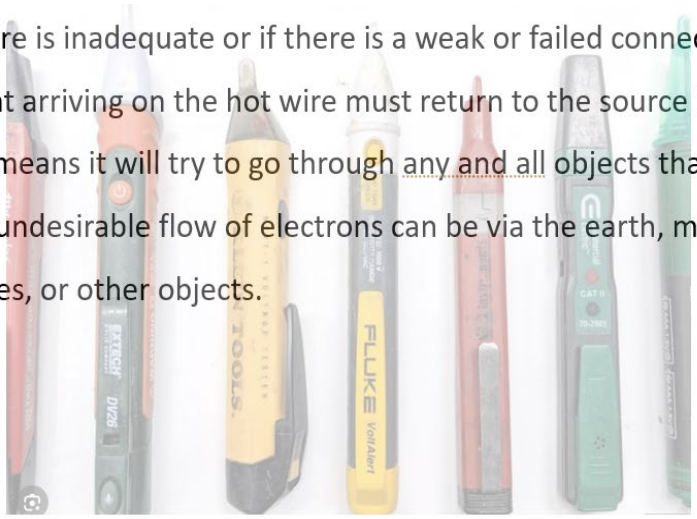
- ASTM-F 1506-22 – Flame resistant, electric arc flash rated clothing
- NFPA 70E – Standard for electrical safety in the workplace
- Appendix E to 1910.269 – Protection from flames and electric arcs
- NFPA 2112 – Standard on flame resistant clothing against short-duration thermal exposures from fire

Examples:

- Working in, on or around utility sites where the potential of arc flash exists
- Electrical panels
- Utility / Transmission lines (Inside Minimum Approach Distance)

Stray Voltage Detectors

If the neutral wire is inadequate or if there is a weak or failed connection, the electrical current arriving 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

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.

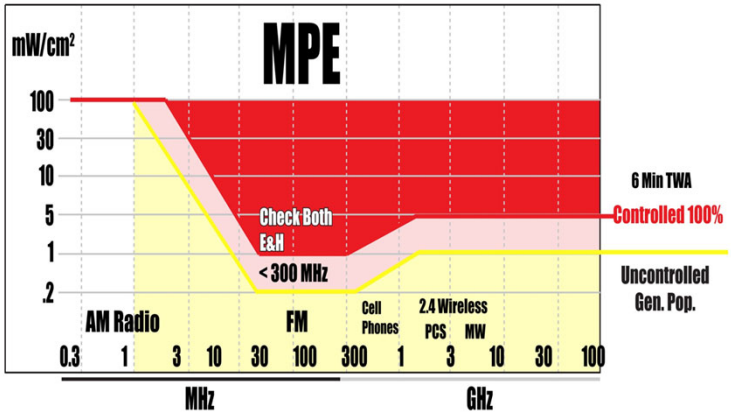
RF Suits

- 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

RF Suits

Maximum Permissible Exposure (MPE)



Maximum permissible exposure (MPE)This is the minimum irradiance or radiant exposure that may be incident upon the eye or skin without causing biological damage. The MPE varies by wavelength and duration of exposure and is documented in tables published in ANSI z136.

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.

A best management practice (BMP) is that the RF Personal Protective Monitor (PPM) has precedence above all other things like signage and barriers as remember things change on telecom sites. It's critical to read the instruction manual on how to properly use the PPM. They should be worn on the front of the body, not in your back pocket, as your body is shielding the RF from the monitor is in the back pocket.

RF Exposure

Telecom Climb Facility Hazards

Welding Jackets

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

- 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.

DOT 23 CFR 634 – US Department of Transportation standard for traffic workers.

OSHA handles high visibility clothing under the general duty clause Section 5(a)(1) except for traffic work zone flaggers.

Section 1926.201 – Signaling

Flagman shall be provided with and shall wear a red or orange warning garment while flagging. Warning garments worn at night shall be of reflectorized material.

ANSI D6.1 – Section 6E-e (High Visibility Clothing)

For daytime work, the flagger's vest, shirt, or jacket shall be orange, yellow, strong yellow, green or fluorescent versions of these colors. For nighttime work, similar outside garments shall be retro reflective.

Body Protection Types

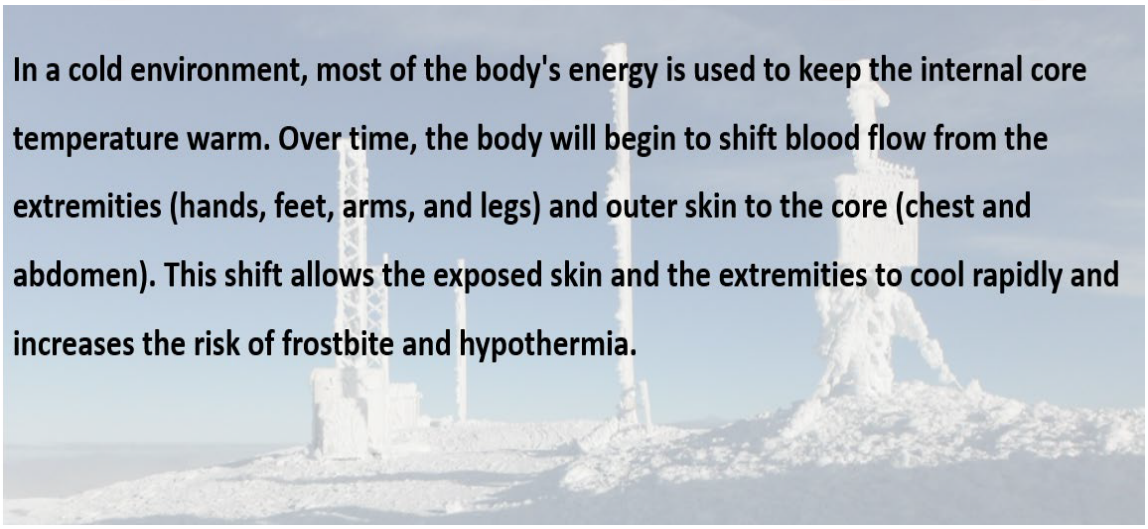
Garment Type	Type "O" (Off-Road)	Type "R" (Roadway)	Type "R" (Roadway)	Type "P" (Fire, Police, EMS Personnel)	Type "P" (Fire, Police, EMS Personnel)	Supplemental Items (Garments with Legs, including Gaiters)
Performance Class	Class 1	Class 2	Class 3	Class 2	Class 3	Class E
Background Material Amounts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

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



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:

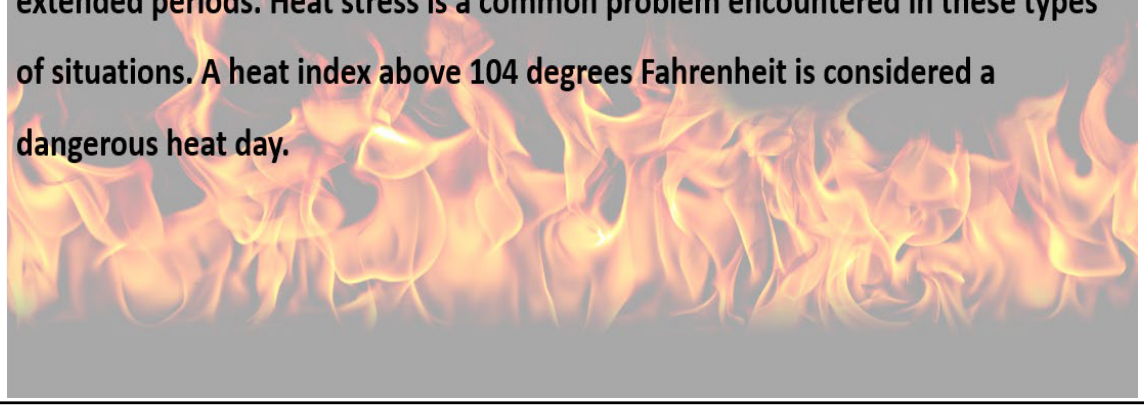
- Layering provides better insulation (base, middle, and outer layers) are key.
  - A base layer of wool, silk or synthetic to keep moisture away from the body.
  - A middle layer of wool, fleece, or synthetic to provide insulation even when wet.
  - An outer wind and rain protection layer that allows 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

- 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

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

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

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

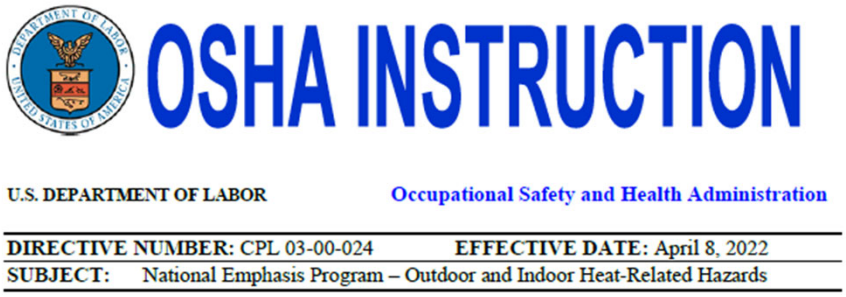
Protecting Workers from Heat Stress

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.

www.osha.gov/heat/employer-responsibility

Heat Stress Standards and Documents

OSHA - National Emphasis Program (NEP) CPL_03-00-024



OSHA INSTRUCTION

U.S. DEPARTMENT OF LABOR — Occupational Safety and Health Administration

DIRECTIVE NUMBER: CPL 03-00-024 **EFFECTIVE DATE:** April 8, 2022

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

Section 13
Hearing Protection

HEARING PROTECTION

TYPES OF HEARING PROTECTION

NOISE LEVELS

WHERE AND HOW IT IS USED IN THE INDUSTRY

STANDARDS

Hearing Protection

Certain operations generate noise requiring hearing protection. Employee exposure to excessive noise depends upon a number of factors, including:

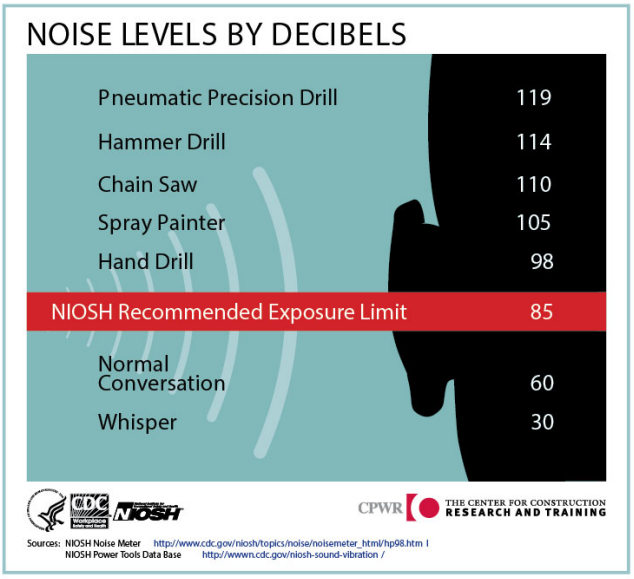
- The noise level, as measured in decibels (dB).
- The duration of each employee's exposure to the noise.
- Whether employees move between work areas with different noise levels.
- Whether noise is generated from one or multiple sources.
- Generally, the louder the noise, the shorter the exposure time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

For instance, employees may be exposed to a noise level of 90 dB for 8 hours per day (unless they experience a Standard Threshold Shift) before hearing protection is required. On the other hand, if the noise level reaches 115 dB hearing protection is required if the anticipated exposure exceeds 15 minutes.

Types of Hearing Protection

- 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.

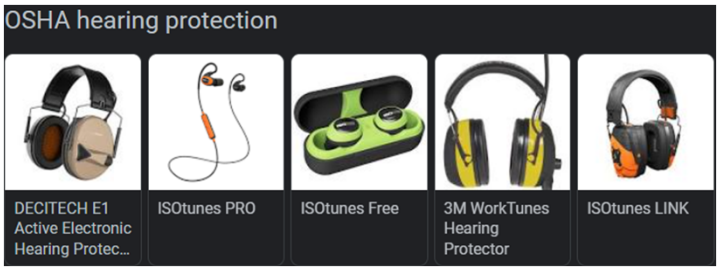
Noise Levels



Where and How it is Used

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.



Employer must provide two or more forms of hearing protection to ensure fit.

How to Use Formable Earplugs

https://youtu.be/2eBpSctTXkY

Standard

OSHA 1910.95(b) – Occupational Noise Exposure (general industry)
OSHA 1926.101 – Hearing Protection (construction)

Permissible Noise Exposures

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

„ww.osha.gov/laws-regs/regulations/standardnumber/1910/1910.95

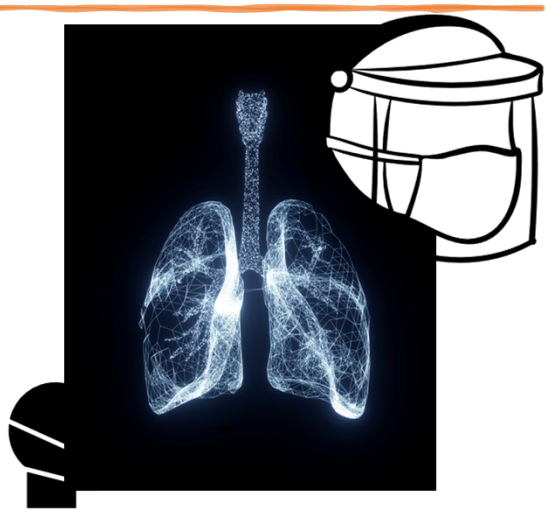
Above 100% dose hearing protection is mandatory.

1926.101(b) Ear protective devices inserted in the ear shall be fitted or determined individually by competent persons.

Section 14
Respiratory Protection

I. Respiratory Hazards

II. Types of Respiratory Protection



Respiratory Hazards

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.

- Some of these can make you sick if you breathe them in.
- Some respiratory hazards act quickly, like carbon monoxide which can make you unconscious or kill you in minutes.
- Other respiratory hazards can take years to make you sick, like asbestos which can cause lung cancer decades after you breathe it in.

Types of Respiratory Protection

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.

Explain – respirator would be an absolute LAST resort due to the medical evaluation and fit test.

Respirators are not used very often in our industry. If they are needed follow company policy for use.

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.

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

September 2019

Selection of Respirators

- 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.

Explain – respirator would be an absolute LAST resort due to the medical evaluation and fit test.

Respirators are not used very often in our industry. If they are needed follow company policy for use.

Evaluation Requirements

- 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.

- Respirators are not used very often in our industry. If they are needed follow company policy for use.
- **Explain** – respirator would be an absolute LAST resort due to the medical evaluation and fit test.
- Employee needs to be working in an environment that requires the use of a respirator
- Using a respirator may place physiological stress on the employee and vary with type of respirator, workplace conditions and medical status of the employee.
- Evaluations are conducted before any fit test takes place by a physician designated by the employer.

Fit Tested Requirements

- 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.

- Must also pass a qualitative fit test.
- Additional tests should be conducted if any changes are noted, employee reports changes, or if a supervisor visually notes changes in employee condition or behavior.

Respirator Seal Check

https://youtu.be/pGXiUyAoEd8

Maintenance Requirements

- 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

- Employers provide cleaning and disinfecting material for respirators
- Example of used by multiple employee will be training and fit testing
- Inspected before use include:
  - Check for proper function
  - Check all rubber parts for deterioration
  - SCBA should be inspected monthly

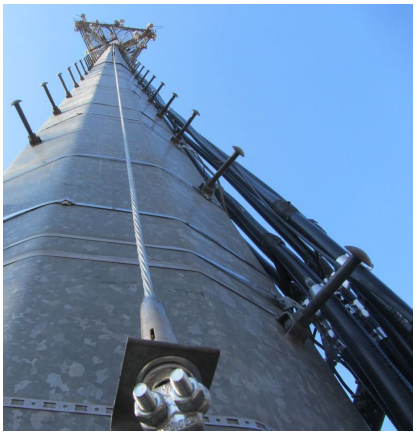
Section 15
Climbing Facilities

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?

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



Ask: What is a climbing facility?

Inspection Requirements to Determine Proper PPE Selection

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

Per ANSI/ASSP A10.48-A:

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

Inspection Requirements to Determine PPE

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.

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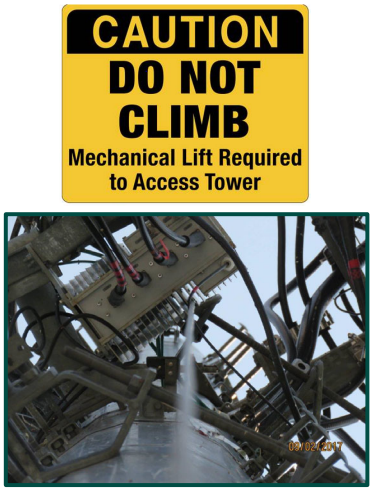
- Climbing and safety climb devices need not be installed over the entire height of a structure when their installation would adversely affect the performance of an antenna. In such case, the structure shall be equipped with a warning sign or climber attachment anchorages shall be provided.
- Structures 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. (A good example of this are flagpoles).

Inspection Requirements to Determine PPE (continued)



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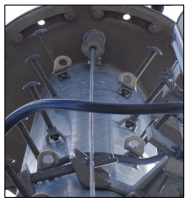
Telecom Climb Facility Types

Monopole Step Bolts

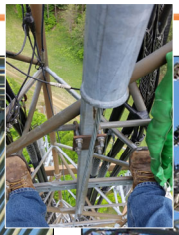


Monopole Drop-In Steps

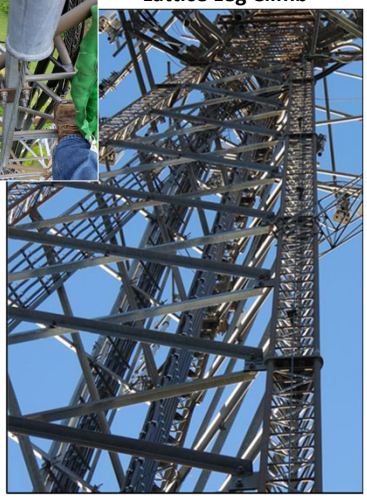
Telecom Climb Facility Types (continued)

Face Climb

Ladder



Lattice Leg Climb



Telecom Climb Facility Types (continued)

Angle Leg Climb

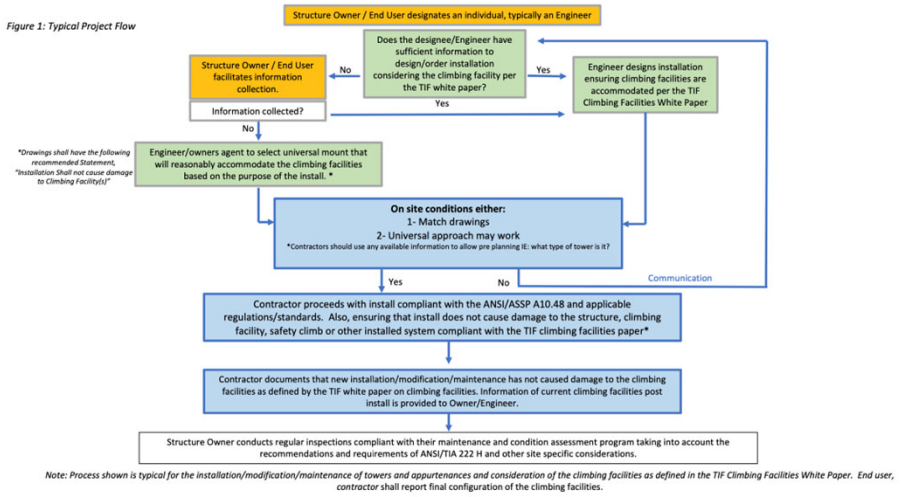
Round Climb Leg

Safety Climbs

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

Watch safety climbs video and review bulleted points/discuss.

TIF White Paper: Climbing Facilities



White Paper: Climbing Facilities

The goal of this TIF White Paper is to outline best-practices to avoid installations that harm the structure, climbing facilities, safety climbs, or any other known systems installed on a structure that will be impacted by the telecommunication equipment installation. Additionally, the intent of this White Paper is to provide clarification on the roles and responsibilities of each stakeholder and encourage dialogue between them.

Stakeholder responsibilities discussed are:

- End Users
  - Carriers
  - Government Bodies
  - Broadcasters
- Structure Owners
  - Tower Owners
  - Communication Facility Owners
- Manufactures
- Engineers
- Contractors

Review typical project flow pictured.

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

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.

Ask What is a climbing path obstruction?

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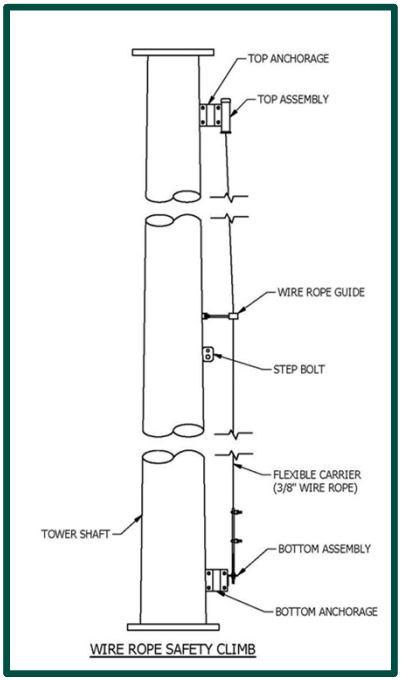
Wire Rope Safety Climbs

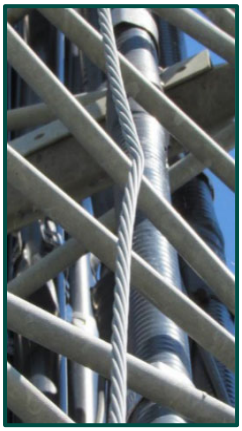
- Wire rope condition meets or exceeds requirements as specified by ASME B30.30.
- Wire rope is pre-tensioned. Environmental conditions may impact wire rope safety climb tensions throughout the day.
- Size (3/8 in. diameter wire rope) and type (1x7 or 7x19) are compatible with the safety sleeve.



Review wire rope safety climbs.

Wire Rope Safety Climbs

- 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.



Continued review of wire rope safety climbs.

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	Skylotec 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.

NATE
THE COMMUNICATIONS INFRASTRUCTURE CONTRACTORS ASSOCIATION


Drop 1


Drop 2


Drop 3


Drop 4

Dynamic Drop Test – Leg Mount

Purpose
The purpose is to complete dynamic performance testing to evaluate wire rope safety climb system components under ideal/environmentally controlled conditions. The drop scenario was to replicate a single climber falling on a newly installed system.

Test Setup
A new 20’ leg mounted PerfectVision Climb-Maxx system with a 3/8”, 7x19 stainless steel wire rope pretensioned to 400 lbf. (pound-force) was installed per the manufacturer’s specifications on the structure without wire rope guides and did not have interference from appurtenances or wire rope deflection.

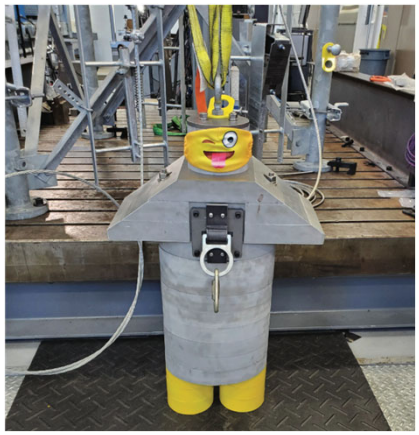
Results
Wire rope safety climb system, including climbing facility, showed no signs of wear or damage during/post drop test.

It should be noted that some manufacturers state that their wire rope safety sleeves should only be utilized with their wire rope safety climbs. SEMC testing results show that failure to adhere to these requirements may result in malfunction or equipment failure.

SEMC Wire Rope Safety Climbs

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.



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SEMC Fall Arrest Lanyard Testing

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.

The Communications Infrastructure Contractors Association today unveiled a video shining a spotlight on the recent Fall Arrest Lanyard Testing Event that the Safety Equipment Manufacturers Committee (SEMC) held at the University of Dayton Research Institute in Dayton, Ohio. The #ClimberConnection 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. The NATE SEMC's mission is to test the equipment based on how it functions in real-world, field-based environments and our dedicated group of industry subject matter experts have been able to do that successfully over the last 10 years.

To access the NATE SEMC white papers on the various testing and research initiatives, visit https://natehome.com/safety-equipment-manufacturers-committee-semc-initiatives/2021-nate-semc-wire-rope-safety-sleeve-testing-report-ii/2021-nate-semc-wire-rope-safety-sleeve-testing-report-ii/

NATE Safety Sleeve Testing White Paper

- 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 un-supported 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 unsecure on the safety climb system when working at heights.

NATE Safety Sleeve Testing Final Report White Paper is an in-depth, 62-page white paper describes the overall scope, methodology and results from the NATE sponsored Safety Sleeve Testing events that were performed at the University of Dayton Research Institute (UDRI) in Dayton, Ohio in 2018 and 2019.

The testing, performed over three different events and six total days, included over one hundred-ten (110) drops completed. The Association's Safety Sleeve Testing Team attempted to push the design limits and standards of the safety sleeves and test outside of the parameters established by ANSI/ASSE Z359. Therefore, most of the tests were performed for replication of real-world use and application. The test results presented should only be used to validate and reinforce existing safety procedures.

The test results confirmed that the existing ANSI/ASSP Z359 standard testing protocol is not robust enough, in terms of simulating real life conditions on antenna supporting structures, and that additional testing criteria should be considered going forward.

Step Bolts

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

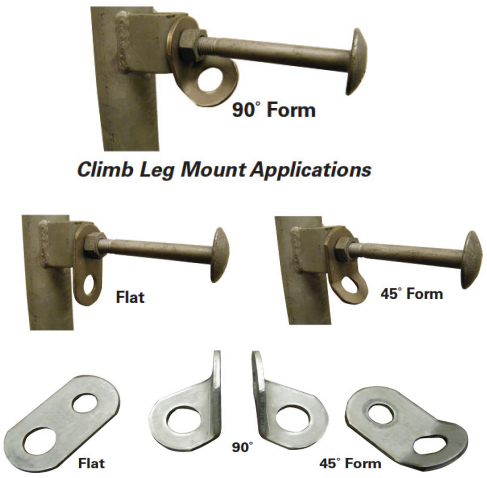
- Load factor of 1.2 applied to dead loads for determining strength requirements
- Designed to support a minimum normal concentrated factored load equal to 600 lbs. applied 2 inches from the inside face of the step bolt head.
- Step bolt clip strength requirements.

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

Explain why this is a bad example.

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.



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- Step bolt clip material requirements.

SEMC Step Bolt Testing

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

https://www.youtube.com/watch?v=KYm4jwwBTpg

NATE today released a video that was produced as a result of several prominent industry step bolt testing events that were conducted at the University of Dayton Research Institute (UDRI) in Dayton, Ohio. The #ClimberConnection video, entitled "To Tie-Off or Not to Tie-Off", contains important safety information that the industry's tower technician workforce needs to know before working on tower structures installed with step bolts. The informative video was unveiled at the 2019 Wireless West Conference in Scottsdale, Arizona.

The video shows jaw-dropping footage of the static and dynamic drop tests that were performed at the UDRI facility in order to test the strength of step bolts. The video reinforces the key findings of the testing that 5/8" step bolts, while suitable for climbing, DO NOT have the capacity to be used as an anchorage for any type of personal fall arrest systems.

"The information contained in this video should be utilized by every company and worker in the industry as a training tool as it contains important step bolt related information derived from our testing ," said NATE Board of Directors member John Paul Jones, who helped spearhead the testing activities. "I would like to thank all of the manufacturers, tower owner/ vertical realtor firms, contractor companies and technicians who collaborated together on these testing initiatives. The results obtained from the testing will ultimately help create a safer environment for the men and women working at elevation on monopole towers," Jones added.

The Climber Connection Volume 4 campaign was developed by the NATE Member Services Committee in conjunction with the NATE Safety & Education Committee and is designed to provide specific resources and communicate the Association's message directly to the industry's workforce.

Planning Advisory Notice: Step Bolts

- **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.

TIF, PAN Step Bolts purpose was to raise awareness of the design, performance and intent of step bolts, a testing paradigm and process was underwritten by NATE and supported by many others in the industry. This test provided accurate data to verify the existing engineering design methodology is in fact valid, and supported enhancements to the climbing facilities section of the ANSI/TIA-222-H Standard.

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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 require- ments 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 protect 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

Chemical	Neoprene	Latex/Rubber	Butyl	Nitrile
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
Dioctyl 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

Chemical	Neoprene	Latex/Rubber	Butyl	Nitrile
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

Chemical	Neoprene	Latex/Rubber	Butyl	Nitrile
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 metharcrylate	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

Chemical	Neoprene	Latex/Rubber	Butyl	Nitrile
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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