



Fall Prevention Worker Training

Instructor Workbook

(Susan Harwood Grant # SH-27625-SH5)

Disclaimer

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The information used in the development of this workbook was taken from OSHA standards for general industry and construction, 29CFR 1910 and 29CFR 1926.

The contents of this workbook are organized into seven sections that parallel the Tower Climber Fall Prevention Worker Training PowerPoint. Each section is approximately 45 minutes in length. The following sections and topics are covered in this training:

Notes for Instructors

This course was designed for the least experience climber in the tower industry. It contains very basic, easy to comprehend goals. It is your responsibility to ensure that students complete each section and remediate on the learning objectives.

Always keep in mind that a successful instructor will:

1. Tell the students what they will be taught followed by;
2. Teaching them what you told them you would teach them and finally;
3. Telling them what you taught them.

If you follow these three principals, you will find success in your classroom

What you will need to conduct this training

1. Turning Point 5.0
2. Computer
3. Power Point Projector
4. Blank JSA Forms
5. Climber Kit
6. Flip Chart
7. Markers

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Course Objectives:

By the end of the five-hour training session students will be able to demonstrate the knowledge, skill, or behavior change in the following areas:

1. The knowledge and skill to identify various types of fall protection for the tower Industry and their components.
2. The knowledge and skill to recognize fall hazards and identify abatement methods for fall hazards.
3. The knowledge and skill to define the proper use of fall protection equipment and personal fall arrest systems.
4. The knowledge to select proper climbing paths.
5. The knowledge of standards.
6. The knowledge skill and behavioral change to understand JSAs and Pre-climb check lists.

Instructor may either brainstorm the course objectives through an ice breaker exercise whereby the students introduce themselves, where they work, what they do and finally to list at least one learning objective they have for themselves. The instructor will list each of these by student and then refine the list until he/she arrives at the 6 objectives.

Alternate method: Instructor to read the slide emphasizing the six objectives of the course.

Class Organization:

The class is organized into six sections. Each section is approximately 45 minutes in length. The following sections and topics are covered in this training:

- Section 1: Introduction
- Section 2: Climbing Techniques
- Section 3: Subpart M Fall Protection
- Section 4: Fall Protection Systems
- Section 5: Personal Protective & Life Saving Equipment
- Section 6: Tower Systems
- Section 7: Safety Plans

Course Itinerary:

Topic	Format	Minutes
Review of Objectives (7-7:15)	Lecture	15
Section 1: Introduction (7:15-8)		
NATE		
OSHA	Lecture	35
Employee Rights		
Whistleblower Protection		

How to File a Complaint		
Why Tower Climbers Need a Fall Protection Training Program		
Turning Point Review of Topics Covered	Quiz	10

Section 2: Climbing Techniques (8-8:45)

Climbing Safety		
Three Points of Contact		
Skeletal System	Lecture	35
Safety Considerations for all Climbs		

Topic	Format	Minutes
Turning Point Review of Topics Covered	Quiz	10

Section 3: Subpart M - Fall Protection (8:45-9:30)

Scope and Application of Subpart M		
Duty To Have Fall Protection		
Fall Protection Systems: Criteria & Practices	Lecture	35
Training Requirements		
Turning Point Review of Topics Covered	Quiz	10

15 Minute Break

Section 4: Fall Protection Systems (9:45-10:30)

Prevention Methods		
Criteria for Personal Fall Protection Systems	Lecture	30
Criteria for Safety Net Systems		
Demonstration of PFAS equipment	Hands-On Demo	5
Turning Point Review of Topics Covered	Quiz	10

Section 5: Personal Protective & Life Saving Equipment (10:30-11:15)

Definitions of PFAS Components with physical examples		
Anchorage Points		
Additional Requirements	Lecture / Hands-On Demo	25
Suspension Trauma		
Rescue Methods		
Fatal Fall Exercise	Online Participation	10
Turning Point Review of Topics Covered	Quiz	10

Break for Lunch

Section 6: Tower Systems (12:30-1:15)

Different Tower Systems: Guyed, Monopole, Self Supporting		
Fall Protection on Each Tower System	Lecture	25
Anchorage Points on Tower Systems		
Fall Protection when working with a Gin Pole		
Brainstorming Photo Series	Small Groups	10
Turning Point Review of Topics Covered	Quiz	10

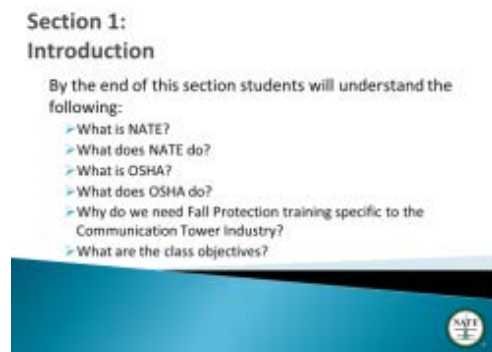
Topic	Format	Minutes
Section 7: Fall Protection Plans (1:15-2)		
Importance of Safety Plans	Lecture	15
Training Requirements		
How to Develop a JSA	Interactive PPT ?s	20
Turning Point Review of Topics Covered	Quiz	10

Section 1: Introduction

Unlike other construction industries, tower erection and maintenance has few hazards. Despite these limited hazards, the likelihood of an accident and severity of the accident, if it were to occur in Tower erection and maintenance, is high, and often yields catastrophic results.

This introduction is designed to teach students what hazards are encountered for Tower Climbers. They will also learn about the organization that represents the tower industry – The National Association of Tower Erectors (NATE) – and its functions.

Another important learning objective in this section includes learning about the Occupational Safety and Health Administration (OSHA), specifically: what it does, employee rights, and employer’s responsibilities to safeguard them from hazards associated with tower climbing. Students will learn which OSHA standards apply and why they need specific fall protection training for this industry.



Hazards of Tower Erection:

Below are the major hazards associated with Tower Climbing:

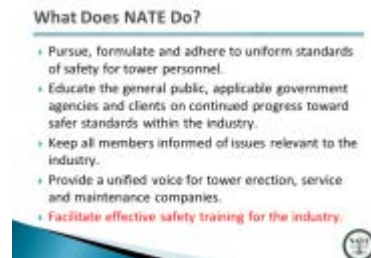
- Falls from great heights. This is the single most significant hazard in Tower erection.
- Electrical hazards, such as accidental contact with active, high-voltage power lines.
- Hazards associated with hoisting personnel and equipment with base-mounted drum hoists.
- Inclement weather, such as high winds, rain, thunder, lightning, etc.
- Falling object hazards, possibly from another worker.
- Equipment failure, stemming from worn or old equipment.
- Structural collapse of towers.



National Association of Tower Erectors (NATE):

The National Association of Tower Erectors (NATE) is a non-profit trade association providing a unified voice for tower erection, maintenance and service companies. NATE provides the following services:

1. Pursues, formulates and adheres to uniform standards of safety for tower personnel.
2. Educates the general public, applicable government agencies and clients on continued progress toward safer standards within the industry.
 - Keeps all members informed of issues relevant to the industry.
 - Provides a unified voice for tower erection, service and maintenance companies.
 - Facilitates effective safety training for the industry



Occupational Safety and Health Administration (OSHA)

OSHA was signed into Law in 1970 by then President Richard M. Nixon with the passage of the Occupational Safety and Health Act. The agency was created to enforce workplace safety and health regulations. Since then OSHA has reduced the occurrence of work related fatalities by half and has

reduced work place injuries and illnesses by 40%. OSHA Regulations cover both General Industry and Construction activities. The Act provides the following provisions:

- Provide a workplace free from serious 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.
- No discrimination against employees who exercise their rights under the Act.
- Inform employees of hazards through training, labels, alarms, etc.
- Train employees in a language/vocabulary an employee can understand.
- Keep accurate records of work-related injuries and illnesses.

In addition OSHA performs the following activities:

1. Works with employers and employees to reduce workplace hazards.
2. Introduces new or improves upon existing safety and health programs.
3. Develops safety and health standards that are designed to protect workers.
4. Enforces the standards through inspection and citations.
5. Maintains a report and recordkeeping system to monitor job-related injuries and illnesses.
6. Provides assistance and training to help employers and employees.

OSHA also enforces employee rights under the OSH Act. All employees have the right to:

- Safe and healthful working conditions.
- File a confidential complaint with OSHA to have workplace inspected (see below).
- Review records of work-related injuries and illnesses.
- Receive training, methods to prevent harm, and the OSHA standards that apply to their workplace.
- Use their rights under the law without retaliation or discrimination.
- Obtain copies of test results done to find hazards in the workplace.
- Obtain copies of their medical records.

OSHA also enforces Whistleblower Protection to Employees who raise concerns about workplace safety. Whistleblower Protection prevents the following retaliation/discrimination against the notifying employee(s):

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

Filing an OSHA Complaint

Employees, or their representatives, have a right to request an inspection of a workplace if they believe there is a violation of a safety or health standard, or if there is any danger that threatens physical harm,

or if an "imminent danger" exists. Employees may file a complaint by calling the nearest Area or Regional OSHA Office. An employee can also file a complaint electronically by going to OSHA.Gov and follow the instructions for filing a complaint.

What Does OSHA Do?

Workers Have the Right To...

- Safe and healthful working conditions
- File a confidential complaint with OSHA to have their workplace inspected
- Review records of work-related injuries and illnesses
- Receive training, methods to prevent harm, and the OSHA standards that apply to their workplace
- Use their rights under the law without retaliation or discrimination
- Obtain copies of test results done to find hazards in the workplace
- Obtain copies of their medical records

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



What Does OSHA Do?

Employers Must...

- Provide a workplace free from serious recognized hazards and comply with standards, rules and regulations issued under the OSHA 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
- Keep accurate records of work-related injuries and illnesses

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



What Does OSHA Do?

Whistleblower Protection

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

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



What Does OSHA Do?

How To File A Complaint

- Visit www.osha.gov/workers.html or call 800-321-OSHA
- Be prepared to provide specific details about yourself, your company and the type of hazard or discrimination being reported
- **Note:** A signed complaint is necessary, even if originally phoned in
- Keep a confidential record of all details
- Once a complaint is filed or reported, an inspection is normally warranted (see criteria on website)

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



Has OSHA Made a Difference?

Yes!

Since 1970, OSHA has:

- Helped cut the work-related fatality rate in half
- Worked with employers and workers to reduce workplace injuries and illnesses by 40 percent

Why is Fall Protection Training Needed:

You should open up a conversation on why there is a need to train in the tower industry. The discussion should continue until the following has been identified:

1. Tower fall fatalities are one of the highest among all industries;
2. Tower fall protection is unique as compared to other industries;
3. The cost of fall fatalities challenge the respect owners and regulators have towards the industry.



Section 1: Review Questions

Which organization is the unified voice representing the Tower Industry?

- A. OSHA
- B. NATE**
- C. ANSI
- D. NECA

Which is not a function of OSHA?

- A. Promulgate new standards
- B. Training
- C. Enforcement of standards
- D. Conducts research on hazards**

NATE's role is to facilitate effective safety training for the industry.

- A. True**
- B. False

Why do we need a specific fall protection course for the tower industry?

- A. The tower industry fall hazards are unique;
- B. Limited anchorage points on towers;
- C. Remote locations of tower erection presents unique challenges;
- D. All the above**

Which answer below represents the greatest Hazard in Tower erection?

- A. Falls from great heights.
- B. Electrical hazards.
- C. Hazards associated with hoisting personnel and equipment;
- D. Falling Objects
- E. Tower collapse

Section 2: Climbing Techniques

Tower Climbers have a physically demanding job. It is imperative that workers in this industry understand the physicality and preparation required for climbing. This section of the course details how a tower climber can ascend a structure safely and introduces key pieces of fall prevention equipment. The student should also understand how the human body can assist a climber when dealing with stressful situations.

By the end of this section students will understand the following:

- How to climb a tower safely and how to conserve energy
- The importance of maintaining “Three points of contact”
- Use of skeletal system to reduce muscle fatigue
- Safety considerations for all climbs

Before You Climb:

Tower climbing requires the employee to be constantly engaged in his or her work. Taking the time plan your climb and follow the steps below before each climb can lead to the safest climb possible. Awareness, training, and critical thinking are some of the best skills a climber can possess.

- Report unsafe or questionable conditions to Site Supervisor.
- Take the appropriate steps to correct or minimize the unsafe condition.
- Follow all safety regulations of the employer.
- Anticipate environmental and other site related hazards/exposures.
- Periodically inspect the site as work progresses.
- Conduct annual on/off site inspections to ensure compliance and reevaluate work practices and procedures.
- When you get to a position to rest always tie off so you can rest. You must trust your equipment.

Section 2:

Climbing Techniques

By the end of this section, students will understand the following:

- ▶ Climb Safely and Conserve Energy
- ▶ Explain “three points of contact”
- ▶ Explain use of skeletal System
- ▶ Explain safety considerations for all climbs

Pre-Climb Check list

Before You Climb:

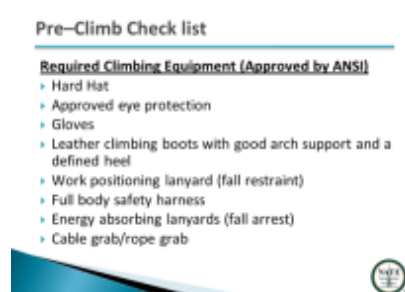
- ▶ Inspect your work environment for any unsafe conditions.
- ▶ Report unsafe or questionable conditions to Site Supervisor.
- ▶ Take the appropriate steps to correct or minimize the unsafe condition.
- ▶ Follow all safety regulations, including employers.
- ▶ Anticipate environmental and other site related hazards/exposures.
- ▶ Periodically inspect the site as work progresses
- ▶ Conduct annual on/off site inspections to ensure compliance and reevaluate work practices and procedures.

Required Climbing Equipment:

While PPE is not fundamental to this training you are trying to get the students to appreciate pre planning their climb by thinking about all PPE that is required. Emphasize to the class that they should secure related tools and equipment in a position that will not impede ascending / descending the tower or ladder.

The following list contains items that the industry and OSHA deem required for tower climbers to don before each climb. Emphasize that, all the Personal Protective Equipment in the world is useless unless it is consistently used and maintained in a proper manner.

- Hard Hat
- Approved eye protection
- Gloves
- Leather climbing boots with good arch support and a defined heel
- Work positioning lanyard (fall restraint)
- Full body safety harness
- Energy absorbing lanyards (fall arrest)
- Cable grab/rope grab



When inspecting the tower:

Tower climbers can further limit hazards associated with their job by doing as much work as possible on the ground. This includes inspection of all equipment and the tower structure itself. When walking around the tower, be aware of bolts lying on the ground and always look up at the structure for inconsistencies in the structure itself. This is a good time to plan a climbing path, consider obstacles that may make one path more desirable than another (i.e. climb the path with the fewest obstructions).

- Look for the safest and most effective path up and down the tower.
- Based on the type of tower, corners may help save energy when climbing.
- Look for rest positions; you must know your limits and what you can do. Remain focused.

Climbing Techniques

When inspecting the tower:

- ▶ Look for the safest and most effective path up and down the tower.
- ▶ Based on the type of tower, corners may help save energy when climbing.
- ▶ Look for rest positions; you must know your limits and what you can do...Remain Focused.

When Climbing a Tower:

When climbing a tower, consider all possible ways to limit your load as a climber to conserve energy and add to the safety of the climb. It is most common to use a Double Lanyard. A double lanyard is preferred over a single lanyard because it allows for 100% fall protection when ascending or descending. When using a double lanyard a climber should adhere to the following practice:

- Climb to where the hook is at your waist.
- Reach overhead and hook the other lanyard as far as your arm will reach without overextending.
- Always keep in mind that short moves may cause fatigue.
- As you climb look at the placement of your hands, feet, and line of travel.

When climbing a tower it is important to know that one of the safeguards is maintaining “Three Points of Contact” (arms and legs) on the structure at all times. Dangling feet and or arms will only serve to increase the gravitational pull down to the ground and adds to worker fatigue.

- Watch where you place your extremities, you should only see one move at a time.
- Standing or clinging is a point of contact.
- You may use an arm or leg lock for short stops.
- Possible combinations of the “Three Points of Contact”: two hands & one foot; one hand & two feet; etc.

Climbing Techniques

Most common type of climbing in tower work is
Double Lanyard

- ▶ Maintains 100% tie off when ascending or descending
 - Climb to where the hook is at your waist
 - Hook the other one, at arms reach above
 - Short moves may cause fatigue
 - As you climb look at the placement of your hands, feet and line of travel

A climber's skeletal system helps support and makes up the framework of the body and is crucial in order to maintain form. Unlike muscles, bones don't fatigue as quickly. This is why tower climbers should be aware of their movements and recognize when they need to conserve energy. It is important for a climber to rest when possible, and use their skeletal structure to brace themselves against an anchorage point. Maintaining a good climbing form and rhythm can contribute to a safer climb and less


fatigue. Establishing a personal rhythm or pattern builds a climber's consistency so they do not overexert themselves and contribute to fatigue during a climb.

- The skeletal structure also protects vital organs and most importantly the spinal cord to reduce damage, even fatally, during a fall or any sort of accident.
- Legs are much stronger than arm muscles.

Climbing Techniques


"THREE POINTS OF CONTACT"

- Maintain 3 of hands/feet (combination of 2 hands and 1 foot or 1 hand and 2 feet) on the structure at all times when climbing.
- By visually watching where you place your extremities, you should only see one move at a time.
- Standing or clinging is a point of contact.
- You may use an arm or leg lock for short stops.



Skeletal system

- A climber's skeletal system helps support and makes up the framework of the body and is crucial in order to maintain form
- The skeletal structure also protects vital organs and most importantly the spinal cord to reduce damage, even fatally, during a fall or any sort of accident
- Legs are much stronger than arm muscles



Section 2: Review Questions

When you plan your climb you reduce the probability of fall hazards?

- A. True**
- B. False

Which of these must you do when inspecting a tower?

- A. Looking for the safest and most effective path up and down the tower.
- B. Based on the type of tower corners may help save energy when climbing.
- C. Look for rest positions, you must know your limits and what you can do. Remain Relaxed
- D. All the above**

Double lanyards provide 100% fall protection when used as designed?

- A. True**
- B. False

You should maintain 2 points of contact at all times?

- A. True
- B. False**

Section 3: Subpart M Fall Protection

Subpart M focuses exclusively on fall protection; however, there are a number of tasks that are excluded from the standard or are different in Subpart M to other subparts in 29CFR1926. Also note that for maintenance activities some parts of the General Industry standard 29CFR1910 apply. Subpart M includes criteria for personal fall protection systems and anchorage points. It also includes the permissible guidelines for what constitutes stressors to a climber's skeletal structure.

By the end of this section, students will understand the following:

- Scope and application of this subpart
- Duty to have fall protection
- OSHA Construction Standards that applies to Tower Erection (29 CFR 1926)
- Nature of Falls
- Training Requirements

Subpart M Applies to:

Below are the most common elements encountered in the Tower Industry where Subpart M applies.

- Unprotected Sides & Edges
- Skylights on rooftops
- Leading Edges
- Hoist Areas
- Holes
- Other areas unrelated to the tower construction industry
- All Tower Work Including:
 - Initial construction
 - Replacement of tower components
 - Work off rooftops
 - Tower construction work off conventional platforms (concrete pads) as well as non-conventional platforms, such as road signs on freeways and highways
 - When installing antennas on above ground water tanks

Section 3:

1926 Subpart M – Fall Protection

By the end of this section students will understand the following:

- ▶ Scope and application of this subpart;
- ▶ Duty to have fall protection;
- ▶ Fall protection systems criteria and practices;
- ▶ Training requirements



Subpart M – Fall Protection

- 1926.500 Scope, application, and definitions
- 1926.500(a)(3)(iv) Section 1926.502 does not apply to the erection of tanks and communication and broadcast towers
- 1926.501 Duty to have fall protection.
- 1926.502 Fall protection systems criteria and practices.
- 1926.503 Training requirements.



Duty to Have Fall Protection

As previously discussed in Section 1, OSHA requires employers to provide employees with proper fall prevention equipment and protective measures. OSHA considers Guard Rail Systems, Safety Net Systems, and Personal Fall Arrest Systems to be conventional fall protection.

In OSHA terminology, “conventional” means it will stop a fall. All other types of fall protection are considered non-conventional, meaning they are more like administrative controls.

In the Tower Industry, employees will most frequently encounter the following protection measures:

- “Unprotected sides and edges.” Each employee on a walking/working surface (horizontal and vertical surface) with an unprotected side or edge which is 6 feet (1.8 m) or more above a lower level shall be protected from falling by the use of:
 - Guard Rail Systems
 - Safety Net Systems
 - Personal Fall Arrest Systems
- Walking/working surfaces on which employees are to work are required to have the strength and structural integrity to support them safely.

Subpart M – Fall Protection

Duty to Have Fall Protection

“Unprotected sides and edges.” Each employee on a walking/working surface (horizontal and vertical surface) with an unprotected side or edge which is 6 feet (1.8 m) or more above a lower level shall be protected from falling by the use of *guardrail systems, safety net systems, or personal fall arrest systems.*



Subpart M – Fall Protection

Duty to Have Fall Protection

Walking/working surfaces on which employees are to work have the strength and structural integrity to support them safely.



Subpart M – Fall Protection

Subpart M applies to:

1. Unprotected sides & edges
2. Leading edges
3. Hoist areas
4. Holes
5. And other areas unrelated to the tower construction industry



Subpart M applies to:

- All tower work including:
 - Initial construction;
 - Replacement of tower components;
 - Work off rooftops;
 - Tower Construction work off conventional platforms (concrete pad) as well as non-conventional platforms such as road signs on freeways and highways;
 - When installing antennas on aboveground water tanks



OSHA Construction Standards applicable to Tower Industry (29CFR1926)

Within OSHA 29th CFR 1926, there are several standards that require employers to train their employees. We are going to look at applicable standards within the Construction standard and explain how they apply to your work place.

First is Subpart C, of 29th CFR 1926.21, which requires training and is worded as follows:

1926.21 (b)(2) The employer shall instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his work environment to control or eliminate any hazards or other exposure to illness or injury.

What does this mean? Simply stated your employer has the obligation to point out unsafe conditions and instruct you on how to avoid hazards that could cause illness or injury. Example, a floor has an opening in it that would allow entry of a foot or leg. Is this a hazard? Yes, by inadvertently stepping into it could cause a leg fracture. In this case the employer has the duty to eliminate or control the hazard. How can it be eliminated? Simply by placing an adequate cover over the opening.

Throughout the OSHA construction standards there are requirements that direct other types of training including fall protection. Why? Falls are the highest risk hazard, and the leading cause of deaths in the construction industry.

29th CFR 1926.501, or Subpart M, is the Fall Protection standard which states the Employer has a duty to protect employees from falls and also requires mandatory training that must also be certified, to which competent person(s) that are qualified must perform.

This subpart outlines requirements for fall protection to prevent employees from falling from elevation. First let's look at some definitions applicable to this subpart starting with the Competent Person.

What is a competent person? OSHA mentions this title in the standard. OSHA defines a competent person as "one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them".

The terms Qualified Person is also used when planning and/or designing fall protection systems. A Qualified Person is defined as one with a recognized degree or professional certificate and extensive knowledge and experience in the subject field who is capable of design, analysis, evaluation and specifications in the subject work, project, or product.

Let's address what an existing hazard is. Refer back to the example of a floor opening. It is an existing hazard as it appears in plain sight, its open, and presents a hazard. What is a predictable hazard? For instance, if our task requires the removal of a floor covering to perform an operation, this would be predictable because we know at some point during the job the cover has to be removed. Now since a floor covering has been removed we are now required to protect the employee performing the work from falling and other employees in the area who may be exposed to the hazard.

Fall protection is as the words describe protection from falling. This could be from stepping into a floor opening, falling off of a roof, or other elevation. As such employees must be prevented from falling. OSHA defines methods of fall protection as Guard Rails, Safety Net Systems, or Personal Fall arrest systems.

Fall Protection Training

29th CFR 1926.503 requires employers to provide a training program for each employee who "might" be exposed to fall hazards. Referencing falls to a lower level in height, the word "might" speaks of the possibility of a worker falling more than 6 feet.

The employer is required to establish a training program meeting the following standards:
The employer shall provide a training program for each employee who might be exposed to fall hazards. The program shall enable each employee to recognize the hazards of falling and shall train each employee in the procedures to be followed in order to minimize these hazards.

The employer shall assure that a competent person qualified in the following areas has trained each employee, as necessary.

A Competent Person must certify training in written form. The written certification record shall contain the name or other identity of the employee trained, the date(s) of the training, and the signature of the person who conducted the training or the signature of the employer. In addition when the employer has reason to believe that any affected employee who has already been trained does not have the understanding and skill required by paragraph (a) of this section, the employer shall retrain each such employee.

Section 3: Review Questions

The three forms of conventional fall protection are: Personal Fall Arrest System, Guard Rail System, and Safety Net System?

- A. True
- B. False

Subpart M applies to all but which of the following answers?

- A. Leading Edges
- B. Hoist Areas
- C. Holes
- D. All of the above
- E. None of the above

Subpart M also covers erection of towers and antennas installed on freeway signs?

- A. True
- B. False

Employers are not required to develop a Fall Protection training program for workers.

- A. True
- B. False

Section 4: Fall Protection Systems

Although there are many different types of fall protection available, this section covers the most common ones used in the tower industry. Most frequently used is the Personal Fall Arrest System consisting of a body harness, arresting lanyard, and anchorage points.

By the end of this section, students will understand the following:

- Prevention Methods
- Criteria for Personal Fall Arrest Systems
- Criteria for Safety Net Systems

As stated earlier falls are the LEADING CAUSE of fatalities in the tower industry. In the tower industry there were 123 fatal falls that occurred from 2003 to November 2015 (WirelessEstimator.com).



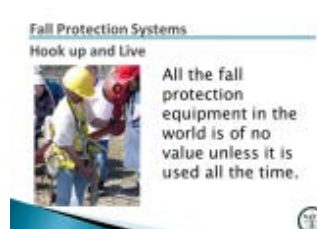
Prevention

The best way to address the hazard of falls in any industry is prevention. With as many fatal falls that occur in the tower industry, prevention cannot be overstated. To prevent falls, employers and employees must work together to select, use, enforce, and train on the proper prevention methods. The industry requires that when climbing you maintain 100 percent fall protection at all times.

The most acceptable and results-proven method to preventing falls is by following the steps established below:

1. Select fall protection systems appropriate for given situations
2. Use proper construction and installation of safety systems
3. Supervise employees properly
4. Use safe work procedures as outlined in your fall protection plan
5. Training in the proper selection, use, and maintenance of your fall protection systems

Remember – all the fall protection equipment in the world is of no value unless it is used ALL THE TIME. That means 100 percent TIE OFF. This means that a climber’s arresting lanyard should be connected at all times.



Safety Net Systems

Many times the nature and location of the work will dictate the form that fall protection takes. If the employer chooses to use a safety net system, he must comply with the following provisions:

Safety nets must be installed as close as practicable under the surface on which employees are working, but in no case more than 30 feet below. When nets are used on bridges, the potential fall area must be unobstructed.

Safety nets must extend outward from the outermost projection of the work surface as follows:

Vertical distance from working level to horizontal plane of net	Minimum required horizontal distance of outer edge of net from the edge of the working surface
Up to 5 feet	8 feet
5 to 10 feet	10 feet
More than 10 feet	13 feet

Safety nets must be installed with sufficient clearance to prevent contact with the surface or structures under them when subjected to an impact force equal to the drop test described below.

Safety nets and their installations must be capable of absorbing an impact force equal to the drop test described below.

Safety nets and safety net installations must be drop-tested at the jobsite:

- After initial installation and before being used.
- Whenever relocated.
- After major repair.
- At 6-month intervals if left in one place.

The drop test consists of a 400 pound bag of sand 28-32 inches in diameter dropped into the net from the highest surface at which employees are exposed to fall hazards, but not from less than 42 inches above that level.

When the employer can demonstrate that it is unreasonable to perform the drop-test described above, the employer or a designated competent person shall certify that the net and net installation have sufficient clearance and impact absorption by preparing a certification record prior to the net being used as a fall protection system. The certification must include.

- Identification of the net and net installation.
- Date that it was determined that the net and net installation were in compliance. Signature of the person making the determination and certification.

The most recent certification record for each net and net installation must be available at the jobsite for inspection.

Safety nets must be inspected for wear, damage, and other deterioration at least once a week, and after any occurrence that could affect the integrity of the system.

Defective nets shall not be used, and defective components must be removed from service.

Objects which have fallen into the safety net, such as scrap pieces, equipment, and tools, must be removed as soon as possible from the net and at least before the next work shift.

Maximum mesh size must not exceed 6 inches by 6 inches. All mesh crossings must be secured to prevent enlargement of the mesh opening, which must be no longer than 6 inches, measured center-to-center.

Each safety net, or section thereof, must have a border rope for webbing with a minimum breaking strength of 5,000 pounds. Connections between safety net panels must be as strong as integral net components, and must not be spaced more than 6 inches apart.

Fall Protection Systems (FPS)



Personal Fall Arrest Systems (PFAS)

A personal fall arrest system is one option of protection that OSHA requires for workers on construction sites who are exposed to vertical drops of 6 feet or more.

A personal fall arrest system may consist of a full body harness, a deceleration device, a lanyard, and an anchor point. A PFAS is designed to safely stop a fall before the worker strikes a lower level. A properly functioning PFAS will limit the maximum resting force exerted on a body to 900 lbs.



It includes three major components:

- An anchorage to which the other components of the PFAS are rigged.
- A full body harness worn by the worker.
- A connector, such as an arresting lanyard or lifeline, linking the harness to the anchorage.

A rip-stitch lanyard, or deceleration device, is also typically a part of the system. In personal fall arrest a worker must be anchored to a point where it can hold 5,000 lbs of arresting force.

OSHA allows the use of an effective fall restraint system in lieu of a personal fall arrest system. To be effective, a fall restraint system must be rigged to prevent a worker from reaching a fall hazard and falling over the edge. A fall restraint system may consist of a full body harness or body belt that is connected to an anchor point at the center of a roof.



Additional Requirements for Personal Fall Arrest Systems (PFAS)

- PFAS may only be used for fall protection
- If subject to impact loading, the equipment must be inspected by a Competent Person (CP)
- Prompt rescue provided
- PFAS must be inspected prior to each use
- PFAS may not be attached to guardrail systems. Guardrails are not designed to absorb the impact forces generated.
- At hoist areas, allow movement to edge only

Positioning Device Systems

Positioning device system means a body belt or body harness system rigged to allow an employee to be supported on an elevated vertical surface and work with both hands free while leaning.

Positioning devices are not considered fall protection. PFAS must also be worn in addition to any positioning device system.

Anchorage can handle at least 3,000 pounds, according to industry standard.

Section 4: Review Questions

Fatalities in the tower industry roughly match that of all other industries?

- A. True
- B. False**

Which of the following is not part of a fall prevention program?

- A. Selection of appropriate fall protection systems.
- B. Proper construction and installation of safety systems.
- C. Allow employees to supervise themselves.**
- D. Use safe work procedures.
- E. Training workers.

Body belts are approved for Personal Fall Arrest Systems?

- A. True
- B. False**

Which of the following is required as part of a Personal Fall Arrest System?

- A. It limits maximum arresting force on an employee to 1,800 pounds.
- B. Rigged so an employee can't free fall more than 6 feet (1.8 m).
- C. Must bring an employee to a complete stop
- D. None of the above
- E. All of the above**

Section 5: Personal Protective and Life Saving Equipment

The employer, according to OSHA regulations, must furnish any Personal Protective Equipment. All equipment must be in good working condition, and be maintained by the employer. This also includes all lifelines, lanyards – shock absorbing and retractable, as well as all rescue equipment.

By the end of this section students will understand the following:

- Definitions of PFAS components
- Anchorage Points
- Additional requirements
- Suspension Trauma
- Rescue Methods



Definitions

Anchorage: means a secure point of attachment for lifelines, lanyards or deceleration devices. Anchorages used for attachment of personal fall arrest equipment shall be independent of any anchorage being used to support or suspend platforms and capable of supporting at least 5,000 pounds (22.2 kn.) per employee attached. Anchorage must be part of a complete personal fall arrest system, which maintains a safety factor of at least two, and be under the supervision of a qualified person.



Attachment Point: The attachment point of the body harness shall be located in the center of the wearer's back near shoulder level.

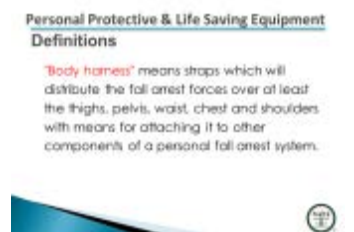


Body belt (safety belt): means a strap with means both for securing it about the waist and for attaching it to a lanyard, lifeline, or deceleration device. As of January 1, 1998, subpart M provides that body belts are not acceptable as part of a personal fall arrest system.

Note see 1926.104 for the definition for telecommunications.



Body harness: means straps which will distribute the fall arrest forces over at least the thighs, pelvis, waist, chest and shoulders with means for attaching it to other components of a PFAS.



Buckle means any device for holding the body belt or body harness closed around the employee's body.

Competent Person is a person capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Connector means a device that is used to couple (connect) parts of the personal fall arrest system and positioning device systems together. It may be an independent component of the system, such as a carabiner, or it may be an integral component of part of the system (such as a buckle or dee-ring sewn into a body belt or body harness, or a snap-hook spliced or sewn to a lanyard or self-retracting lanyard).



Controlled access zone (CAZ) means an area in which certain work (e.g., overhand bricklaying) may take place without the use of guardrail systems, personal fall arrest systems, or safety net systems and access to the zone is controlled.

Deceleration device means any mechanism, such as a rope grab, rip-stitch lanyard, specially-woven lanyard, tearing or deforming lanyards, automatic self-retracting lifelines/lanyards, etc., which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limit the energy imposed on an employee during fall arrest.



Deceleration distance means the additional vertical distance a falling employee travels, excluding lifeline elongation and free fall distance, before stopping, from the point at which the deceleration device begins to operate. It is measured as the distance between the location of an employee's body belt or body harness attachment point at the moment of activation (at the onset of fall arrest forces) of the deceleration device during a fall, and the location of that attachment point after the employee comes to a full stop.



Lanyard: means a flexible line of rope, wire rope, or strap which generally has a connector at each end for connecting the body belt or body harness to a deceleration device, lifeline, or anchorage.

Note see 1926.104(d) for Lanyard definition for Telecommunications

Personal Protective & Life Saving Equipment

Definitions

"Lanyard" means a flexible line of rope, wire rope, or strap which generally has a connector at each end for connecting the body belt or body harness to a deceleration device, lifeline, or anchorage.

Note: see 1926.104(d) for Lanyard definition for Telecommunications



Lanyard

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



Personal fall arrest system: means a system used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, a body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these.

Personal Protective & Life Saving Equipment

Definitions

"Personal fall arrest system" means a system used to arrest an employee in a fall from a working level.

It consists of an anchorage, connectors, a body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these.



Positioning device system: means a body belt or body harness system rigged to allow an employee to be supported on an elevated vertical surface, such as a wall, and work with both hands free while leaning.

Positioning devices shall be rigged such that an employee cannot free fall more than 2 feet (.9 m).

Positioning devices shall be secured to an anchorage capable of supporting at least twice the potential impact load of an employee's fall or 3,000 pounds (13.3 kn.), whichever is greater.

For hands free work on towers, workers can use positioning devices effectively and safely. The requirements for using this type of fall protection are contained in OSHA Standard 29CFR 1926.502(e).

This standard requires an anchorage of at least 3000 lbs. or twice the maximum intended load, whichever is greater, and must limit the workers fall to two feet. There are a number of devices that will allow this to take place.

A lineman's body belt, self retracting lifeline and beam strap are several of these devices. However as with the PFAS, all the individual components, such as the full body harness, must be rated at 5000 lbs. Dee-rings and snap hooks must be proof tested to 3600 lbs. tensile load without cracking, braking or taking on permanent deformation

Personal Protective & Life Saving Equipment

Positioning Systems

- "Positioning device system" means a body belt or body harness system rigged to allow an employee to be supported on an elevated vertical surface and work with both hands free while leaning.
- Positioning devices are not considered fall protection...PFAS must also be worn in addition to any position device system
- Anchorage can handle at least 3000 pounds, according to industry standard*



Personal Protective & Life Saving Equipment

Positioning Systems

Positioning devices allow hands-free work.



Qualified person means one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, the work, or the project

Snap Hooks: Unless the snap hook is a locking type and designed for the following connections, snap hooks shall not be engaged:

- Directly to webbing, rope, or wire rope
- To each other
- To a dee-ring to which another snap hook or other connector is attached
- To a horizontal lifeline.

Snap Hook

The locking type with a self-closing, self-locking keeper which remains closed and locked until unlocked and pressed open for connection or disconnection; or

The non-locking type with a self-closing keeper that remains closed until pressed open for connection or disconnection.

As of January 1, 1998, the use of a non-locking snaphook as part of personal fall arrest systems and positioning device systems is prohibited.



Retraining When the employer has reason to believe that any affected employee who has already been trained does not have the understanding and skill required by paragraph (a) of this section, the employer shall retrain each such employee.

Rope Grab is the device that allows the worker to move up and down a vertical lifeline.



Hazards:

Holes and Skylights

Each employee on a walking/working surface shall be protected from tripping in or stepping into or through holes (including skylights) by covers.

Each employee on a walking/working surface shall be protected from objects falling through holes (including skylights) by covers. O-2

Covering holes and skylights must be performed safely as an abatement method. All covers shall be capable of supporting, without failure, at least twice the weight of employees, equipment, and materials that may be imposed on the cover at any one time. All covers shall be secured when installed so as to prevent accidental displacement by the wind, equipment, or employees.



Working closely to the Edge

Antenna and tower work on roofs is covered by the OSHA standard in Subpart M. The specific standard, §29 CFR 1926.501(b)(1), requires that unprotected sides and edges 6 feet or more above any adjacent surface. PFAS and safety nets could be applied here, however, an alternative system could also be restraint lines. O-2ar



Rooftop Walkway Guardrails:

Rooftop walkways may not be protected by guard railings as is this walkway. If they are provided, the host employer may require that workers who are not working on the walkway use an alternative fall protection system. The guard railing systems are not normally designed and cannot be used as an anchor point for PFAS or positioning device systems.

Personal Protective & Life Saving Equipment

Rooftop Walkway Guardrail

Rooftop Walkways guardrails cannot be used as an anchorage point.



Suspension Trauma:

To avoid suspension trauma, employers and employees should develop and train on a good rescue plan, as part of the pre-climb planning. This will ensure that if an employee falls and becomes suspended; he or she does not suffer permanent damage from a fall.

The medical effects of immobilization in a suspended, vertical position:

- Gravity pulls your blood into your legs
- The veins in your legs are entwined within the skeletal muscles, and when you move your legs, these muscles squeeze the veins, pushing the blood out of the way.
- If the muscles are not pumping the blood upwards, it pools in your legs.
- You can “lose” several pints of blood this way, and go into shock, which presents an immediate threat of death to anyone immobilized in a vertical position.
- The brain tries ‘shock’ for a while, but of course it doesn’t help – blood is still stuck in the legs.
- After a few minutes, the body goes for the last-ditch method.

Possible Symptoms of Suspension Trauma:

- Dizzy, sweaty and other signs of shock.
- Increased pulse and breathing rates.
- Then a sudden drop in pulse & Blood Pressure
- Loss of consciousness.

Personal Protective & Life Saving Equipment

Suspension Trauma

Suspension Trauma Definition:

- The medical effects of immobilization in a vertical position
- Presents an immediate threat of death to anyone immobilized in a vertical position, (Hanging still in a harness).



Personal Protective & Life Saving Equipment

Suspension Trauma

Suspension Trauma Effects:

1. Gravity pulls your blood into your legs
2. The veins in your legs are entwined within the skeletal muscles, and when you move your legs, these muscles squeeze the veins, pushing the blood out of the way
3. General feelings of unease
 - Dizziness, sweatiness and other signs of shock
 - Increased pulse and breathing rates
 - Then a sudden drop in pulse & Blood Pressure
 - Loss of consciousness



Personal Protective & Life Saving Equipment

Suspension Trauma

- Notice the legs dangling
- Gravity is holding the blood
- Pooled blood can become “stale” in as little as 15-40 minutes
- You must act fast



If you Accidentally Fall:

- **Remain calm** - Relax as much as possible. Panic makes things worse.
- AVOID using your legs. You don't want blood sent there.
- Lift your knees into a sitting position.
- If you can, every few minutes swing yourself upside down. This redistributes blood in throughout your body.

Personal Protective & Life Saving Equipment
If you fall accidentally and are suspended:



- Remain calm
- AVOID using your legs...you don't want blood sent there.
- Lift your knees into a sitting position
- Relax as much as possible. Panic makes things worse.
- If you can, every few minutes swing yourself upside down.

Personal Protective & Life Saving Equipment
Suspension Trauma

- If at all possible, climb out of suspension
- Using self-rescue equipment, improvised or otherwise
- Get into a sitting position straight after the fall
- Pass the casualty a work seat or improvised platform
- All casualties must be "immediately rescued"

All that matters is that the legs are lower than the heart and the leg muscles are immobile. No other injury is needed.

Anyone released from immobile suspension should be kept in a sitting position for at least 30 minutes

Emergency Action Plan/Rescue:

As part of a work site's safety plan, a procedure should be developed to address rescue of personnel should it become necessary. OSHA requires that the employer must provide for prompt rescue of employees in the event of a fall or assure that employees are able to rescue themselves. Putting together a comprehensive emergency action plan that deals with those issues specific to a worksite is not difficult. It involves taking what was learned from a workplace evaluation and describing how employees will respond to different types of emergencies.

In addition to the requirement for workers to use 100% fall protection the employer must assure prompt rescue of fallen employees if the employees cannot rescue themselves. The need to be able to rescue fallen workers is contained in OSHA Standard 29CFR 1926.502(b)(20). This means that high angle rescue training must have been completed by at least one member of the crew and that adequate rescue equipment be present on the site and available for instant use.

Personal Protective & Life Saving Equipment
Rescue

The employer must provide for prompt rescue of employees in the event of a fall; or assure that employees are able to rescue themselves.



Personal Protective & Life Saving Equipment
Rescue

- Putting together a comprehensive emergency action plan that deals with those issues specific to your worksite is not difficult
- It involves taking what was learned from your workplace evaluation and describing how employees will respond to different types of emergencies

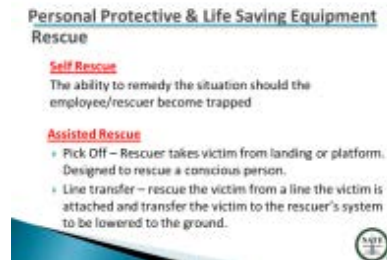
Personal Protective & Life Saving Equipment
Rescue

- www.WirelessEstimator.com offers comprehensive jobsite emergency action plans
- The plan should include but not be limited to:

Company Name	Date/ Time (Work to be done)
Site location/directions	Competent person contact
Emergency phone numbers	Communications (cell, landline)
List of emergency equipment	List of possible hazards
Description of work being done	Proximity of rescue personnel

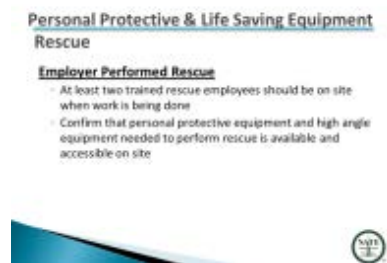
Self Rescue

- If at all possible, climb out of suspension using self-rescue equipment, improvised or otherwise.
- Get into a sitting position straight after the fall.
- Use a work seat or improvised platform.
- All fall victims must be 'immediately rescued'



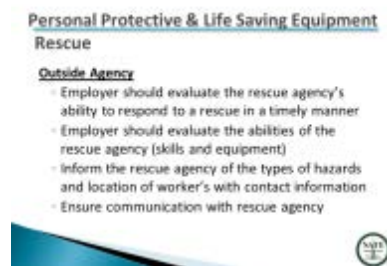
Employer Performed Rescue:

- At least two trained rescue employees should be on site when work is being done.
- Confirm that personal protective equipment and high angle equipment needed to perform rescue is available and accessible on site.



Outside Agency:

If an employer chooses an outside agency to perform rescue duties that the employer must first evaluate the agency for its capabilities and manage all communication between the leadership on the tower project and the agency it hires to perform the rescue.



The Nature of Falls

Let's understand the nature of falls on the job. The challenge with falls is that most people do not understand the forces involved with falling. Many workers simply don't realize the extreme forces of gravity and this oversight often leads them to second guess all the OSHA associated numbers, such as a tie-off point of 5000lbs, which could dangle the weight of a mid-size pick-up truck from, as being

excessive or overkill, while in fact these numbers are based on simple mathematic formulas. So there is a divide between theory and the so called “real world.”


Free Fall Distance:

Let us first understand what is meant by Free Fall Distance, (FFD). FFD represents the vertical displacement of the fall arrest attachment point on the employee's body belt or body harness between onset of the fall and just before the system begins to apply force to arrest the fall.

This distance excludes deceleration distance, and lifeline/lanyard elongation, but includes any deceleration device slide distance or self-retracting lifeline/lanyard extension before they operate and fall arrest forces occur.

Personal Protective & Life Saving Equipment
Free Fall Distance

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



Personal Protective & Life Saving Equipment
Free Fall Distance

Calculation of Total Fall Distance

- Freefall = 6 feet maximum
- Deceleration Distance = 3.5 feet maximum
- Lifeline elongation = 2 feet maximum
- Total fall before stopping = 11.5 feet
- Portion of body landing below attachment point approximately 5 feet
- Total clearance below required to avoid contacting lower level may be as great as 16.5 feet or more!




The forces involved can be understood by applying the formula of Isaac Newton’s second law: $ma=f$ (Mass X Acceleration= force). For example a 200-pound person jumping off a 3 foot desk onto a bathroom scale, would hit the scale with a force greater than twice their weight. $32\text{feet}/\text{second}^2$ actually means that for the first second of time an object will fall 32 feet and that on the next second the object will get heavier and faster. The impact may not feel like 725lbs because the impact is transferred and distributed by your muscle bones and connective tissue, such as ligaments, tendons, and cartilage. The force for the same worker falling 25 feet would be approximately 10,000 pounds of force.

Personal Protective & Life Saving Equipment
Fall Factor

A derived number used to evaluate the shock loads generated on the worker, belaying and anchors that occur when a worker falls.

The higher the fall factor the greater the forces placed on the system:

Fall factor= Length of fall divided by length of rope



Personal Protective & Life Saving Equipment
Fall Factor



Fatal Fall Exercise:

You should conduct an interactive exercise and have student’s calculate their force of impact when falling from a structure. Use the online calculators to help with speed of results. Calculate impact of the students’ weight with the following information. If you do not have access to the internet print the exercise ahead of time and distribute copies to the class.

- ▶ Acceleration = $32\text{ft}/\text{sec}^2$
- ▶ Force = Mass x Acceleration
- ▶ Force Calculator: <https://www.easycalculation.com/physics/classical-physics/force.php>
- ▶ Conversion to Pounds of Pressure: <http://www.convertunits.com/from/newton/to/pound>

Personal Protective & Life Saving Equipment

Fatal Fall Exercise

- ▶ Calculate impact of the students' weight
- ▶ Acceleration = 32ft/sec²
- ▶ Force = Mass x Acceleration
- ▶ Force Calculator:

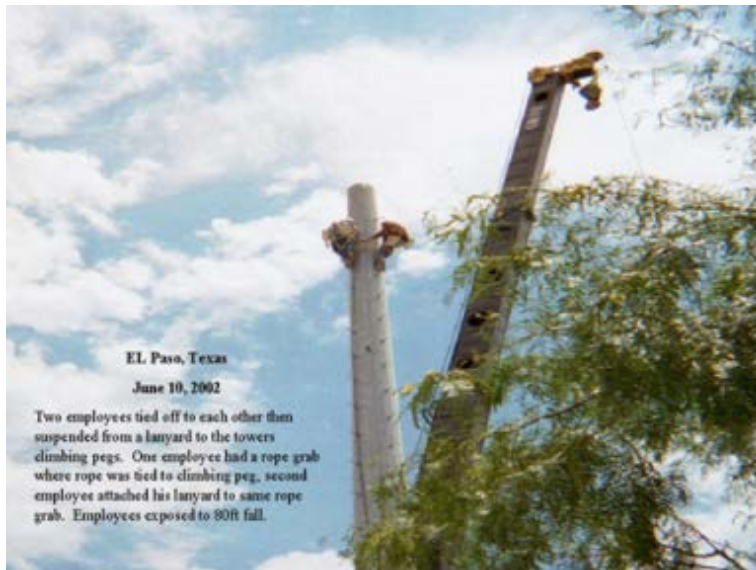
<https://www.easycalculation.com/physics/classical-physics/force.php>

- ▶ Conversion to Pounds of Pressure:

<http://www.convertunits.com/from/newton/to/pound>



When employees do not use the required equipment or they choose not to follow their employer's 100% fall protection program or just ignore their fall protection training they have a ten times greater chance to fall and be killed. Falls involving tower hands result in death. OSHA and NIOSH data shows that tower workers are ten times more likely to die on the job than other trade construction workers. This photo was taken by an OSHA compliance officer while driving to another inspection. The employees were brought down and the employer was cited and penalized for violation of the standards



Section 5: Review Questions

Which of the following is not part of a Personal Fall Arrest System?

- A. Full Body Harness
- B. Anchorage Point
- C. Body Belt**
- D. Lanyard
- E. Connectors

Is it OK to use non-locking snaphooks as part of personal fall arrest systems and positioning device systems?

- A. True
- B. False**

How often do you need to inspect your PFAS equipment?

- A. Weekly
- B. At the end of your shift
- C. Before each use**
- D. Monthly
- E. None of the above

How many feet away must you be from a rooftop edge or leading edge before fall protection is required?

- A. 10 feet
- B. 15 feet
- C. 5 feet
- D. 6 feet**
- E. None of the above

The one benefit of positioning devices is it allows for hands-free work.

- A. True**
- B. False

Which best describes the term Suspension Trauma?

- A. Medical effects from bruises as a result of climbing a tower
- B. Medical effects from being suspended vertically**
- C. Medical effects from being suspended horizontally
- D. None of the above

Which is not a symptom of Suspension Trauma?

- A. Dizzy, sweaty and other signs of shock
- B. Increased pulse and breathing rates
- C. Sudden drop in pulse & Blood Pressure
- D. Loss of consciousness
- E. All the above**

If you fall accidentally and are suspended, what SHOULDN'T you do?

- A. Avoid using your legs...you don't want blood sent there
- B. Lift your knees into a sitting position
- C. Panic, scream for help until you are head**
- D. Relax as much as possible; panic makes things worse
- E. If you can, every few minutes swing yourself upside down

What is the most important thing to remember if you are suspended after a fall?

- A. Keep legs lower than the heart and the leg muscles are immobile**
- B. Get in a standing position after the fall
- C. Scream for help until you are heard

- D. Elevate your legs above the heart muscle and keep swaying them back and forth
- E. None of the above

The two types of rescue are called self and shared rescue?

- A. True
- B. **False**

The two types of assisted rescue are pick off and line transfer?

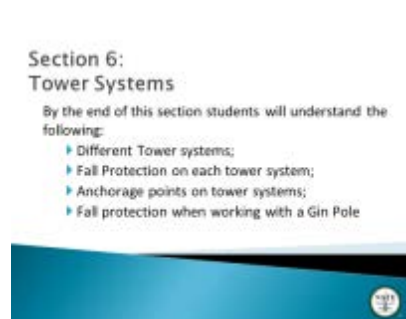
- A. **True**
- B. False

Section 6: Tower Systems

Antenna-supporting structures come in many shapes and sizes, and support many different types of antennas. The ability to recognize different types of antenna-supporting structures is crucial to planning a safe climb. Planning a safe climb ensures reduced hazards and fatigue to each climber.

By the end of this section students will understand the following:

- Different Tower systems;
- Fall Protection on each tower system;
- Anchorage points on tower systems;
- Fall protection when working with a Gin Pole



Monopole Systems

Monopoles are one of three tower types. It is an independent structure. Typically it only has one anchorage point. The idea of a monopole tower is that it is more aesthetically pleasing and more often found in urban areas.

Monopole Tower Systems are designed for cables to run on the interior of the tower. Demand for space has placed more and more cable outside of the structure creating a climbing hazard.

Monopole towers have safety climb system built into the exterior of the structure. This provides for 100% fall protection at all times.

The antenna nest (pictured below) may be the only trustworthy anchorage point located on the tower for resting. Lifelines are one method for providing fall protection on monopole towers during construction.



Separate lifelines are required for all workers on the tower during erection of the tower. It makes no difference if the lifeline is rated at two or even three times the 5000 lb. requirement for each worker. The requirement is for **separate lifelines**. Reference (§29CFR 1926.502(d)(10)(i)). Remember a lifeline must support 5,000 pounds per worker.

Typically anchorage points are found on platforms as you ascend the tower. However there may be no trustworthy anchor connection spots until you reach the top of a monopole. This is an example of why it is so important to complete a JSA prior to project start-up

Tower Systems
Monopole Towers

Designed for cables to be inside


The antenna nest may be the only anchor point



Designed for cables to run on the interior of the tower

Antenna nest at the top of the tower may be the only anchor point

Lifelines are one method for providing fall protection on monopole towers.



SAFE

Self-Supporting Towers

Some Self-Supporting Tower Systems come with different leg structures. The nature of self-supporting towers provides multiple ways/methods to climb. Given the structure, self-supporting towers typically require less maintenance.

Self-supported tower vary in size, but are built between 0 and 500 feet tall. They are not built to great heights. Most have a triangle base; few have a square base.

Adequate anchorage points are found throughout the tower structure. Usually welded tabs on cross braces where they meet the vertical are adequate anchorage points where you can apply your pelican hook on the tab. Double lanyard are always required to maintain 100% fall protection.

In addition to the welded anchorage points, self-supporting towers have safety climb systems built next to the line leg or on the interior where climbing ladders are provided.

Tower Systems
Self Supporting Towers

- Some Self Supporting Towers come with different leg structures
- Some provide a different way to climb
- Typically possess a triangle base; very few have a square base
- Self Supported towers vary in size



Tower Systems
Self Supporting Towers

Self-Supported Tower with use of Retractable Lifelines as part of PFAS



Guyed Towers


Demand for space has placed more and more cable on the exterior of tower structures, especially Guyed Towers. This bulk of cables creates more potential hazards for climbers. Guyed Towers are the most common type of tower climber's encounter.

Guyed towers are the most common type of tower and can be easily overloaded. All components of the tower should be thoroughly inspected by a Competent Person before each climb.


Guyed Towers have a range of 200 feet to greater than 1,000 feet. The Guyed Tower System is supported by exterior cables, which, again, means objects and workers can get in the way. Older guyed towers have base mount that rest on more than one pin (or feet). Newer guyed towers rest solely on a one pin (foot) system, placing more importance on the guy wires. The older mount created too much tension as guyed towers are designed to move with the wind.

Tower Systems
Guyed Towers


Objects and workers can get in the way



Older form of anchoring a guyed tower.



Typical base of guyed tower



Tower Systems
Guyed Towers

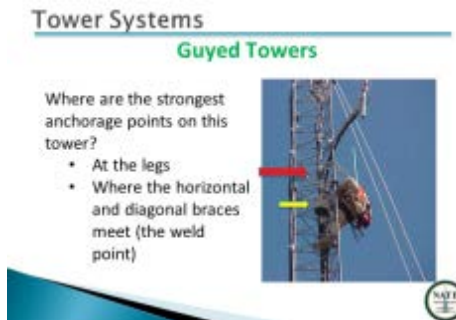
- Have a range of 200 feet to greater than 1,000 feet
- The Guyed Tower system is supported by exterior cables



Look for safe clean areas to climb.

Anchorage points on guided towers are similar self-supporting tower systems. The one exception is the bases are much smaller on guided towers and some towers are bolted instead of welded. Even when bolted these bolted tabs provide adequate anchorage points.

The OSHA standard that is applied to of any construction tower activity requires fall protection at 6 feet. O-5, O-4 Can you tell me if he is tied off or not tied off? Have students put arrows to identify anchorage points, and identify where the strongest tie off points are on the different types of towers. There are no engineered anchorage points on guide towers, examples of anchorage points which are acceptable are at weld points which are at horizontal and diagonal members come together or on exterior legs. Here is an example of a guide tower with proper anchorage points. Red arrow identifies personal fall arrest anchorage point. Yellow arrow identifies proper anchor point where all members come together at weld.



Gin Poles

A gin pole is used during construction of new towers. A gin pole is an apparatus that is tied to the tower structure itself, which allows for hoisting of components and equipment to erect the next section. All workers more than 25 feet above the ground must use conventional fall protection. Here all three men up are using personal fall arrest systems. All workers are attached to separate lifelines.

Communication is always required between crew members. Hand signals, voice and/or radio communications are all acceptable. The specific requirements contained in OSHA CPL 2-1.056 should be reviewed prior to any employees going up.

Employees performing tower work, are required to use 100% fall protection when stationary, moving point-to-point and riding the line. This means that there must be a 100% fall protection program in place and that program must be enforced by management.

Never climb on a gin pole. Always climb and work off the tower maintaining 100% fall protection.



Softeners

Natural and synthetic ropes and slings must be protected. Sharp edges will cut them, weakening them and reducing their ability to perform safely. Welding and other hot work can only be performed if

workers are using wire rope lanyards and /or wire rope or wire rope core lanyards and positioning devices. Lanyard web protection / softeners may be required when around hard angles.

Brainstorming Activities

Below are some of the reference photos used in the Fall Prevention Worker Training Course's brainstorming interactive activity. Using the material covered so far, identify any hazards apparent in the photos and discuss how to abate or eliminate them through proper fall protection strategies.

How can this worker better protect himself from falling?



This worker is welding and he has attached himself to a fixed ladder rung by a synthetic rope lanyard. There are several serious hazards that need to be discussed with students at this time.

1. The hazard of welding while using synthetic fall protective equipment is unacceptable. While suspended at heights, hot work can only be done using wire rope or chain lanyards or material that will not burn or melt.) OSHA Standard 29CFR 1926.503;
2. The ladder rung used as an anchor point is unacceptable because it may not meet the strength requirements of the OSHA standards. It would be much better to attach to the side rail. The worker can move a short distance when working but if the movement is not intended or is unexpected the individual will experience a heart check. (that feeling one has when, he/she realizes they may have just fallen a several inches or so but their fall protection just saved their life even though it was not properly attached. The anchor point must be capable of withstanding 5000 lbs. or be designed, installed and used as a part of a complete fall arrest system that maintains a safety factor of two. §29CFR 1926.502(d)(15).
3. Workers must be protected 100% of the time while moving point-to-point. In this case there is no ladder safety climbing device and the worker only has a single lanyard to use in climbing or

moving horizontally across the tower face. (§ 29CFR 105(a), 501(b)(15) & OSHA Compliance Directive CPL2-1.36 dated March 3, 2002.

4. The manufacture of the PFAS will specify the conditions under which the equipment can and cannot be used.
5. The ladder manufacturer must specify the proper installation and use requirements for his equipment may or may not be appropriate for use as a part of a fall protection system.

Are step bolts good to use as fall protection anchorage point?



Step bolts are not designed for fall arrest anchor points. It is important to reemphasize this fact on all workers. ANSI & OSHA standards require it but workers will use them thinking that they will hold them if they fall because they can climb on them.

List the reasons it is a better to do as much work on the ground as you can.



Generally, work on the ground is much safer than having workers on the tower and can be more efficient. With that concept in mind, the more work that can be completed on the ground minimizes the workers exposure to fall hazards. This is a good concept to use simply because there is a significantly reduced worker exposure.

Is this worker properly protected from falling?



No.

He has attached his fall protective equipment to the step bolts of the monopole. There are special devices that can be attached to the step bolts that will provide a 5000 lb. anchor point. One such device is the step bolt anchor bracket manufactured by Tuf-Tug. This device fits 5/8 and 3/4 inch step bolts and is tested to 5000 lbs. This meets OSHA and ANSI standards.

Is the worker on the left properly protected from falling?



Lifelines and load lines are required to be separate when ascending towers. The worker on the left may not be properly protected from falls because he has tied the load to his lifeline.

**How close can he get to the edge
before he needs fall protection?**



The answer is ***six feet from the lower level when exposed to a fall hazard***. This is because the OSHA standard for fall protection, Subpart M is applied to this hazard. A follow-up question might be. What type of fall protection could be used and/or what is the best type of fall protection that could be used? Here the answers could be many: scaffolds, aerial lifts, self-retracting lifelines, restraints or PFAS. Make sure you select the proper fall protection system for the work being performed.

**Identify the fall protection systems
these workers can use when moving
point-to-point.**



There are several ways of using fall protection when moving point-to-point. One is by ***attaching a lanyard with a deceleration device attached to the cross members***. Other ways are ***a self-retracting lifeline attached to the tower legs or the installation of a vertical lifeline attached to the tower legs***. One of the most important things to be brought out in the discussion is the need to have a system that is separate for each employee or is designed, installed, and used in such a way it will not fail under load. This requires a qualified person.

Is a safety climb device required on this ladder?



The answer is ***no***. But it should be understood that the reason why is because the top of the ladder is not 24 feet high. It must also be pointed out that fall protection is required for workers on the roof where the antennas are mounted because the roof is more than six feet above the ground. You do not need fall protection to go up the ladder, but once you're up near the antennas you do.

This parapet wall is 35 inches high. Do workers working on the antenna four feet from the edge need fall protection?



Section 7: Fall Protection Plans

Fall Protection Plans are normally considered in the Job Safety Analysis (JSA) or Job Hazard Analysis (JHA) implemented on job sites to provide elimination of recognizable hazards at the beginning of work. Fall Protection Plans are crucial in providing climber safety and efficiency of the work to be performed. Fall Protection Plans are typically overseen by a Competent Person, and requires his or her signature.

By the end of this section, students will understand the following:

- The importance of safety plans

- How to develop a JSA/JHA
- Training Requirements

Section 7: Fall Protection Plans

By the end of this section students will understand the following:

- ▶ The importance of safety plans
- ▶ How to develop a JSA
- ▶ Training requirements



Safety Plans/Fall Protection Plans

Prior to beginning a job a safety plan must be prepared. This plan addresses hazards that are present or likely to be present. This will enable the planner to address hazards on the job site. The following items are elements of the plan:

- The plan must be prepared by a qualified person.
- The plan must be specific to the site.
- Any changes necessary must be made by a qualified person.
- The plan must be kept at the work site.
- The plan must be implemented by a competent person
- If traditional methods of fall protection are not useable at a specific site, documentation must be kept as to why conventional fall protection is infeasible.
- The competent/qualified person must discuss measures used to protect workers with the workers.

Fall Protection Plan

- Prepared by qualified person
- Specific to site
- Changes made by qualified person
- Plan kept at site



Fall Protection Plan

- Implemented by competent person
- Documents why conventional fall protection is infeasible
- Discuss measures used to protect workers



Job Safety Analysis (JSA)

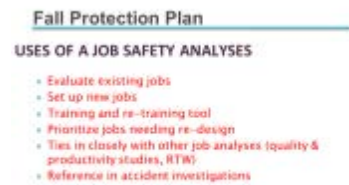
The Job Safety Analysis or JSA is a method of breaking a job task down into identifiable steps. Each step is then evaluated for hazards. This will help determine appropriate controls needed to control each of the identified hazards. The end benefits are:

- Identifies unsafe work practices before an accident occurs
- Decreases injury rates
- Increases quality
- Increases productivity

To assist in preparing the analysis the planner can use information such as past accident history, employee feedback, jobs that evidence the potential for accidents and other management personnel.

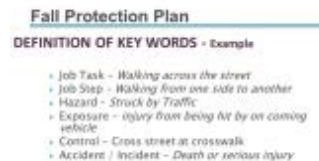
The following are some suggestions to assist the planner:

- Evaluate all aspects of the job task, even if performed infrequently
- Observe more than one employee doing a specific job task
- Observe more than one shift
- Take enough time observing the job
- Observe a worker actually doing the job, not just describing job



In order to perform a Job Safety Analysis the use of key words to assist the planner will help better understand the elements of the analysis:

- Job Task – *Walking across the street*
- Job Step – *Walking from one side to another*
- Hazard – *Struck by Traffic*
- Exposure - *injury from being hit by on coming vehicle*
- Control - *Cross street at crosswalk*
- Accident / Incident – *Death or serious injury*



One Process Three Goals:

Safety isn't a person or thing. It is not your Safety Coordinator and it is not a written safety manual. It is a process, specifically the way our workers perform their jobs collectively each day. At times, they have the proper equipment, tools, job instruction, training and attitude to perform their jobs safely. At other times however, one or more of these elements may be lacking.

Similarly, productivity and quality are the results of the same process as workers complete their jobs each day. Either they have and use the prerequisites to perform the job successfully or they don't.

Frequently, the method that is the safest way to perform a specific job task is also a highly productive one that results in a high level of quality as well. (Provide an example). Occasionally, this is not true and a compromise solution may be needed to balance the three goals. (Provide example).

All three of these ingredients are intertwined in the same process and all three directly and collectively impact the company's bottom line results. Therefore studying and improving job methods is extremely important to us all.

Make sure this point is understood & accepted.

Fall Protection Plan

ONE PROCESS, THREE GOALS

The diagram consists of three grey chevron arrows pointing to the right, labeled 'Safety', 'Productivity', and 'Quality'. These three arrows are grouped under a larger, darker grey arrow labeled 'PROCESS'. To the right of the 'PROCESS' arrow is an equals sign followed by the word 'Production'. Below the diagram is a blue and black decorative graphic on the left and a circular logo on the right.

Where to Start:

Review each of these as sources of information in prioritizing job tasks that need to study immediately. Initially, the job tasks being studied will be high exposure tasks. Over time, the exposure from job tasks being studied should continually decrease.

However, other factors such as new accidents, equipment changes, and process re-design are likely to continually shuffle the priorities of job tasks to be studied. Job Safety Analysis is a continual process that does not carry a completion date.

TRANSITION: If, after using all of the above information it's still not clear as to which jobs should be prioritized for JSA usage...

Fall Protection Plan

WHERE TO START?

- Accident history
- Employee complaints
- Employee turnover
- Absenteeism
- Other supervisors & managers
- Safety manager
- Jobs showing potential for loss

Below the list is a blue and black decorative graphic on the left and a circular logo on the right.

When in Doubt, use common sense...it's best just to use our own best judgement and common sense.

TRANSITION: Now that we've covered the benefits, uses and need for a Job Safety Analysis program, let's talk about the actual process of completing a JSA. It consists of four basic steps...



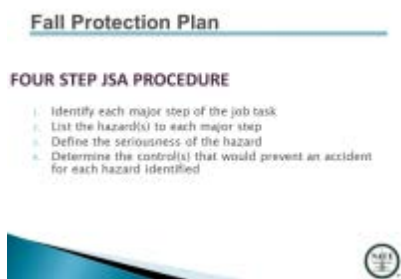
FOUR STEP JSA PROCEDURE

Briefly describe the 4 steps that comprise all JSAs.

1. Identify each major step of the job task
2. List the hazard(s) to each major step
3. Define the seriousness of the hazard
4. Determine the control(s) that would prevent an accident for each hazard identified

(Don't spend a lot of time here unless questions develop. Details and tips for completing each of these three steps will be developed later in the presentation).

TRANSITION: Let's now cover several important tips on the proper completion of all JSAs...



Introduce these important tips on overall completion of JSAs.

- ▶ Evaluate all aspects of the job task, even if performed infrequently
- ▶ Observe more than one employee doing a specific job task
- ▶ Observe more than one shift
- ▶ Take enough time observing the job
- ▶ Observe a worker actually doing the job, not just describing job


Failure to follow each of these tips can result incomplete information within the JSAs, limiting their effectiveness. Make sure that attendees understand the "why" behind each of these tips. Examples may be useful here.

TRANSITION: After we've selected a job task to be evaluated, we're ready to begin the first step of the JSA...

Fall Protection Plan

IMPORTANT TIPS

- Evaluate all aspects of the job task, even if performed infrequently
- Observe more than one employee doing a specific job task
- Observe more than one shift
- Take enough time observing the job
- Observe a worker actually doing the job, not just describing job



Introduce this as the flow chart that we will be following in the next few slides. Explain that the basis of a JSA is first defining the task followed by hazards, then control measure category and then followed by specific control measures.



Step 1- Documenting Job Tasks:


The first step is to list the major job steps. The idea is not to make the job steps either too broad or too narrow in scope. We'll run through a few examples that will give you a good feel for what we mean here.

After recording the initial results, take the time to ensure that the information obtained is accurate and complete. Let's discuss a few additional tips on how to do that.

Fall Protection Plan

STEP 1:
LIST BASIC JOB STEPS

- Define the job task to be studied
- Observe task and break into major steps
- Record results
- Ensure that information is complete and accurate



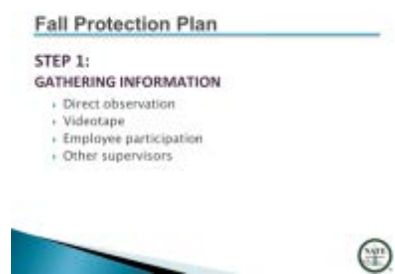
Gathering Information:

Direct observation of a job task is the most common and preferred means of gathering the necessary information for completing a JSA. There may be times when videotaping is necessary so that they can be viewed and analyzed at a later time but these instances are probably limited. (Give example) In either case, it is important to explain to the employee why the observation is being made and what the results will be used for.

The employee should be asked to perform their job in a normal manner. Pertinent questions should be asked of the worker as needed.

Other employees performing the same job task should be observed including on other work shifts, if possible, to observe various individual approaches to completing the same job task. Other supervisors and managers may also be consulted if appropriate.

TRANSITION: Now that we have covered Step 1, let's practice the technique on an example together...



List Basic Job Tasks:

Introduce a case study to the class and, as a group, complete Step 1 of the JSA, listing the major steps of a job task. A videotaped job task is a good method to visually introduce and evaluate this case study.

As a class exercise, list the major job steps on a blank JSA form.

This exercise will only produce Step 1 of the JSA. The other two steps will be completed by the class after some additional instruction.

You may want to list the major job steps on a flip chart for all to refer to.

TRANSITION: Before moving into completion of JSA Step 2, we need to cover some pointers on identifying hazards in the workplace...

Listing Basic Job Tasks Case Study:

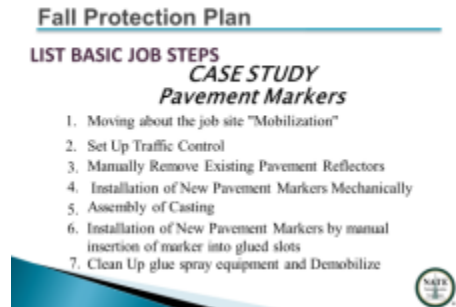
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You may want to list the major job steps on a flip chart for all to refer to.

TRANSITION: Before moving into completion of JSA Step 2, we need to cover some pointers on identifying hazards in the workplace...



Step 2 - Hazard Identification

The next step in preparation of a fall protection plan is to consider the types of hazards that may be present or likely to be present. A walk around site audit should be performed prior to the start of a fall protection plan. These key points will help us in identifying the hazards associated with the major job steps.

We have listed hazards as falling into one of three broad categories: ergonomic hazards, environmental hazards, and physical hazards.

Let's discuss each one of these, starting with ergonomic hazards.



Ergonomic Hazards

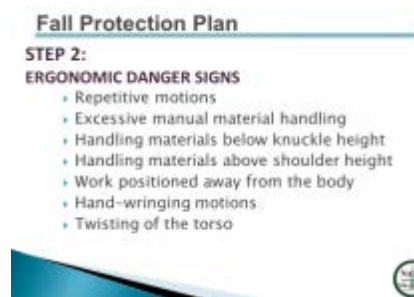
Ergonomics is the process of fitting the job to the worker. There are many ergonomic hazards in the workplace, but if we can remember several warning signs that indicate that a hazard exist that can be resolved ergonomically, then we will be able to recognize most of the hazards that exist within this broad category.

- Does any of the tasks require have Repetitive motion?
- Is there excessive lifting of heavy objects involved?
- Are any materials handled below knuckle height?
- Are any materials handled above shoulder height?
- Is the work positioned away from the body?

- Does the job require twisting of the body?

Review each of the points, one-by-one. Remind the supervisors this information is contained in their reference guides. The next slide is a continuation of this one.

TRANSITION: Now let's cover environmental hazards...

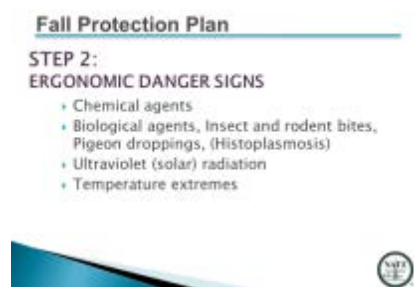


Environmental conditions:

The next category of hazards are those related to the environment that the worker performs in. Hazards in this category include chemical agents (fumes, mists, vapors, etc.), biological agents (blood borne pathogens), temperature extremes (both high and low extremes are hazardous), and radiation exposure (electric-magnetic fields is one example).

- Are employees exposed to hot environmental conditions?
- Are employees exposed to cold environmental conditions?
- Does the weather pose a hazard such as high wind, lightning, or storms?
- Is the work required during the day or night?

Give a quick example of each type of hazard as it relates to the actual facility.



Physical hazards:

This final category of hazards is physical hazards, which includes point of operation hazards (hands close to a grinding wheel).

Another type of physical hazard is associated with power transmission devices such as an unguarded drive belt that may pull a worker's hand or loose sleeve into the machine.

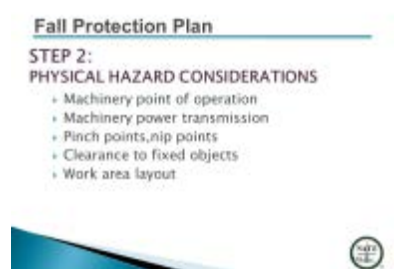
Pinch points and nip points are commonly encountered on conveyor lines where there are in-running rollers that could draw in a worker's fingertips.

Inadequate clearance to fixed objects results in the hazard of striking the body against the fixed object.

Work area layout, as a whole, can pose a hazard if there is unusual congestion, poor housekeeping, tripping hazards, etc.

- Are there any machines in use that may expose employees to a guarding hazard such as nip points, drive shafts, or flying objects?
- Is there sufficient clearance to fixed objects?
- Does the work area layout present hazards such as open excavations, swinging cranes, or vehicular traffic?

TRANSITION: Now that we have a basic understanding of the three basic categories of hazards, let's return to our case study and, as a group, complete Step #2 for each of the major job steps we identified earlier...

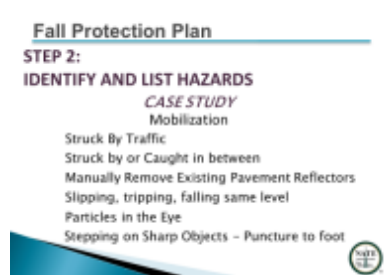
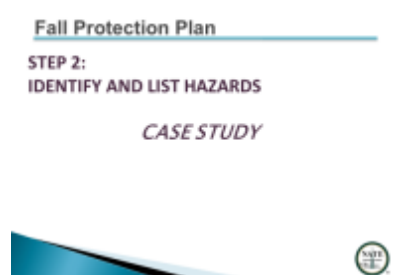


Identify and List Hazards Case Study:

As a group, list the hazards corresponding to the major job steps. Reinforce earlier principles, such as there can be more than one hazard for each job step.

Continue to list the class responses on the flip chart that was started earlier.

TRANSITION: *Before we complete the JSA by working on Step 3, let's talk about the effectiveness of controls...*



Step 3 – Classifying the Hazard:

These key points will help us in identifying the hazards associated with the major job steps.

We have listed hazards as falling into one of three broad categories: ergonomic hazards, environmental hazards, and physical hazards.


Let's discuss each one of these, starting with ergonomic hazards.

Fall Protection Plan

Hazard

Frequency of Occurrence	Severity			
	(1) Catastrophic	(2) Critical	(3) Marginal	(4) Negligible
(A) Frequent	4A	3A	2A	1A
(B) Probable	4B	3B	2B	1B
(C) Occasional	4C	3C	2C	1C
(D) Remote	4D	3D	2D	1D
(E) Improbable	4E	3E	2E	1E

Risk Categories: High, Serious, Medium, Low




Fall Protection Plan

STEP 3:
Classifying the Hazard

- Low to High Probability of an accident
- Low to high degree of severity if an accident occurs

Example
You have a low probability of being struck by a bus when crossing the street but a high degree of severity in the event you are struck.



These key points will help us in identifying the hazards associated with the major job steps.

We have listed hazards as falling into one of three broad categories: ergonomic hazards, environmental hazards, and physical hazards.


Let's discuss each one of these, starting with ergonomic hazards.

Fall Protection Plan

STEP 3:
Classifying the Hazard

Frequency of Occurrence	Severity			
	(1) Catastrophic	(2) Critical	(3) Marginal	(4) Negligible
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(D) Remote	4D	3D	2D	1D
(E) Improbable	4E	3E	2E	1E

Risk Categories: High, Serious, Medium, Low



Classifying the Hazard – Case Study:

As a group, return to the case study and list the recommended job procedures and controls corresponding to the hazards identified in Step 2.

Reinforce earlier principles as needed, such as there can be more than one control for each identified hazard and to utilize the Control Hit List as a means to prioritize the controls to make sure the best possible control is evaluated.


Continue to list the class responses on the flip chart that was started earlier.

This will complete the case study of filling out a sample JSA as a group.

Fall Protection Plan

STEP 3:
Classifying the Hazard

CASE STUDY
Mobilization "Struck By Traffic"



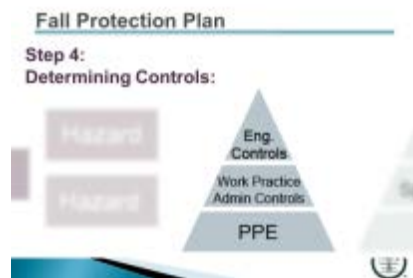
Determining Controls

Now that a Job Safety Analysis has been completed controls must be considered to mitigate hazards and potential hazards. There are three types of controls to consider:

1. Engineering Controls.
2. Administrative Work Practice Controls.
3. Personal Protective Equipment.

This step is important for two reasons. First by training yourself to think about using engineering controls will increase the opportunities for you to remove the hazard altogether instead of simply relying on PPE; the second is identifying the control strategy helps you get into practice to follow OSHA's recommended hierarchy of controls to eliminate or reduce hazards.

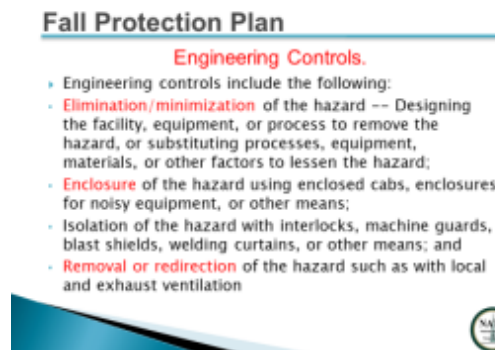
Always follow OSHA's Hierarchy of Controls to reduce or eliminate hazards. The first control measure is engineering controls, the second is administrative or work practice controls and last is personal protective equipment.



Engineering controls

Engineering controls is the preferred method of control examples include:

- Elimination/minimization of the hazard -- Designing the facility, equipment, or process to remove the hazard, or substituting processes, equipment, materials, or other factors to lessen the hazard;
- Enclosure of the hazard using enclosed cabs, enclosures for noisy equipment, or other means;
- Isolation of the hazard with interlocks, machine guards, blast shields, welding curtains, or other means; and
- Removal or redirection of the hazard such as with local and exhaust ventilation.



Administrative controls

Administrative controls include the following:

- Written operating procedures, work permits, and safe work practices;
- Exposure time limitations (used most commonly to control temperature extremes and ergonomic hazards);
- Monitoring the use of highly hazardous materials;
- Signaling, including: alarms, signs, and warnings;
- Buddy system such as a spotter;
- Meaningful Training not just going through the motions.

Fall Protection Plan

Administrative Work Practice Controls

- Administrative controls include the following:
 - **Written** operating procedures, work permits, and safe work practices
 - **Exposure time limitations** (used most commonly to control temperature extremes and ergonomic hazards)
 - **Monitoring** the use of highly hazardous materials
 - **Signaling**, including: alarms, signs, and warnings
 - **Buddy system** such as a spotter
 - Meaningful **Training** not just going through the motions



Personal Protective Equipment

Personal Protective Equipment -- such as respirators, hearing protection, protective clothing, safety glasses, and hardhats -- is acceptable as a control method in the following circumstances:

- When engineering controls are not feasible or do not totally eliminate the hazard;
- While engineering controls are being developed;
- When safe work practices do not provide sufficient additional protection;
- During emergencies when engineering controls may not be feasible.

Fall Protection Plan

Personal Protective Equipment

- Personal Protective Equipment -- such as respirators, hearing protection, protective clothing, safety glasses, and hardhats -- is acceptable as a control method in the following circumstances:
- When **engineering controls are not feasible** or do not totally eliminate the hazard
 - While engineering controls are **being developed**
 - When **safe work practices do not provide sufficient additional protection**
 - **During emergencies** when engineering controls may not be feasible



Determining Controls:

Once you understand the differences between the control measures, you can now apply that knowledge to develop specific control measures for each hazard.



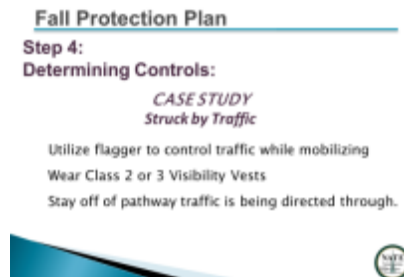
Determining Controls – Case Study:

As a group, return to the case study and list the recommended job procedures and controls corresponding to the hazards identified in Step 2.

Reinforce earlier principles as needed, such as there can be more than one control for each identified hazard and to utilize the Control Hit List as a means to prioritize the controls to make sure the best possible control is evaluated.

Continue to list the class responses on the flip chart that was started earlier.

This will complete the case study of filling out a sample JSA as a group.



Training:

The employer shall provide a training program for each employee who might be exposed to fall hazards. The program shall enable each employee to recognize the hazards of falling and shall train each employee in the procedures to be followed in order to minimize these hazards.

The correct procedures for erecting, maintaining, disassembling, and inspecting the fall protection systems to be used;

Training

Training can take many forms:

- Traditional Classroom training on the hazards and expectations
- Tool Box Safety Talks on the job to ensure that everyone on the crew knows what is expected of them
- Union Based/Sponsored training
- Independent training



Training

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



Section 7: Review Questions

One of the benefits of a JSA is it can increase productivity?

- A. True**
- B. False

Which of these is not a use of the JSA form?

- A. Evaluate existing jobs
- B. Set up new jobs
- C. Training and re-training tool
- D. Prioritize jobs needing re-design
- E. Makes for a good document to show OSHA**
- F. Reference in accident investigations

Using the Hazard Probability Chart, Answer the Question How great is the Hazard “Struck by Traffic”?

- 1. High**
- 2. Serious
- 3. Moderate
- 4. Low

What type of Control is “Wear Class 2 or 3 Visibility Vests?”

- 1. Engineering Control, EC
- 2. Administrative/Work Practice Control, AWPC**
- 3. Personal protective equipment, PPE

What type of Control is “Stay off of pathway traffic which is being directed through?”

- 1. Engineering Control, EC**
- 2. Administrative/Work Practice Control, AWPC
- 3. Personal protective equipment, PPE

Part 2 Structural Hazard Check List	
Is there a recent inspection report/structural analysis of the structure?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
Did you check all guys and their associated anchors for corrosion?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
Did you check all guys and the structure for plumb and tension?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
Have you visually inspected the tower's condition before climbing?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA

Part 3 Overall Hazard Check List	
Have you checked for overhead power lines?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
Do you have the proper PPE for the hazards on site?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
Have you inspected the site for fall protection hazards and do you have the applicable equipment on site to mitigate those hazards?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
Do you have a documented site specific rescue plan on site?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
Have you reviewed the RF & EME hazards of the site?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
Are there First Aid/CPR certified individuals on site?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA

Job Site Exposures and Hazard Identification (Check the Hazards):

Items checked below relate to existing conditions or may be a result of site operations.

Physical Hazards		Health Hazards	
<input type="checkbox"/> Falls from Elevations	<input type="checkbox"/> Electrical Shock	<input type="checkbox"/> Heat Stress	<input type="checkbox"/> Cold Stress
<input type="checkbox"/> Heavy Equipment	<input type="checkbox"/> Slips, Trips, or Falls	<input type="checkbox"/> High Noise (> 85 dBA)	<input type="checkbox"/> Chemical Exposure
<input type="checkbox"/> Underground Utilities	<input type="checkbox"/> Overhead Utilities	<input type="checkbox"/> Silica Exposure (Concrete Cutting)	
<input type="checkbox"/> Vehicle Traffic	<input type="checkbox"/> Elevation/Site Terrain	<input type="checkbox"/> RF/EME	<input type="checkbox"/> Lifting Hazard
<input type="checkbox"/> Other Workers on Site	<input type="checkbox"/> Fire Hazards	<input type="checkbox"/> Biological	<input type="checkbox"/> Lead Paint
<input type="checkbox"/> Holes and Trenches	<input type="checkbox"/> Confined Space	<input type="checkbox"/> Birds / Animals / Insects / Reptiles / Plants	
<input type="checkbox"/> Trash, Debris, Dunnage	<input type="checkbox"/> Lacerations, Abrasions	<input type="checkbox"/> Asbestos Containing Materials	
<input type="checkbox"/> Welding	<input type="checkbox"/> High Crime Area	<input type="checkbox"/> Other:	
<input type="checkbox"/> Confined Space	<input type="checkbox"/> Lifting, Pulling		
<input type="checkbox"/> Falling Objects	<input type="checkbox"/> Other:		
<input type="checkbox"/> Have you reviewed MSDSs for hazardous substances that might be present at the job site?			

Hazard Control Measures (Check the Control Measures):

Required PPE	Inspections	Safety Training/ Programs	Site Security
<input type="checkbox"/> Head Protection	<input type="checkbox"/> Tools/Equipment	<input type="checkbox"/> Tailgate Meeting	<input type="checkbox"/> Inner City
<input type="checkbox"/> Foot Protection	<input type="checkbox"/> Rigging	<input type="checkbox"/> Site Signage	<input type="checkbox"/> Rural
<input type="checkbox"/> Eye Protection	<input type="checkbox"/> Housekeeping	<input type="checkbox"/> RF Safety Awareness	<input type="checkbox"/> Night Work
<input type="checkbox"/> Hearing Protection	<input type="checkbox"/> Tag Lines	<input type="checkbox"/> Lockout / Tagout	<input type="checkbox"/> Locked Fences and Access
<input type="checkbox"/> Hand Protection	<input type="checkbox"/> Ground Fault Protection	<input type="checkbox"/> Equipment Operation	Doors
<input type="checkbox"/> Fall Protection	<input type="checkbox"/> Gin Poles	<input type="checkbox"/> Other:	<input type="checkbox"/> Lighting
<input type="checkbox"/> RF Monitors	<input type="checkbox"/> Hoists		<input type="checkbox"/> Provided Building/Rooftop
<input type="checkbox"/> RF Suits	<input type="checkbox"/> Call Before Digging		Access
<input type="checkbox"/> Face/Dust Mask	<input type="checkbox"/> Other:		<input type="checkbox"/> Barricades
<input type="checkbox"/> Work Clothing <input type="checkbox"/> First Aid			<input type="checkbox"/> Other:
<input type="checkbox"/> Other:			
Required Permits and/or Plan Requirements for your Company or Client			
<input type="checkbox"/> Hoisting Personnel <input type="checkbox"/> Personnel Lift (Manbasket) <input type="checkbox"/> Descent Control <input type="checkbox"/> Drum Hoist or Gin Pole <input type="checkbox"/> Crane Lift Data Sheet and Layout <input type="checkbox"/> Capstan (Cat-Head) <input type="checkbox"/> Confined Space <input type="checkbox"/> Excavation <input type="checkbox"/> Hot Work <input type="checkbox"/> Lockout/Tagout <input type="checkbox"/> Other:			
Have all applicable notifications related to permits been made <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA			

Hazard Control Measures (continued):

Electrical		Rooftop Control Measures	
<input type="checkbox"/> Electrical Tools and Testing Equipment	<input type="checkbox"/> Electrical Equipment Inspection	<input type="checkbox"/> Personal Fall Arrest System	<input type="checkbox"/> Guard Rails / Parapet (42" Minimum)
<input type="checkbox"/> GFCI	<input type="checkbox"/> Electrical PPE	<input type="checkbox"/> Warning Line System	<input type="checkbox"/> Anchorage System
<input type="checkbox"/> Lockout / Tagout	<input type="checkbox"/> Other:	<input type="checkbox"/> Other:	<input type="checkbox"/> Skylight Barricades
All Tasks			
Describe the elevation, site terrain and environmental hazards:			
Describe hazards with site/vehicle access (i.e. boom and cranes/electrical lines) and storage of materials:			
Describe the overhead and underground electrical hazards:			
Describe other:			

Complete for Civil Work:

Describe type and depth of excavations:
Describe cave-in control measures to be used if excavation will be 5 feet or greater and personnel are entering the trench:
<input type="checkbox"/> Sloping <input type="checkbox"/> Benching <input type="checkbox"/> Shoring Trench <input type="checkbox"/> Shield/Box
<input type="checkbox"/> Ladder in Trench or excavation (if 4 feet deep or greater) every 25 feet of length. Must extend 36 inches above landing.
Describe other:

Complete for Elevated Work (Fall Protection & Using Suspended Personnel Platform):

Fall protection to be used if working 6 feet or more AGL:
<input type="checkbox"/> Full Body Harness <input type="checkbox"/> Double Leg or 2 Lanyards <input type="checkbox"/> Rope Grab <input type="checkbox"/> Cable Grab <input type="checkbox"/> Retractable Lifeline
<input type="checkbox"/> Anchorage Straps <input type="checkbox"/> Ropes Descenders <input type="checkbox"/> Boatswains Chair <input type="checkbox"/> Ladder Safety Climb
Has each employee inspected his or her fall protection equipment? <input type="checkbox"/> Yes <input type="checkbox"/> No
Is all gear in rescue bag or container present and operable at the base of tower or elevation? <input type="checkbox"/> Yes <input type="checkbox"/> No
Hoisting Equipment to be used (if applicable):
<input type="checkbox"/> Base Mounted Hoist <input type="checkbox"/> Crane/Boom Truck <input type="checkbox"/> Gin Pole <input type="checkbox"/> Suspended Personnel Platform (Manbasket) <input type="checkbox"/> Aerial Lift Device
Is the Suspended Personnel Platform Checklist and Critical Lift Plan completed and on site? <input type="checkbox"/> Yes <input type="checkbox"/> No
Does the hoist comply with the regulations for lifting personnel? <input type="checkbox"/> Yes <input type="checkbox"/> No
Are there adequate radio communications from tower to ground? <input type="checkbox"/> Yes <input type="checkbox"/> No
Job Hazard Analysis discussed and reviewed with all crew members and other contractors on site? <input type="checkbox"/> Yes <input type="checkbox"/> No

LAST FIVE MINUTES

The "Last Five Minutes" is intended to be a quick assessment of the site before leaving.

Check the box next to each item if it is satisfactory. As You Leave the Site:

<input type="checkbox"/> Is the log book signed and NOC notified (if applicable)?
<input type="checkbox"/> Is the construction area secured (i.e., fenced, barrier tape, warning signs, etc.)?
<input type="checkbox"/> Are all trenches covered and/or barriers in place?
<input type="checkbox"/> Is any material or equipment left in a suspended condition (i.e., hanging off of the tower or over an edge of the shelter)?
<input type="checkbox"/> Are the shelter, gang boxes, and/or equipment doors closed and secured/locked?
<input type="checkbox"/> Are the warning/no trespassing signs visible?
<input type="checkbox"/> FINALLY; Did I lock the gate when I left the site?
The "Last Five Minutes" sets the stage for how the client and others will view the site when they arrive.
A SITE FREE OF ACCIDENTS WAITING TO HAPPEN AND FREE OF DEFECTS, SPEAKS FOR ITSELF.

Project Personnel:

Name	Company:	CPR/ First Aid Trained	Certified Climber	Tower/ Rescue Trained	Initials
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Competent Rigger or Supervisor Signature

DATE:

Development of this JHA:

At the request and assistance of many of the country's leading companies in the wireless infrastructure industry, WirelessEstimator.com developed this best practices document to cover the most commonly required disciplines in wireless construction. This JHA meets and exceeds all project JHA requirements set forth in ANSI/TIA-1019-A's Check List for Site Evaluation for projects.

Use of this JHA:

By using this JHA, you acknowledge and agree that there may be other hazards that must be evaluated and you shall hold harmless and indemnify Wireless Estimator, Inc. against any losses, liabilities and claims arising out of or relating to the use of this document.