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About This Guide

This document is provided for guidance and as a model safety program. Operating unit management is ultimately responsible for workplace safety at each operating unit. This program is intended to assist operating unit management and safety personnel in providing a safe workplace for operating unit employees.

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Symbols in Text

This symbol indicates cautionary information regarding equipment that may cause serious injury or procedures that must be followed completely and carefully.

This symbol indicates important information about equipment, procedures, or Company requirements.

This symbol indicates supplemental information.

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Quanta Services, Inc.
Attention: VP – Health, Safety & Environmental

Foreword

A safe workplace is a sign of a well-managed company. Quanta Services, Inc. expects that all of its operating units will implement the necessary systems and policies, and provide employees with applicable education, tools, and equipment, to ensure that employees work in conditions that are safe and in compliance with applicable laws and regulations.

No written manual can address or resolve all workplace safety hazards or challenges. Written policies are merely a starting point for an effective safety program. Each operating unit is in the best position, and has the responsibility, to ensure that the work employees perform occurs safely. This manual is intended to assist Quanta Services companies in their efforts to protect employee safety and health and conduct operations in compliance with applicable regulations. The policies, procedures, and safe practices described in this manual represent accepted safety standards approved by Quanta Services, based on years of industry experience.

Each operating unit must ensure that its safety rules and procedures provide at least as much protection to employee safety and health as the provisions contained in this Manual. Some operating companies, local bargaining contracts, customer/client requirements, and applicable laws and regulation may present more stringent requirements than the policies, procedures, and safe practices described in this manual. When an applicable law, regulation, or order varies from a rule or procedure in this *Safety, Health and Environmental Program Manual*, the operating unit must ensure that its operations and practices conform to the law, regulation, or order. Operating units must observe and comply with the applicable requirements that provide the greatest level of safety and health protection to employees.

Nothing contained in this *Safety, Health and Environmental Program Manual* should be deemed to constitute a minimum or maximum standard for safety or operating procedures. The rules, standards, and procedures in this *Safety, Health and Environmental Program Manual* are guidelines and are not designed or intended to establish a legal standard or duty of care.

Corporate Safety, Health and Environmental Policy

Letter from the CEO

Dear Fellow Employees:

Quanta Services is committed to the health and safety of its employees, customers, contractors, and the communities in which we work. It is our mission to provide and maintain a safe work environment for our family of employees. Our ***core philosophy*** is that safety takes precedence over all business pursuits and work practices.

As a responsible corporate citizen, we each have a role in the development of quality performance methods that protect and preserve the environment for future generations. Quanta's policies, procedures and work practices are intended to help ensure that operations do not adversely impact the community or the environment and comply with all federal, state and local safety, health and environmental guidelines.

Employees receive training in safe operating practices that safeguard them from potential hazards. Employees are expected to adhere to mandatory safety regulations and standards, use personal protective equipment and leverage training opportunities to prevent incidents and accidents.

Quanta's policies and procedures are designed to ensure that all operations and training provided comply with all federal, state and local safety, health and environmental guidelines.

Quanta Services and Quanta subsidiary teams provide strong safety leadership that instills Safety ownership in our employees and helps to embrace excellence in all aspects of safety. Our management's commitment and our proactive safety processes enhance and support our goal of ***Zero Incidents/Zero Accidents***.

Jim O'Neil

President, Chief Executive Officer

QUANTA SERVICES

Safety, Health and Environmental Mission Statement

Our Mission Is To:

- PROVIDE PROACTIVE SAFETY MANAGEMENT SYSTEMS AND OCCUPATIONAL HEALTH PROCESSES TO MITIGATE AND ELIMINATE ACCIDENTS AND INJURIES.
- CREATE A WORKING ENVIRONMENT THAT PLACES THE HIGHEST VALUE ON THE HEALTH AND WELFARE OF THE EMPLOYEE, CUSTOMER, CLIENT, AND COMMUNITY.
- OPERATE IN, PRESERVE, AND PROTECT THE ENVIRONMENT.
- INSTILL A SENSE OF OWNERSHIP IN EMPLOYEES.
- EMBRACE EXCELLENCE IN ALL ASPECTS OF SAFETY.

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Safety, Health, and Environmental Policy

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

Statement of Policy

Quanta Services is committed to the health and safety of its employees, customers, contractors, and the communities in which we work. It is our mission to provide and maintain a safe work environment for our family of employees. Our ***core philosophy*** is that safety takes precedence over all business pursuits and work practices.

As responsible corporate citizens, we each have a role in the development of quality performance methods that protect and preserve the environment for future generations. Quanta's policies, procedures and work practices are intended to help ensure that operations do not adversely impact the community or the environment.

Employees receive training in safe operating practices that safeguard them from potential hazards. Employees are expected to adhere to mandatory safety regulations and standards, use personal protective equipment (PPE), and leverage training opportunities to prevent incidents and accidents.

Quanta's policies and procedures are designed to ensure that all operations and training provided comply with all federal, state, and local safety, health, and environmental guidelines and comply with the applicable legislation and other requirements of the region and country where work is performed.

Quanta Services and Quanta subsidiary teams provide strong safety leadership that instills Safety ownership in our employees and helps to embrace excellence in all aspects of safety. Our management's commitment and our proactive safety processes enhance and support our goal of ***Zero Incidents/Zero Accidents***.

Philosophy

The Company is committed to providing employees with a safe working environment. The following statements comprise the philosophy that guides this policy:

- It is possible to meet all Company objectives without injury or damage to health or property.
- Protect all employees from occupational injury or illness.
- Protect the public and environment from adverse consequences due to our operations.
- Incidents resulting in personal injury or damage to health or property represent needless human and economic losses and must be prevented by every reasonable means available.
- There is no conflict between safety, quality, and productivity. Sound safety practices enhance quality and production.
- Equipment, tools, procedures, training, and all other elements of the work environment must be designed and managed to eliminate or reduce employee exposure to injury and health hazards.
- A good safety record is an element of good personal performance. Employees at all levels are responsible for the safety and well-being of themselves and their fellow workers.
- A good safety record is evidence of good management practices. Managers and supervisors at all levels are accountable for the safety and safety performance of all employees who report to them. Managers and supervisors must provide leadership.
- Each employee has a duty to cooperate with and willingly participate in the accident prevention effort.
- All managers, supervisors and employees must comply with all safety regulations and procedures.
- The Company expects all employees to comply with all laws and regulations governing the workplace, and each employee is expected to fully cooperate and participate in this effort.
- The prevention of accidents on and away from the job is equally important. Each employee should apply the principles of safety learned on the job to prevent accidents in the home, on the highway, and in other external activities.
- Strive for continuous improvement of the Company's safety management systems through a process of monitoring and adjustment.
- Involve employees in all aspects of the safety process.

Safety Responsibilities

To achieve a safe working environment and adhere to the policies and procedures provided in the *Safety, Health, and Environmental Program Manual*, employees must be aware of their role in preventing accidents and maintaining the standards set forth by Company policies.

The following sections, which explain employee responsibilities, are intended to be illustrative and informative, but not necessarily all-inclusive.

All Employees

Employees must:

- Accept ownership of the Safety process.
- Maintain constant safety awareness and exercise reasonable caution in all activities on or away from the job.
- Assist fellow workers in maintaining safety awareness at all times.
- Understand and comply with all government, company, and customer safety regulations and procedures that relate to job activities.
- Report any unsafe conditions, injuries, near-misses, or safety suggestions to their supervisors immediately.
- Cooperate with and participate in incident investigations to determine and eliminate causes or hazards.
- Employees should understand that they have the right to refuse to do a job if they believe, in good faith, that they are exposed to an imminent danger. Imminent danger is defined as any conditions or practice which is such that a danger exists which could reasonably be expected to cause death or serious physical harm.

Supervisors

Supervisors must understand their role and responsibility to effectively communicate all Company directives and must:

- Ensure that all their decisions and actions comply with applicable local, state and federal governmental regulations and the Company *Safety, Health, and Environmental Program Manual*.
- Place the highest value on the health and welfare of the employee, customer, client and community.
- Ensure that their employees have the knowledge and training necessary to perform each task safely.
- Take immediate action to abate and eliminate safety or health hazards in their areas of responsibility.
- Establish an accident/injury free work environment.
- Enforce all applicable local, state and federal governmental regulations and the Company *Safety, Health and Environmental Program Manual.*
- Immediately report to management any accidents or near-misses occurring in their areas of responsibility and participate in investigations to determine and eliminate the causes.
- Report all accidents, injuries, and near-misses immediately to the Safety Department. Complete all Supervisor Accident Investigation Report forms within 24 hours and send them to the Corporate office.
- Strive for excellence in all aspects of safety.
- Conduct periodic inspections of their operations.

- Provide Personal Protective Equipment required for each job.
- Pre-plan safety in all work operations.
- Ensure prompt and adequate first aid and/or medical treatment as needed.
- Participate in crisis management and emergency response plans as directed.

Managers

Managers must emphasize the importance of safety to supervisors and employees and ensure that they are provided with the necessary means to achieve safety goals. It is the responsibility of all managers to:

- Provide guidance for decision making and performance by communicating, enforcing and supporting the Company safety, health, and environmental philosophy.
- Emphasize the importance of safety and health as a meaningful part of the objective-setting and performance evaluation processes at all levels of the organization.
- Allocate the necessary resources to provide and maintain a safe and healthful work environment and hold field supervisors accountable.
- Provide an organizational structure and resources that are appropriate and necessary for an effective safety and health program.

Safety Directors

The Safety Director is responsible for the effective application and administration of the safety, health, and environmental program for the Operating Unit and must:

- Establish and oversee comprehensive safety programs consistent with local, state and federal governmental regulations and the Company *Safety, Health and Environmental Program Manual*.
- Employ and train qualified personnel for field level Safety Supervisor and Safety Inspector positions.
- Set up methods for safety education, safety rules, and procedures.
- Assist and consult management with accident control problems and analysis of serious accidents.
- Conduct periodic inspections on the jobsite to ensure that an aggressive safety program is in operation.
- Provide management with guidance on up-to-date federal, state, and local codes and standards.
- Enforce all applicable local, state and federal governmental regulations and the Company *Safety, Health and Environmental Program Manual.*
- Review all routine inspection reports from Safety Inspectors to analyze trends and common practices.
- Follow established incident/accident reporting procedures.
- Review and analyze all incident/accident reports, unusual accidents, or trends and ensure that corrective action has been applied.

- Select tailgate safety training topics and provide material to the jobsites for conducting the training.
- Ensure that all jobsites maintain necessary files and records that conform to applicable recordkeeping requirements.
- Develop a Crisis Management and Emergency Action Plan for each project location.
- Assist clients in requests for safety programs and recommendations for jobsite improvement.
- Designate the physician or hospital to be assigned for each jobsite.
- Conduct a prejob hazard survey before a new project is started.
- Ensure that new-hire orientation is provided to all newly hired employees.

Safety Inspector

The Safety Inspector must work with supervisors and Safety Directors, as directed by management, to ensure that safety and health requirements are met. Safety Inspectors must:

- Assist the Safety Director in establishing a comprehensive safety program for each jobsite, in accordance with client and company policy.
- Ensure the acquisition, use, and proper maintenance of safety supplies, clothing, and equipment.
- Set up weekly safety meetings with supervisors, coordinate safety training for new employees, and distribute weekly tailgate safety training to all supervisors.
- Conduct routine inspections of jobsites and equipment. Submit all inspection reports to the Safety Director.
- Investigate and analyze all incidents/accidents, unusual accidents and near-misses for trends and submit reports with recommendations to the Safety Director.

Examples of Safe Work Practices

Management

Management, regardless of the size of the organization, can eliminate the majority of employee work injuries. Most injuries result from a combination of physical hazards and human error that can easily be corrected. All physical hazards must be reduced as much as possible and every means must be taken to control work habits and practices. Suggestions for accomplishing these goals include:

- Providing safe physical, mechanical, and chemical work environments
- Providing safe work methods, processes, and procedures
- Providing necessary training and qualified supervisors
- Providing protective devices and equipment
- Leading by example

Supervision

Supervisors are the key to the implementation of safe work methods and practices. They will promote safety with their employees by the example shown in their attitude toward safety. The following methods are recommended to promote safety:

- Providing safety instructions for each job
- Lead by example in promoting safe work practices and procedures
- Requiring workers to perform their jobs safely and use all required personal protective equipment

General Safety Rules

All employees must observe these general safety rules:

- Follow all instructions for performing job functions, be certain of the outcome of actions before performing them, and ask a supervisor for clarification of instructions if there is a question.
- Make sure that each job has been adequately planned and that proper methods are identified and used to address hazards presented by the work or jobsite.
- Correct or report all unsafe conditions to your immediate supervisor.
- Help keep the workplace and equipment clean and orderly, especially your immediate work area.
- Use the correct tools and equipment for the job.
- Report all incidents/injuries, no matter how minor, to your supervisor or foreman immediately.
- Take an active role in the Safety Health and Environmental process.
- Operate, use, adjust, and repair only those machines and/or equipment for which you have been trained and are authorized.
- Wear all prescribed PPE, wear required safety clothing, and keep clothing and equipment in good condition.
- Do not engage in horseplay. Avoid distracting others, especially if working as a team member in the field.
- Smoking is not allowed in Company vehicles.
- Smoking is not allowed in offices, except in designated smoking areas.
- Comply with all company, client, and governmental safety rules, signs and work procedures.
- In case of an emergency, know what procedures to follow for each jobsite.

Elements of a Successful Safety Program

New Employee Orientation

Every new employee will attend a new employee orientation. The new employee orientation must address topics sufficient to allow employees to identify and control workplace safety and health hazards. Topics should include:

- The employee's overall role in the success of the safety program:
    - Recognizing hazards in the work area
    - Correcting hazards in the work area
    - Reporting hazards that you cannot correct to your supervisor
    - Knowing and using safe work methods
    - Complying with all safety rules
    - Participating in the Job Task Safety Analysis (JTSA) process
- Quanta Services *Safety Code of Conduct*
- Area safety council training requirements (when applicable)
- Union training requirements (where applicable)
- Safety committees
- Safety meetings
- Accident and near-miss reports
- Emergency telephone numbers
- Emergency Action Plan
- How to obtain first aid
- Power line awareness
- Site-specific information:
    - Prohibited items
    - Dress code
    - PPE
    - Safe work practices around and/or near energized parts
    - Respiratory protection
    - Fall protection
    - Hazard communication
    - Fire extinguishers
    - Water coolers

- Inspection of equipment
- Material handling
- Confined spaces
- Trenching and excavations
- Warning signs
- Housekeeping

Safety Training

Training is provided for employees on an as-needed basis. Employees should be trained for the tasks they are expected to perform. Training is provided for, but not limited to, the following subjects as appropriate to the hazards and conditions presented by the job and duties of employees:

- Quanta Services *Safety Code of Conduct*
- New Hire Orientation—Employee
- Orientation for Newly Promoted Supervisors
- First Aid
- CPR
- Bloodborne pathogens
- Hazard Communication
- Haz-Mat Responder
- Job Task Safety Analysis
- OSHA 10-hour Construction
- OSHA 10-hour Electrical T&D
- OSHA 20-hour Leadership
- Confined Spaces
- Confined-space rescue
- Crane operation
- Mobile Equipment operation
- Principles of Rigging
- Qualified Rigger
- Qualified Signal Person
- Helicopter Safety
- Trenching and excavations
- Fire protection and prevention
- Hand and power tools

- Powder-actuated tools
- Equal Potential Grounding and Bonding Work Zone
- Lockout and tagout
- PPE
- Scaffolding
- Ladders
- Pole top rescue
- Bucket rescue
- Tower rescue
- RF Hazards
- HDD
- Electrical Awareness for Telecommunication Workers
- Fall Protection
- Work Zone Awareness
- Flaggers
- Defensive Driving Course (DDC)
- Distracted Driving

Safety Committees

Committees can be valuable if they have a purpose, an objective, and a plan of action. A safety committee of two or three employees on even the smallest jobsite can successfully implement the basic elements of a safety program. The Safety Committee will be chartered with the purpose, objective, and plan of action. A Safety Committee should include representation from all levels.

Suggested rules for the Safety Committee include:

- Inspect, investigate, educate and recommend improvements for the project.
- Evaluate effectiveness of safety on the project.
- Maintain safety performance by obtaining full cooperation of everyone on the project.
- Encourage a closer relationship between management and workers through effective committee meetings.
- Recommend improvements to existing safety and health rules, policies and procedures.
- Review and update existing work practices.
- Provide suggestions necessary to maintain safe working conditions.
- Review incident reports to determine how to prevent them from occurring and determine effectiveness of corrective action.
- Provide information to supervisors regarding safe work methods and practices.

- Recommend changes or additions to personal protective equipment.
- Lead by example in promoting safe work practices.

Safety Meetings

Safety meetings are an integral part of a proactive safety management process. There are many types of safety meetings held.

Daily, before the start of work, the crew generally should hold a documented tailgate safety meeting. The meeting should focus on safety issues relevant to the work processes to be performed that day, along with reminders regarding the safe use and inspection of the tools and equipment required for the tasks to be performed that day. The crew should also discuss any near-misses, noncompliance, or other safety issues that were encountered the previous day.

A weekly safety meeting will be held on each jobsite. The purpose is to cover subjects of great importance and relevance to the success of the job. The subjects discussed and attendance will be documented by signing a meeting roster. These meetings supplement and support the safety training provided for all employees. Weekly safety meetings will generally last between 15 and 30 minutes.

The topics may be:

- Pre-chosen and information sent to the field by the Corporate Office and/or Operating Unit.
- Pertinent to the work being performed.
- Tools and equipment being used in the field.
- Work procedures and policies of the client/customer.
- Issues related to the crew’s activities.
- “Special” safety meetings, which may be called when:
  - An incident occurs on a jobsite.
  - Non-compliance was observed.
  - New work practices and/or policies are implemented.
  - New tools and/or equipment are introduced into the work area.
  - Other reasons.

Job Task Safety Analysis

Each day, before the start of each workday, the supervisor/foreman (person in charge) or their designee, should conduct a job briefing or Job Task Safety Analysis (JTSA) with the employees involved (see Chapter 29). The purpose of the JTSA is to identify the hazards associated with the scope of work, determine the safety precautions that will be implemented, and the required PPE by the crew performing the work assignment. The JTSA helps ensure that all members of the crew understand the work assignment and acknowledge that they understand and will follow the safety plan established to complete the work assignment. The JTSA should be documented and signed by all crewmembers. The following are requirements for the JTSA:

- The foreman (person in charge) should assemble the crew at the job site and explain the work to be done, and outline the steps to be followed.

- The foreman (person in charge) and the members of the crew will identify the hazards of the job. The crew should identify appropriate controls to eliminate, mitigate, control, or reduce the accident-producing potential of the hazards.
- If the hazards cannot be eliminated from the jobsite, the JTSA should list how the hazards can be mitigated, controlled, or reduced. This may be done by:
  - Dedicated assignment of work responsibilities.
  - Methods to isolate or control the hazard.
  - Other forms of protection (PPE, training, others) to reduce the hazard to the employees.
- The foreman (person in charge) must ensure that each member of the crew understands all instructions given.
- If the work or operations to be performed during the workday or shift are repetitive and similar, at least one JTSA should be conducted before the start of the first job of each day or shift. An additional JTSA should be completed and a meeting held with the members of the crew if significant changes that might affect the safety of the employees occur during the course of the work. Significant changes include changes in the scope of the work, work assignments, crew structure, crew leadership, environmental conditions, or when other hazards (not originally noted) are determined to be present in the workplace.
- The discussion should be in such detail that all employees, by virtue of training and experience, can reasonably be expected to recognize and avoid the hazards involved in the job. A more extensive discussion should be conducted if the work is complicated or particularly hazardous or if the employee cannot be expected to recognize and avoid the hazards involved in the job.
- The foreman (person in charge) is responsible for accounting for all employees after the completion of each job.

Measuring Safety Performance

The following standards should be used when measuring safety performance.

- The standard measure of how often injuries occur is the *Injury Incidence Rate*.

  $$\text{Injury Incidence Rate} = \frac{\text{Number of injuries x 200,000}}{\text{Employee work hours}}$$

- The standard measure of how serious injuries are is the *Injury Severity Rate.*

  $$\text{Injury Severity Rate} = \frac{\text{Total days lost x 200,000}}{\text{Employee work hours}}$$

  A disabling injury is a work injury that results in death, permanent total disability, permanent partial disability, or temporary total disability.

- Injury rates compiled in accordance with this standard may be used to evaluate:
  - The relative need for accident prevention activities in different departments or jobsites of an establishment.
  - The seriousness of the accident problem in an establishment or industry.
  - The effectiveness of safety activities in establishments with comparable hazards.

- The progress made in accident prevention within an establishment or industry.

The Bureau of Labor Statistics of the U.S. Department of Labor publishes annual summaries of injury experiences that may be used for comparisons.

Inspections

Regular inspections are an important step in an accident prevention effort. Inspections can be performed by supervisors, safety committees, specialists, and workers.

- Supervisors inspect to observe whether designated work practices and procedures are being followed.
- Committees or specialists inspect to identify hazards, control maintenance, prevent fire hazards, maintain housekeeping, identify special problems, and evaluate general conditions.
- Workers inspect their machines, tools, and work areas to keep them in proper operating condition.

An inspection is of no value if the resulting information is not addressed and where appropriate forwarded to the proper members of management. All inspection items should be numbered with a follow-up system to ensure that action has been taken. Where possible, especially where an inspection reveals an imminent safety hazard or concern, action should be taken immediately. For additional information, see Chapter 2, "Safety Inspections."

Investigations

Accidents should be investigated as soon after the occurrence as possible to determine the cause and initiate corrective action. The supervisor should be involved in all phases of the investigation. To guide the investigation, answer the following questions in order:

1. Who was involved in the accident?
2. What happened during the accident?
3. Where did the accident occur?
4. When did the accident occur?
5. How did the accident occur?
6. Why did the accident occur?

The investigator should obtain as many details as possible and then compare all facts to obtain the correct version of how the accident occurred. Then the necessary action should be taken to prevent the accident from happening again. For additional information, see Chapter 5, "Accident Investigation and Incident Injury Reporting Guidelines."

Serious accidents, especially if they involve employee injuries or serious property damage, must be coordinated through corporate safety and legal departments.

Education and Training

Employees must be trained and educated how to perform their jobs and how to recognize and avert the hazards associated with their jobs:

- **R**ecognize the hazard.

- **A**void the hazard.
- **P**revent the hazard.

If you cannot avoid the hazard, develop means to control the hazard.

The supervisor and employees should analyze every job to determine the most effective step-by-step procedure for completing the job. All job hazards should be addressed in this procedure with suggestions for control. The JTSA form has been designed to facilitate compliance with this requirement.

Employees should be trained in the determined procedure and observed to ensure that they continue to work accordingly. Safety consciousness, awareness, and alertness should be part of worker training. Every supervisor should hold a daily safety discussion with all workers. Tailgate safety training is used for this purpose.

Employee Cooperation through Incentives

Promoting and maintaining interest in safety can take many forms. Public recognition is important in gaining voluntary acceptance of the program and encouraging continuous cooperation with safety efforts by all personnel.

Safety contests, safety suggestion systems, meetings, periodicals, signs, slogans, and recognition of effort through awards are possible methods to develop and maintain the interest of employees.

Visual Aids

Visual aids that point out specific hazards or emphasize a safety message can be an important part of the safety program. Some examples of visual aids are:

- Posters displayed at locations where employees congregate or pass frequently.
- Bulletin boards used to display posters, notices, proper use of safety equipment, and other safety-related matters.
- Safety signs posted to warn of hazardous areas or give instructions.
- Films shown at safety meetings or used as training material.
- Slide presentations used to illustrate the work involved in a specific task.

Enforcement through Discipline

Disciplinary action should be considered for failure to comply with safety rules. Each Operating Unit should develop and follow a written disciplinary action program.

2

Safety Inspections

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental inspection processes and procedures.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

Definitions

- **Company project site**—A Company project site is any location, owned or not owned by the Company, where Company employees perform work for the Company, including but not limited to all offices, buildings, work sites, equipment yards, or storage facilities.
- **Compliance Safety and Health Officer (CSHO)**—A representative of a governmental regulatory agency who conducts regulatory compliance inspections.
- **The person in charge**—The person in charge is the department or project manager, job superintendent, or equivalent level of supervisor or designee who represents Company management at a particular project site and who is responsible for adhering to inspection procedures.

General Requirements

Safety inspections are a proactive part of a complete safety program and are necessary to maintain a safe and healthful work environment. Conditions constantly change as materials are moved and used, work activities evolve, environmental conditions change and waste materials are accumulated. During safety inspections, inspectors survey and appraise the conditions and work practices including those that result from these changes. Safety inspections enable:

- **Detection**—Seeking out unsafe work methods and conditions.
- **Analysis**—Determining why the unsafe methods or conditions exist.
- **Correction**—Eliminating unsafe methods or conditions before they cause a problem.

- **Follow Up**—Reviewing previous corrective actions to determine overall effectiveness of the Safety program.

Types of Inspections

Several types of inspections can be conducted to identify, analyze, and correct safety or health hazards:

- **Continuous activity**—"Day-to-day" inspections made by Safety Supervisors, Safety Inspectors, foremen, and other management personnel.
- **Pre-Use**—The practice of inspecting personal protective equipment (PPE) or tools on either a daily basis or prior to each use.
- **Preventive maintenance**—Scheduled or continuing inspections conducted by electricians, mechanics, maintenance employees, supervisors, or other designated personnel. Preventive maintenance includes inspections for safety and mechanical functioning, damage, lubrication, and wear.
- **Licensed**—Inspections made by certified or licensed inspectors who usually are not part of the organization being inspected. Boiler, elevator, insurance, and electrical inspectors conduct this type of inspection.
- **Governmental regulatory compliance inspections**—Inspections made for specific purposes by CSHOs representing a governmental regulatory agency.
- **Insurance**—Inspections made by representatives of the Company insurance carrier or insurance broker.

Safety Guidelines for Conducting Inspections

The following sections describe the elements of a safety inspection. Follow these guidelines when conducting inspections at Company sites.

Preparation

Prepare for conducting an inspection by completing the following tasks:

1. Develop a written procedure that will be followed during the inspection.
2. Check available records for the area that will be inspected and review the safety history of the area.
3. Obtain and study information about the potential hazards of the operations that will be inspected.
4. Prepare an outline of specific items to check during the inspection.
5. Develop a follow-up tool for assessment and measurement to determine overall effectiveness of the Safety program.

Equipment

While conducting an inspection, have the following equipment:

- Notebook
- Pencil
- Proper PPE
- Flashlight
- Tape measure
- Camera

Personal Contact

While conducting an inspection and following up with supervisors and management:

- Be objective, but maintain a cooperative spirit.
- Make a good impression. Remember that you are rendering a service.
- Avoid undue criticism, and do not behave in a condescending way.
- Convince your audience that your recommendations are necessary and practical through explanation, reasoning, and examples.

Route

Plan an inspection route that begins with the first process and continues with the remaining processes in their normal order. Decide which areas and buildings will be inspected and which operations, processes, or objectives, such as housekeeping or machine guarding, are most important to the inspection before arriving at the site.

Inspection Tips

To complete a successful inspection:

- Observe the general working conditions, including lighting, work areas, and buildings.
- Note any specific hazards that might be presented by tools, machines, and equipment.
- Observe employees and the work procedures.
- Take notes, but be brief when recording information.
- Perform inspections without disrupting operations.
- Speak to employees individually as well as collectively in a group.
- Inspect all areas of the site—even areas that are not used frequently. Do not be steered away from anything.
- Be constructive. Safety inspection is a proactive function designed to make the workplace safer. Approach the inspection with clarity and certainty.

- Seek reasons why adverse conditions exist, but think in terms of corrective action only.
- Answer questions and discuss items with supervisors if they request information. Avoid arguments or time-consuming or disruptive discussions.
- Prepare recommendations and be prepared to discuss them with supervisors and management. Have good reference notes and ensure that offered ideas are reasonable and well organized. Use a selling approach to convince management of any needs observed.
- Take emergency corrective action in the event of imminent danger.

Safety Inspection Checklist

The following list identifies specific areas that require inspection, but it does not identify all possible areas. Use this list as a guide when conducting inspections to ensure that all areas meet safety expectations.

- **Receiving, shipping, and storage**—Equipment, job planning, layout, heights, floor loads, projection of materials, and material-handling methods
- **Safe conditions**—Floors, walls, ceilings, exits, stairs, walkways, ramps, platforms, driveways, aisles, ladders, scaffolds, handrails, and other places frequented by personnel
- **Housekeeping**—Waste disposal, tools, objects, materials, leakage and spillage, methods, schedules, work areas, remote areas, windows, and ledges
- **Electricity**—Equipment, switches, breakers, fuses, switchboards, junctions, special fixtures, circuits, insulation, extensions, tools, motors, grounding, and code compliance
- **Lighting**—Type, intensity, controls, conditions, diffusion, location, glare and shadow control, and standards applied
- **Heating and ventilation**—Type, effectiveness, temperature and humidity controls, natural and artificial ventilation, and exhaust systems
- **Machines**—Points of operation, flywheels, gears, shafts, pulleys, key ways, belts, couplings, sprockets, chains, frames, controls, lighting, tools and equipment, brakes, exhausting, feeding, oiling, adjusting, maintenance, grounding, how attended, how attached, work space, and location
- **Personnel**—Training; experience; methods of checking machine before use; methods of cleaning, oiling, or adjusting machinery; type of clothing; PPE; use of guards; tool storage; and work practices
- **Hand and power tools**—Purchasing standards, inspection methods, storage, repair, types, maintenance, grounding, use, and handling
- **Chemicals**—Storage, handling, transportation, amounts used, warning signs, supervision, training, protective clothing, equipment, and Safety Data Sheets (SDS)
- **Fire prevention**—Extinguishers, alarms, sprinklers, smoking rules, exits, personnel assigned, separation of flammable materials and dangerous operations, explosion-proof fixtures, and waste disposal
- **Maintenance**—Regularity, effectiveness, training of personnel, materials and equipment used, method of locking out machinery, and general procedures

- **Personal Protective Equipment**—Type, size, maintenance, repair, storage, assignment of responsibility, purchasing methods, standards observed, rules of use, and method of assignment
- **Safety Program**—Is the Company *Safety, Health, and Environmental Program Manual* on site and available?
- **Heavy equipment**—Is equipment in good working order? Is the equipment being maintained? Is there an operator's manual for the equipment? Are the inspection records maintained and current?
- **JTSA**—Has a JTSA been completed for the activities being performed?

Jobsite Safety Audit Form

A sample Jobsite Safety Audit Form is provided at the end of this chapter and is available for use. It can be used on any company jobsite. Take corrective action for each unsafe activity noted on this form.

Governmental Regulatory Agency Inspection Procedures

The following guidelines regarding project site inspections apply to all Company personnel.

All supervisory personnel must enforce these guidelines, and each employee must follow the prescribed procedures.

Refer to the "Checklist for Inspections" later in this chapter to assist with these inspections.

Statement of Policy

The Company cooperates fully with governmental regulatory agencies and their officials during any site inspection.

Inspections

Representatives of governmental regulatory agencies may conduct an inspection:

- As part of a general inspection schedule.
- In response to a report of imminent danger.
- To investigate any accident, fatality, or catastrophe.
- In response to a complaint made by any employee or third party.

On the basis of the inspections, the regulatory agency may issue citations carrying costly penalties and potential future liability for the Company.

Identifying Compliance Officers

When Compliance Safety and Health Officers (CSHOs) arrive at a project site to conduct an inspection:

1. Greet the CSHO in a cordial, business-like manner.
2. Ask to see their identification.

3. Examine the credentials of each person accompanying the compliance officers before permitting entry to the project site.
4. Contact the local office of the governmental regulatory agency to verify the credentials of any person whose identification or authority is in any way uncertain.
5. Record the names of all representatives of governmental regulatory agencies who enter the project site, as well as the address and telephone number of the area office they represent.
6. Contact Management immediately.
7. Require the Compliance Officer to have proper PPE and a safety briefing prior to entering any work area.
8. Escort the officers to the field when authorization is obtained from the corporate office.

Pre-Inspection Procedures

Before allowing the inspection to begin, use the following procedure to find out the reason for and extent of the inspection.

1. Ask the compliance officer the reason for the inspection (for example, whether it is a routine planned inspection or resulted from a specific employee complaint, report of injury, or other reason).
2. If a complaint prompted the inspection, ask the officer whether the complaint was made by an employee, an ex-employee, or an unrelated third party. Avoid asking for identity of the complainant.
3. If a written complaint prompted the inspection, obtain a copy of the complaint.
4. Ask the compliance officer to define the scope of the inspection, such as whether it will include the entire work site or one specific area.
5. When the project site is within a client facility or a multi-employer project site, ask the compliance officer whether the inspection will involve the areas or equipment of the client or other contractors. If so, request permission to notify their representatives.
6. Ask the compliance officer to wait while any necessary clearance to proceed with the inspection is obtained from the client. Do not delay unnecessarily.
7. Notify Company officials of the inspection outside the presence of the compliance officer and request clearance to proceed. The Company Safety Manager contacted might wish to speak directly to the compliance officer before deciding whether to require a search warrant or allow the inspection to proceed.

Inspection Procedures

Accompany the officer during the inspection. Answer the officer’s questions truthfully and completely.

If the compliance officer asks for documents, obtain approval from the Company Safety Manager before releasing information. Do not offer safety documents to the compliance officer. Do not provide the documents at the time of inspection unless approved by the Safety Department. Requests for documents by compliance officers generally should be in writing.

Inform supervisors and employees that they are:

- Not required to sign any document the compliance officer might present.

- Entitled to retain a copy of any statements given to the compliance officer.

Retaliation of any nature against persons who file complaints with a governmental regulatory agency, make good faith complaints about workplace safety to management, or provide information to a governmental regulatory agency is strictly prohibited.

When accompanying the compliance officer during an inspection, take complete notes about the following matters:

- Areas visited
- Employees and other persons interviewed
- Employee use of PPE
- Machinery and equipment inspected
- Material examined
- Potential health hazards inspected
- Samples taken:
    - The materials sampled
    - The number of samples taken and when each was taken
    - The types of equipment used to take samples
    - How often sampling equipment is checked

  When the officer takes survey samples of materials, take duplicate samples (if equipment is available) as evidence that might help the Company in the event of citation or litigation.
- Comments made by the inspector
- Any areas photographed and measurements taken

If possible, take photographs and measurements that are identical to any the compliance officer takes.

Post-Inspection

The Inspection Data Form helps the Company establish its position in contesting any citations resulting from an inspection. Complete this form immediately after the compliance officer leaves and send it to the Company Safety Department as soon as possible, along with the photograph log, comments regarding each alleged violation, and descriptions of the abatement action taken. Refer to the form located at the end of this chapter.

Citations

If a representative of a governmental regulatory agency issues a citation at the project site, take the following actions:

1. Immediately mark the citation with the date received.
2. Make a copy of the citation to keep at the project site.
3. Send the original, in its envelope, to the Safety Department as soon as possible.
4. Post a copy of the citation. Consult with Safety Director on proper posting procedures.

The citation must remain posted for at least three workdays, after which it may be removed if the violation has been corrected.

The Safety Department will confer with management and corporate legal counsel before deciding what action to take in response to the citation, including paying fines or sending letters of abatement to the agency. Do not take action unless instructed to do so by the Safety Director.

Written Response to Complaints

If a governmental regulatory agency receives a written or oral complaint regarding safety or health hazards or wrongful termination, these agencies may serve a written request that the Company investigate the alleged conditions and make any necessary corrections, usually within a specified time frame. In this event, the Company must give the agency a timely written response that includes results of project site investigations. Corporate legal counsel must approve all responses. Corporate legal counsel can also issue written responses made to the agency on the Company's behalf.

Checklist for Inspections

What to do when CSHO shows up on your job:

- **Make a decision regarding shutting the job down.**
- **Call the safety department at once.**
- **Obtain a digital camera.**
- **Request CSHO wear appropriate PPE.**
- **Do not volunteer information or admit guilt.**

Shut Down the Job

- Immediately record name, badge number of Compliance Safety & Health Officer (CSHO), and time of arrival.
- Notify the CSHO that your Company would like to request that a management representative be present when the CSHO conducts their field safety inspection.
- If CSHO does not agree to wait for management representative, call the Corporate Safety Manager. The Corporate Safety Manager will make a verbal request and discuss when a management representative could be available at the jobsite.

Call the Corporate Office

- Advise that a governmental regulatory agency is on site and you need to reach the Company Safety Director immediately.
- Ask the CSHO to wait until a company representative arrives. However, the CSHO should not be asked to wait for more than a brief period normally an hour.
- If a representative is unable to arrive promptly, you will receive instructions by phone.

Photographs

- If you don’t have a camera on site, send someone for several disposable cameras.
- Take pictures of everything the CSHO photographs.

During the Inspection

- Cooperate, but do not volunteer information.
- Complete the Inspection Form.
- Make notes of all comments.
- If you don’t know the answer to a question, tell the CSHO to write down the question and tell them that you will have to get back to them with the answer.
- Keep replies brief and to the point.

The CSHO:

- MUST adhere to all Personal Protective Requirements and Safety Standards.
- CANNOT require you to demonstrate anything for his viewing.
- DOES NOT have control of our employees or job site.
- DOES NOT have the authority to take any of the Company’s written material from our job site.

After the Inspection

Call the Safety Department (if not present) immediately to review the inspection.

Sit down and write out everything that occurred during the inspection. List names of everyone that he/she spoke with. Make a list of any/all questions that were asked and the response. Make a list of all the pictures that were taken and what object in the picture that you were focusing on.

Sample 2-1. Jobsite Safety Audit

JOBSITE SAFETY AUDIT

Company Name	Company Address

Project Location	Project Number	Inspection Date

NOTE: ALL NEGATIVE ANSWERS (X) REQUIRE EXPLANATION AND CORRECTIVE ACTION.

Check (✓) if satisfactory	(X) If needs attention	(NA) Not Applicable

A. General Conditions

1. OSHA sign posted (____)
2. OSHA Form 300 up-to-date (____)
3. Supervisor aware of OSHA inspection rights (____)
4. Weekly safety meetings held (____)
5. Appropriate safety reference material on jobsite (____)
6. Emergency numbers posted (____)
7. Basic safety rules posted (____)
8. New employee orientation procedures in place (____)
9. Permits signed and in place (____)
10. Approved and stocked first aid kits on jobsite (____)
11. All safety activities documented and on file (____)
12. Safety signs prominently displayed (____)
13. Subcontractors aware of company and government responsibilities (____)
14. Client safety procedures disseminated to all employees (____)
15. Accidents/incidents investigated in timely manner documentation on file (____)
16. Precautions taken to protect the public (____)
17. Proper clothing worn by employees (____)
18. First-report-of-injury files up-to-date and first aid lo[illegible] current (____)
19. Job hazard analysis in use (____)
20. Task training documente[illegible] (____)

B. Health and Environment

1. Toilets adequate and well maintained (____)
2. Drinking water marked, cups supplied (____)
3. Procedures in place for hazardous waste removal (____)
4. Illumination adequate for worksite and trailers (____)
5. Oxygen deficiency, toxicity, and flammability tests performed where required (____)
6. Ventilation adequate where ne[illegible] (____)
7. [illegible] CPR [illegible]n on jobsite (____)
8. [illegible]ilitie[illegible]able (____)
9. [illegible]nical [illegible]s an[illegible]vash stations a[illegible]e (____)
10. [illegible] and [illegible]able [illegible]al storage area[illegible]d [illegible]plast[illegible] (____)
11. [illegible] progr[illegible]place (____)
12. [illegible]reas pos[illegible] (____)
13. [illegible]rne pathogen[illegible]ce (____)

C. Hazard[illegible]ication P[illegible]

1. Wr[illegible]site (____)
2. A[illegible]onnel [illegible]ined—atten[illegible]e d[illegible]nted (____)
3. M[illegible]data sheets availab[illegible]catio[illegible]vn (____)
4. [illegible]ling procedures in place (____)
5. [illegible]specific chemicals and MSDSs discussed–acids, [illegible]tics, and so on (____)
6. Chemical inventory on site (____)

D. Pe[illegible]ve E[illegible]

1. Approved Z8[illegible] ha[illegible]red—n[illegible]caps (____)
2. ANSI Z87.1 e[illegible]ecti[illegible]rn (____)
3. [illegible]eye p[illegible]on r[illegible]d for special work tasks (____)
4. [illegible] ava[illegible]e and used near loud e[illegible]where posted (____)
5. Pro[illegible]es worn (____)
6. Safety nets required (____)
7. Approved respirators available—employees medically qualified and fit tested (____)
8. Safety harnesses and lanyards in good condition and used properly (____)
9. Proper footwear in place (____)
10. Additional PPE required for work with chemicals or in toxic material areas (____)
11. Rubber gloves in good condition (____)
12. Rubber gloves test date current (____)
13. Rubber gloves worn when required (____)

E. Material Handling Equipment—Rigging

1. Canopy guards or roll-over protection on all heavy equipment (____)
2. Back-up alarms and/or flashing lights provided (____)
3. No equipment allowed closer than 10 ft to power lines (____)
4. Fire extinguishers in cab of all moving equipment (____)
5. All equipment operators trained and certified (____)
6. Seat belts mandatory for operators (____)
7. Outriggers in place when needed (____)
8. Maximum use made of available material handling equipment by employees (____)
9. Monthly maintenance records maintained (____)
10. Monthly crane inspections on file (____)
11. Horns used during lifts (____)
12. Slings proper size and in safe condition (____)
13. All hooks moused except pelican hooks (____)
14. Cable clips approved type, proper size, and properly installed (____)
15. Wire rope inspected—monthly inspections on file (____)
16. Capacity charts at operator's station (____)
17. Spreader bars marked with capacity (____)
18. Hand signal charts posted and followed (____)
19. Tail-swing of crane barricaded (____)
20. Signal person designated and used (____)
21. Lifting lugs welded by qualified person and checked by Supervisor (____)
22. Tag lines used (____)
23. Heavy loads weighed and marked when possible (____)

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(Jobsite Safety Audit, Continued)

Check (✓) if satisfactory	(X) If needs attention	(NA) Not Applicable

F. Housekeeping and Material Storage

1. Construction materials neatly and safely stored at lay down yards and jobsite
2. Housekeeping performed on daily basis
3. Nails clenched or removed from scrap lumber
4. Adequate trash bins/barrels provided
5. Aisles kept clear of debris, power cords, cables, and other tripping hazards
6. Office trailers clean and orderly
7. Metal banding straps removed quickly
8. Air hoses and electrical cords covered to prevent damage from moving equipment
9. Trash removed from jobsite on regular basis
10. Tool trailers neat and orderly
11. Mushrooms used on rebar where needed
12. Racks, bins, or buckets used for small parts storage

G. Ladders and Scaffolds

1. Ladders extend 3 ft above landings and tied off
2. Scaffolds properly erected under qualified supervision
3. No riders on moving platforms
4. Wheels locked on rolling scaffolds
5. Scaffolding guyed or tied-off to structure
6. Fiberglass ladders in use by electricians
7. Handrails in place
8. Handrails, midrails, and toe boards required
9. Ladders in safe condition and defective ladders removed from service
10. Monthly ladder inspections on file
11. Weekly scaffold inspections on file
12. Proper scaffolding tags used
13. All stairways have handrails
14. Scaffold boards-banded, tested, lapped, and cleated
15. Brackets plumb, arms secured and welded by certified welders
16. Folding ladders not used as straight ladder
17. Folding step ladders placed on solid footings, brackets fully extended, no work off top two steps
18. Ladder base-to-height requirements acceptable

H. Floor, Wall Openings, and Barricades

1. Wall openings (drop of more than 4 ft) provided with handrails and toe boards
2. Open sided floors 6 ft or more above ground level provided with standard railings, toe boards, or equivalent perimeter protection
3. Stairways during construction have handrails on open sides and guardrails at landing or floor openings
4. Ground level openings fenced off, bar... or isolated with flaggi... caution tape
5. Elevated work su... oor openings ...rly cov...d or b...d
6. ...rk a... arricaded with ...ad ... igns

I. Excavation, Trenching and Shoring

1. Excavated material stored a minimum of 2 ft fro... edge of opening
2. Utility company and/or client n... fore digg... when overhead power lines a...
3. Substant... les installe... obile equip... to excav...
4. Tren... ove... hored st...rd ... back ... stab... pes
5. ...eater ... ft provided w... ...eral trav...
6. ...es greater ... rec... ...ined ...ace
7. ...mpetent perso... ...and in place
8. ...t Competent P...
9. ...cavated areas inspected daily

J. Wel... and B...ng

1. Prop... ...ective ... ...d conditi...
2. All gas and oxy... ...lin... ...cured p... ...r in upright position ...s in ...e
3. Fla...k arr... ins...—gauges working pro...
4. All ... condition and free from grease and oil
5. Fire extinguisher and/or fire watch located within 25 ft of work area
6. All flammable material removed from welding, cutting, and burning areas
7. Shields provided to protect workers from flash burns
8. Welding leads and rod holders in good condition
9. Fire box protection and/or barricades provided to prevent slag and sparks from falling on workers
10. Welder's shields and goggles in good condition and equipped with proper lenses—no pancake hoods allowed
11. Forced ventilation or exhaust used to reduce and/or remove welding or cutting fumes in confined areas
12. Frames of all portable electric welding machines grounded
13. Welding units turned off as needed—moving equipment, and so on
14. Hot work permits in place
15. Welding cables and oxy-acetylene hoses positioned to eliminate damage and to prevent tripping hazards

K. Electrical

1. High voltage warning signs in place where needed
2. Electrical control panels labeled
3. Only qualified electricians allowed to work on transformer and/or power stations
4. Lock out/tag out procedures in compliance and being followed
5. Receptacles and attachment plugs not interchangeable on unlike circuits
6. Spliced or defective flexible electrical cords not allowed
7. All generators, heavy welding equipment, and lighting generators equipped with positive grounding rods
8. GFCI protection in place as needed on all temporary power sources including portable generators
9. Electrical service lines elevated or buried
10. Temporary lighting properly grounded, guarded, and supported
11. Assured grounding program in place
12. All electrical tools properly grounded or double insulated—including employees personal tools
13. Are de-energized lines properly grounded?
14. Hot sticks have current test date?
15. Grounds in good condition and have current test date?

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(Jobsite Safety Audit, Continued)

Check (✓) if satisfactory	(X) If needs attention	(NA) Not Applicable

L. Tools and Equipment

1. Air for cleaning properly used (____)
2. Air hose connections wired together (____)
3. Pressure reducing valves in flow lines (larger than 1/2 inch) (____)
4. Guards in place on power tools (____)
5. Abrasive wheels properly handled and stored (____)
6. Power activated tool operators properly trained (____)
7. Air receivers certified and equipped with pressure gauge and pop-off valve (____)
8. Defective hand tools repaired or removed from jobsite (____)
9. Radioactive testing equipment and procedures in compliance with governmental standards (____)
10. Constant pressure switches on hand-held power tools (____)

M. Fire Prevention

1. Fuels and flammables properly stored (____)
2. No gas cans allowed in trailers (____)
3. Safety cans used for gasoline storage—equipped with screens and properly labeled (____)
4. Extinguishers checked on monthly basis and properly tagged (____)
5. Fire extinguisher available for each work area and conspicuously located (____)
6. "No Smoking" or "Smoking Permitted" locations designated with signs (____)
7. Gasoline never used for cleaning (____)
8. Paints and other flammables with broken seals stored in metal cabinets or separate outside storage bins (____)
9. Adequate precautions taken during spray painting operations (____)
10. Gasoline equipment refueled outside and shut off (____)
11. Flammable fuel containers grounded and bonded (____)
12. Oxygen and gas cylinders stored upright, capped, secured, and separated by 20 ft or fire-resistant barrier (____)
13. Pipelines blanked off or disconnected (____)
14. Employees trained in fire extinguishment procedures (____)
15. Fire extinguishers have annual inspection? (____)

N. DOT

1. Do CDL vehicles have current annual inspection? (____)
2. Pre-trip and/or Post-trip inspection completed? (____)
3. Driver has valid license for vehicle driven? (____)
4. Medical card (____)
5. Warning signs in roadw... (____)
6. Flagger is trained and k...dgeable? (____)
7. Stop/Slo... in u... (____)

(A) **Comments on corrective action taken or recommend... Indic... item ...—us... sh... ecessary.**

(B) **Un... onditions or acts ...ed (... audit...). I... and ... cor...ns—indicate date completed.**

Inspected by:	Date:

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Sample 2-2: Inspection Form

INSPECTION FORM

Operating Unit ____________ Date of Inspection ____________

Job Location ____________ Submitted By ____________

A. PRE-INSPECTION

1. Who was assigned to accompany the representative from the governmental regulatory agency?

   Name: ____________

   Position: ____________

2. Whom did the Inspector first contact at the jobsite?

   Name: ____________

   Position: ____________

3. Did the Inspector show his credenti ____________

4. Name of Inspector: ____________

   Regulator Agency ____________

5. Time tor arri ____________

   Tim r dep l: ____________

NING NC

V ? (e and Firm)

c. ____________
d. ____________
e. ____________
f. ____________

2. What was the purpose of the visit as explained by the Inspector?

____

____

____

____

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SAMPLE

3

Emergency Procedures

Purpose

To provide guidelines to ensure that employees are properly trained and equipped to deal with emergency situations.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

General Requirements

These guidelines provide a systematic approach for managing crises with minimal disruption to normal activities.

A well-designed, carefully implemented crisis management plan maintains the credibility and positive image of the Company with all identified audiences in the face of adversity.

Handle emergencies in a professional, organized manner so that customers, employees, management, financial supporters, industry peers, the public, and any other groups are assured of the Company's professionalism and commitment to safety. Emergencies do not pause to allow people to think through the problem; therefore, prepare procedures for every anticipated emergency.

Responding to Emergencies

Planning

Each project must follow a formalized plan during an emergency. This plan must be communicated to and understood by all personnel. Emergency plans must contain, at a minimum, the following items:

- A list of emergency telephone numbers, including hospitals, physicians, police, fire, ambulance, and other emergency assistance agencies as needed. See the Emergency Phone Number Form included at the end of this chapter.
- Special provisions for specific emergencies such as fire, hurricane, tornado, earthquake, chemical spill, or explosions

- Employee knowledge of the type, location, and use of emergency equipment
- Training for employees in the site-specific emergency signals and warnings
- Escape routes to safe places and assembly points to be followed in case of an emergency (communicate escape routes as written instructions and on-site diagrams posted on employee bulletin boards, in jobsite trailers, and so on)
- Emergency procedures, given to each employee in the New Employee Safety Orientation for each jobsite

Providing Emergency Medical Treatment

The on-site supervisor is responsible for ensuring that the location or facility has a well-stocked, approved first aid kit. Each remote site must have at least one currently trained first aid provider available. Arrange ahead of time for transporting an injured person from a remote work location.

Reporting Emergency Accidents

Safety managers or designated company safety representatives must report all serious accidents immediately to the management of the operating division and the Company Safety Department. See Chapter 5, “Accident Investigation and Incident/Injury Reporting Guidelines” for additional instructions.

Updating Emergency Procedures

Each year, emergency procedures are reviewed to ensure that the reporting data and procedures are current.

Providing Emergency First Aid

In an emergency situation requiring first aid, the goal is to stabilize the victim until further medical treatment is available. Employees should follow these guidelines during an emergency situation:

- Call for medical help immediately. Explain the kind of injury and where the victim is located.
- Follow the first aid procedure that is specific for the type of emergency. Check vital signs.
- Allow only employees certified in first aid/CPR to perform first aid/CPR.
- Stay calm and act quickly.
- Do not move an injured person unless it is necessary to save his or her life.

Severe Injuries and Illnesses

When dealing with serious injuries, the goal remains the same: call for medical help immediately and stabilize the victim until further medical treatment is available. Any first aid training an employee receives should include instructions for how to provide assistance to individuals who suffer the following ailments: burns, electrical shock, chemical exposure, broken bones, cuts, heat-related illnesses and any other injury or illness that could potentially occur based on the nature of the work activities.

Seriously injured employees are treated in emergency rooms of the nearest hospital or industrial clinic. Employees are encouraged to see doctors who are experienced in the treatment of the particular injury.

Emergency Procedures

Emergency situations can arise in many contexts, including fatalities, serious employee injuries, vehicle accidents, hurricanes, tropical storms, fires chemical spills, and natural gas leaks. A well-designed, carefully implemented crisis management plan maintains the credibility and positive image of the Company with all identified audiences in the face of adversity.

Handle emergencies in a professional, organized manner so that customers, employees, management, financial supporters, industry peers, the public, and any other groups are assured of the Company's professionalism and commitment to safety. Emergencies do not pause to allow people to think through the problem; therefore, prepare procedures for every anticipated emergency.

Preparing for a Crisis

A crisis management plan must be organized for immediate use in the event of a crisis. The following sections describe the elements of a good crisis management plan.

Following the Crisis Response Checklist

On receipt of a crisis notice, take these initial steps:

- Contact emergency services (if needed).
- Remove people and equipment from danger.
- Administer first aid (if trained).
- Investigate and gather all available information (what happened, where it happened, who was involved)
- Notify management.
- Limit contact with third parties until a designated operating spokesperson arrives.
- Determine whether to shut down the jobsite
    - ❑ Notify legal counsel (if needed).
    - ❑ Notify the owner of the jobsite.
    - ❑ Notify appropriate agencies.
    - ❑ Inform any surrounding areas that may be affected by the incident.
    - ❑ Write and get clearance for all releases.
    - ❑ Provide post-traumatic stress counseling for employees who witnessed the accident if necessary.
    - ❑ Notify family of any injured employee.

Emergency Response—Natural Gas Leak

For all natural gas emergencies:

1. Call 911 immediately in event of any rupture of existing gas line during excavation process (Federal Law).

Prior to performing any excavation work, call the National One-Call Center at 811 and have all underground utilities located to avoid any emergency ruptures.

2. Call the gas company.
3. Call the Fire Department.
4. Clear and secure the leak area.
5. Shut down vehicles, machinery, and equipment.
6. Eliminate all ignition sources:
    - ❑ Electrical components on vehicles and machinery
    - ❑ Pagers
    - ❑ Cell phones
    - ❑ Telephones
    - ❑ Doorbells
    - ❑ Appliances
    - ❑ Generators
    - ❑ Radios
    - ❑ Flashlights
    - ❑ Light switches
    - ❑ Open flames
    - ❑ Static spark
    - ❑ Smoking materials
    - ❑ Overhead power lines

In the event of a natural gas leak, **Do Not Attempt** to:

- Turn any main valves unless instructed to do so by gas company personnel.
- Cut locks off any gas company equipment.
- Stop the flow of gas unless trained by the gas company.
- Pound plugs into damaged piping.
- Backfill an excavation where gas is escaping.

- Enter any excavation where gas is escaping.
- Attempt to extinguish the fire.
- Make any admissions, statements, or responses to questions from the press.

Blowing Gas

Blowing gas rises and diffuses rapidly. In addition to the general emergency procedure for natural gas leaks, follow these provisions for blowing gas leaks:

- Monitor blowing gas with an attended dry chemical fire extinguisher.
- Stay upwind of the leak.
- Do not bury the leak.

Underground Gas

Underground gas is under pressure and follows the path of least resistance. In addition to the general emergency procedures for natural gas leaks, follow these provisions for leaks involving underground gas:

- Evacuate any building where gas might be accumulating.
- If trained to do so, shut off gas to residences by closing the service valve at the meter riser.
- Do not bury the leak to cause the gas to migrate underground.

Gas Leak with Fire or Explosion

A natural gas leak might result in a fire or explosion. In addition to general natural gas leak emergency procedures, follow these provisions in the event of a fire or explosion caused by natural gas:

- Call 911 immediately.
- Call the gas company.
- Check adjacent buildings for the presence of gas.
- Evacuate and ventilate any buildings where gas is detected.
- If trained to do so, shut off the service valve on the meter riser if gas is detected in a residence.

Emergency Response—Vehicle Accident

In the event of a vehicle accident:

- Contact the police department immediately.
- Alert the fire department, if necessary.
- Call 911 if persons are injured.
- Notify management promptly.
- Complete the Glove Box Accident form.

- Complete an On the Scene Accident Investigation form.

Emergency Response—Fire

Some fire emergencies can be handled by on-site personnel. Employees must recognize situations when it is necessary to contact other authorities. In the event of a fire:

- Rescue those in immediate danger without endangering additional personnel.
- Alert the local fire department, if necessary.
- Contain the fire and monitor it with a fire extinguisher if possible.
- Extinguish the fire if it is safe to do so, or evacuate the area.

Emergency Response—Chemical Spills

Emergencies involving chemical spills can have a variety of physical and environmental hazards. Chemicals should be marked with appropriate warning information and kept in appropriate locations.

To better prepare for emergencies involving chemical spills, have the following information easily available:

- The location of or access information to obtain SDS
- The location of first aid equipment and materials
- The location and telephone numbers of the nearest hospital or emergency clinic

In the event of a chemical spill:

- Contact management immediately and report the following information:
  - What material is leaking
  - Where the leak occurred
  - The size of the spill
  - The flow rate of the spill

Management decides whether to clean the spill with personnel currently available or leave it to trained personnel.

- Evacuate the areas if necessary; if evacuation is not necessary, contain the spill by the best method:
  - Cover drains or other possible escape routes.
  - Build a dike to keep spilled liquid from getting into water.
  - Repair a leaking container or put material in a container that will not leak.
  - Channel the spill to a place where it will not spread, by diking, pumping, or opening a trench to a secure spot.

  - Place an empty container under the leak.
  - Rotate or shift the position of the container to stop the leak.
  - Use pigs, absorbent materials, or blankets to soak up or solidify the spill.
- Remove contaminated soil to prevent further absorption into the ground.

You must be aware of the reporting requirements for the state in which the work is being conducted. Liquid and/or chemical spills may have to be reported to state and local emergency management agencies.

Emergency Response—Severe Weather

- Secure loose objects and materials, if possible.
- Stay away from metal objects such as wire fences, pipes or metal railings.
- Do not take shelter under a tree during lightning.
- Do not stand in an open area. Take cover inside the lowest level of a structure, if possible.

Flood

- Move to higher ground.
- Avoid fast-moving water.
- Do not attempt to drive or wade through streams of water or drainage areas.

Tornado

- Take shelter in a steel-framed or concrete structure.
- Go to the center of the structure, preferably a stairwell, room or area with no windows.
- Stay away from windows or other wall openings.
- Do not take shelter in a vehicle.
- If outdoors, take cover in a ditch or culvert, if possible.
- If no shelter is available, lie face down on the ground and cover your head with your arms.

Earthquake

- If indoors, take cover in doorways or stairways.
- Stay away from windows or other wall openings.
- Be aware of flying and falling objects.
- Be prepared for aftershocks.
- Do not re-enter damaged structures.

Emergency Response—Tropical Storms and Hurricanes

This plan outlines the steps to be taken in the event of tropical storms and hurricanes that threaten any Company location or facility. Coordination of this plan with the preparedness plan of each client ensures that projects are secured in the event of a storm. Follow these plans closely to ensure the safety of personnel and reduce the damage resulting from a hurricane or tropical storm.

The site manager and the Safety Department are responsible for implementing this plan. The site supervisor determines the site response to a tropical storm or hurricane and communicates necessary actions to all employees.

When hurricane or tornado warnings are issued, the Company designates an individual who monitors the path of the hurricane or tornado by consulting National Weather Service advisories. The designated individual maintains a weather chart indicating the path and progress of the storm and notes projections furnished by weather service advisories. The designated individual determines the location of the eye, or center, of the storm in relation to Company facilities as accurately as possible.

Because storms are unpredictable, site response occurs in stages—preparation for the hurricane season, action taken when a hurricane "watch" is issued, and action taken when a hurricane "warning" is issued.

Hurricane Season Preparation

In the event of a hurricane or severe tropical storm, all office trailers, portable buildings, portable restrooms, fuel storage tanks, and other moveable items must be tied down and secured with 1-inch-wide galvanized steel straps and auger-type ground anchors. Storm and hurricane supplies must be readily available for this purpose. Designate these supplies for emergency use only. Store the supply items in a secured gang-box container. Needed supplies can include:

- Rolls of #9 tie wire
- Rolls of plastic
- Duct tape
- 1-inch diameter rope
- Ground anchor augers

Hurricane Alert Status

The site is put on "Alert" when the National Weather Service issues a tropical storm or hurricane watch for the project area. All supervisors and subcontractors are informed of the Alert status and prepare to secure their work areas.

Hurricane Warning Status

When a tropical storm or hurricane is located in offshore waters within 1,000 miles of an Operating Unit facility or project site, management designates an individual to begin tracking the progress of the storm. Tracking ends after the storm has made landfall or is no longer a threat to the project.

When the National Weather Service issues a tropical storm or hurricane warning for the project area, the responsible supervisor places all Company personnel on standby.

All supervisors and subcontractors meet to determine the number of personnel needed to secure the site and list action items for preparing for the storm. All personnel not needed to secure the site are released to go home.

To make final preparation for the storm:

- Secure all scaffolding boards and materials. When possible, dismantle scaffolding and store it on the ground.
- Place all trash and debris in trash bins.
- Cover and rope together or band all trash bins, shipping containers, dunnage lumber, and similar items that are stored outside.
- Remove or secure anything that might be moved by strong winds, including:
  - Trash bins.
  - Loose equipment.
  - Material in lay-down areas.
  - Portable buildings.
  - Portable restrooms.
  - Trailer offices.
- Check the operation and fuel supply of all portable generators and refuel them if necessary.
- Remove any loose materials that cannot be secured to buildings.
- Lock building doors and leave windows slightly open on the side opposite the expected direction of the storm.
- Board windows in buildings that house records or electronic equipment.
- Lower and secure booms of all cranes.
- Shut down power to all buildings at the breaker box.
- Ensure that subcontractors secure their materials and equipment. Move items that cannot be secured in buildings or storage trailers.
- Walk through the site with safety and client personnel, and correct any deficiencies.
- Notify all employees to call their supervisor or come to the site as soon as possible after the storm to determine when to resume normal operations and whether extra help is needed for cleanup and repairs.

Hazardous Waste Operations and Emergency Response (HAZWOPER)

The Company may respond to emergencies or provide emergency response services. This section covers emergency response operations that include releases or threats of releases of hazardous substances.

Training

Employees who perform hazardous waste operations and emergency response must be trained per the requirements of applicable governmental regulatory agencies before performing the work. Training may include, but is not limited to:

- Regulatory standards

- ❑ Types of hazards with the work
- ❑ Medical surveillance
- ❑ Bloodborne pathogens
- ❑ Heat stress
- ❑ PPE
- ❑ Respiratory protection
- ❑ Fire extinguishers
- ❑ LOTO (lock-out/tag-out)
- ❑ Confined space
- ❑ Materials handling
- ❑ First aid
- ❑ Other items including details of the substance present

Training must be based on the duties and functions to be performed by each responder of the Company. The skill and knowledge levels required for all responders will be conveyed to them through proper training before they are permitted to take part in actual emergency operations of an incident.

Training may be provided for the following levels:

a. First Responder Awareness Level
b. First Responder Operations Level
c. Hazardous Materials Technician
d. Hazardous Materials Specialist
e. On Scene Incident Commander
f. 40-hour Waste Site Worker

Emergency Response

The Company is called upon to assist in stopping hazardous materials and leaks. In this role, we must rely on the Host employer (client) to provide information to our employees regarding the hazards, substances involved, and the protective measures to be taken. We must also rely on the Host employer to provide training on their Emergency Response Plan and Procedures. And finally, we must rely on the Host employer to inform our employees of the specific hazards and protocols at their sites.

Emergency Response Plan

An Emergency Response Plan must be developed and implemented to handle anticipated emergencies before any emergency response operations can begin.

Medical Surveillance and Consultation

Members of the Emergency Response Team will receive a baseline physical examination and will be provided with medical surveillance as required.

Any member of the Emergency Response Team who exhibits signs or symptoms that may have resulted from exposure to hazardous substances during the course of an emergency incident, either immediately or subsequently, will be provided with medical consultation.

Medical surveillance and medical consultation will be provided at no cost to the employee.

Monitoring Exposure

The Company shall conduct air monitoring on each workplace and/or work operation to determine accurately the airborne concentrations of materials to which employees can be exposed.

Determinations of employee exposure shall be made from breathing zone air samples that are representative of each employee's average exposure to airborne benzene.

Representative 8-hour TWA employee exposures shall be determined based on one or more samples representing the full shift exposure for each job classification in each work area.

An informed and well-trained work force with a positive work attitude is critical when working with toxic materials.

Chemical Protective Clothing

Chemical protective clothing and equipment to be used by members of the Emergency Response Team shall meet all minimum requirements and/or applicable standards.

Engineering and Work Practice Controls

The Company shall constantly review monitoring results to gauge the effectiveness of the Response Plan. The review shall determine the effectiveness of the engineering and work practice controls that have been implemented. Monitoring results shall also be reviewed to determine the effectiveness of the personal protective equipment (PPE) in use.

When monitoring results show excessive employee exposures, the work will be shut down immediately. The work processes including work practice controls, engineering controls, and PPE will be evaluated. Changes will be made in the process, before work starts again, to ensure exposures are at an acceptable level.

Changes could require such things as pressurized cabs on equipment, remotely operated material handling equipment, and increased use of PPE.

Emergency Response Plan

The following elements are part of the emergency response plan that will be developed and implemented for proper response to the emergency. They are:

- Pre-Emergency Planning
- Coordination with Outside Agencies
- Personnel Roles
- Lines of Authority
- Training
- Communications
- Emergency Recognition and Prevention
- Safe Distances—Places of Refuge

Emergency Response Coordination

The senior official at an emergency response is the most senior official on the site who has the responsibility for controlling the operations at all times while on the site.

Post Emergency Response Operations

After the emergency has been completed, if it is determined necessary to remove hazardous substances, health hazards, and contaminated materials, the Company conducting the clean up shall comply with all federal, state, and local waste regulations.

Sample 3-1: Emergency Phone Number Form

Company Name

Emergency Phone Numbers

Hospitals: ____________________

Ambulance: ____________________

Police Department: ____________________

Insurance Carrier: ____________________

Quanta Safety Department: ____________________

Director of Corporate Safety: ____________________

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4

Medical and First Aid Treatment/Access to Employee Exposure and Medical Records

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

Definitions

Bloodborne pathogens—Pathogenic microorganisms that are present in human blood and can cause disease in humans, including, but not limited to, the hepatitis B virus (HBV) and human immunodeficiency virus (HIV).

Contamination—The presence, or the reasonably anticipated presence, of blood or other potentially infectious materials on a surface or in or on an item.

Exposure incident—A specific eye, mouth, other mucous membrane, nonintact skin, or parenteral contact with blood or other potentially infectious material that results from the performance of an employee's duties.

Other Potentially Infectious Materials (OPIM)—Substances that include the following human body fluids: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, and any body fluid that is visibly contaminated with blood.

Parenteral—The piercing of mucous membranes or the skin through events such as needle sticks, human bites, cuts, and abrasions.

Regulated waste—Liquid or semi-liquid blood or OPIM; contaminated items that would release blood or OPIM in a liquid or semi-liquid state if compressed; and items that are caked with dried blood or OPIM and are capable of releasing these materials during handling.

General Requirements

The Company is responsible for ensuring that every employee injured on the job receives prompt, competent medical treatment.

The employee must report every work-related injury immediately on the day that the injury occurs. Injured employees should follow the professional advice and instructions given by the attending physician. The employee must inform the Company of his or her recovery status on a regular basis.

Facilities for treating work-related injuries or illnesses are provided at every work location. Facilities can consist of either or both:

- First aid supplies for treatment of minor injuries
- An onsite nurse or paramedic

Seriously injured employees should be stabilized until emergency responders arrive and then treated in emergency rooms of the nearest hospital or industrial clinic. Employees are encouraged to see doctors who are experienced in the treatment of industrial injuries.

On most construction sites, supplies necessary to treat job-related injuries will be provided as necessary. The first aid supplies required on the jobsite will be selected as to the job hazards present on the worksite and appropriate for the type of work being performed.

First aid supplies will be stored in weatherproof storage containers either in the jobsite trailer and/or in company vehicles. First aid supplies, within the storage container, shall be in individual sealed packages.

The foreman and/or other site trained first response personnel will be responsible for monitoring the first aid supplies on a daily basis and replenishing the supplies as needed.

Trained First Aid Personnel

First aid training is available to employees. The Company should ensure that an adequate number of employees have been trained in the basics of first aid to provide necessary aid in an injury or illness situation, and every jobsite should have at least one employee trained in first aid, cardiopulmonary resuscitation (CPR), and Automated External Defibrillator (AED) use.

Dealing with Severe Injuries

In an emergency situation requiring first aid, follow these guidelines:

- Follow the first aid procedure that is specific for the type of emergency, injury or illness.
- The goal in any first aid situation is to stabilize the injured employee until he or she is able to receive further treatment from trained medical professionals.
- Allow only employees certified in first aid/CPR to perform first aid/CPR.
- Stay calm and act quickly.
- Call for medical help immediately. Explain the kind of injury and where the victim is located
- Provide the exact location so that emergency response personnel can locate the victim quickly. If the victim is not located near a marked roadway, send a crew member to the nearest access point to guide emergency response personnel to the victim.
- Bring help to the injured; do not bring the injured to help.

- Do not move an injured person unless it is necessary to save his or her life.
- Locate the first aid kits.
- Check vital signs.

AEDs

The Company has implemented a program to make AEDs available for its employees for use in emergency situations.

The goal of an AED program is to increase the rate of survival for people who have sudden cardiac arrests. The AED program is designed to provide equipment and training to enhance life-safety response measures. AEDs make it possible for trained and untrained responders to administer defibrillation prior to the arrival of Emergency Medical Services (EMS) personnel.

Crew foremen are responsible for ensuring that each crew for which they are responsible have proximate and timely access to an AED at all times.

Burns

Burns are serious accidents resulting from exposure to heat (thermal), chemicals, or electricity. The severity of a burn depends on the temperature of the object, liquid, or gas causing the burn, how long the skin was exposed to the source, and the location and extent of the burn.

Classification of Burns

Burns are classified according to their source and the depth of skin layers (1^{st}, 2^{nd}, or 3^{rd} degree) affected.

1st Degree

- First degree burns involve only the top (outer) layer of skin.
- The skin will look red and dry and be painful.

2nd Degree

- Second degree burns will cause the skin to look red and have blisters.
- There will be severe pain and swelling to the area.

3rd Degree

- Third degree burns extend through the skin and into the tissues below the skin.
- This type of burn can be very painful or could be painless when it first occurs as all nerve endings can be destroyed.

First Aid (Chemical & Thermal Burns)

- Treat burns with gentle application of cool water (do not use ice) or towels soaked in cool water. Once cooled, cover the burned area with a sterile dressing. Do not use gauze or cotton over open wounds.
- Seek medical help immediately.

- Never remove charred clothing from the injured person.
- Do not break blisters.
- Keep burned arms or legs elevated higher than the heart.
- Make sure the airway remains open.
- Watch for symptoms of shock.
- If necessary for pain, provide only OTC (over-the-counter) medications (ibuprofen, aspirin, naproxen or acetaminophen).

First Aid (Electrical Burns)

Electrical burns are very different from thermal or chemical burns. The tissue burns occur on the inside of the body from the electrical current. For that reason, many electrical burns do not look severe at first, but the damage to the tissue continues to spread internally for an extended time. The damaged tissue will "die" and have to be surgically removed. It is also impossible to see inside the body and know what organs have been impacted by the electrical current. Many victims experience a heart rhythm disturbance or cardiac arrest as a result. It is imperative to get professional medical help immediately for an electrical burn victim.

- When assisting a victim of electrical shock, always make sure the danger posed by the electrical source has been de-energized or otherwise controlled before attempting to rescue the victim.
- Wrap the burned area in a sterile water-gel burn blanket or water gel patch, if available.
- Be prepared to perform CPR or use an AED, if needed.
- Never remove charred clothing from the injured person.
- Make sure the airway remains open.
- Watch for symptoms of shock.

Heat Illnesses

When your body becomes heated to a point that it cannot cool properly, it begins to show various warning signs. Heat illness can be a serious medical condition. This section describes the various categories, prevention, and treatments of heat illnesses.

Definitions

Acclimatization—Temporary adaptation of the body to work in the heat, occurring gradually as a person is exposed to the heat. Acclimatization peaks in most people within four to fourteen days of regular work in the heat for at least two hours per day.

Heat Illness—A serious medical condition, including heat cramps, heat exhaustion, heat syncope, and heat stroke, resulting from the body's inability to cope with a particular heat load.

Environmental risk factors for heat illness—Working conditions that create the possibility that heat illness could occur, including air temperature, relative humidity, radiant heat from the sun and other sources, conductive heat sources such as the ground, air movement, workload severity and duration, protective clothing and Personal Protective Equipment worn by employees.

Personal risk factors for heat illness—Factors such as an individual's age, degree of acclimatization, health, water, alcohol, and caffeine consumption, and use of prescription medications that affect the body's water retention or other physiological responses to heat.

Preventative recovery period—Time needed to recover from the heat in order to prevent heat illness.

Shade—Blockage of direct sunlight. Canopies, umbrellas, and other temporary structures or devices used to provide shade. One indicator that blockage is sufficient is when objects do not cast a shadow in the area of blocked sunlight. Shade is not adequate when heat in the area of shade defeats the purpose of shade, which is to allow the body to cool. For example, a car sitting in the sun does not provide acceptable shade to a person inside it, unless the car is running with air conditioning.

Provision of Water

Employees must have access to potable drinking water in sufficient quantity to keep their fluid level replenished. A good rule of thumb is to provide two quarts per employee per hour for the entire shift. Employers can begin the shift with smaller quantities of water if they can obtain more during the shift. The frequent drinking of water must be encouraged. Water may be provided by:

Portable Containers

Re-usable closed containers can be used to provide a supply of drinking water provided they meet the following guidelines:

- Containers are properly cleaned on a daily basis.
- Containers are adequately supplied with ice.
- Any container used to store or dispense drinking water shall be properly marked as to the nature of its contents (Drinking Water).
- A spigot or faucet is used to dispense the water.
- Single-service cups are supplied in a sanitary container and a proper method provided for disposing of the used cups.
- The container shall not be opened and water dipped from the containers.
- The container is not used for storage of any other items.

Bottled Water

Bottled water may be iced down and kept in coolers and furnished to the employees.

Access to Shade

Employees shall be provided access to an area with shade that is either open to the air or provided with ventilation or cooling that assists in normal cooling to their body during the day.

High Heat Procedures

When the temperature exceeds 95 degrees Fahrenheit, additional procedures will be implemented to the extent practical:

- Ensure that communication is available to contact or call for medical assistance if needed.

- Observe employees for alertness and signs and symptoms of heat illness.
- Remind employees throughout the work shift to drink plenty of water.
- Monitor new employees until acclimated to the heat conditions.
- Ensure employees take periodic breaks in the shade.

Training

Training in the following topics shall be provided to all supervisory and non-supervisory employees:

- The environmental and personal risk factors for heat illness
- The employer's procedures for identifying, evaluating, and controlling exposures to the environmental and personal risk factors for heat illness
- The importance of frequent consumption of small quantities of water, up to four cups per hour, under extreme conditions of work and heat
- The importance of acclimatization
- The different types of heat illness, as well as the common signs and symptoms
- The importance of immediately reporting to the employer, directly or through the employee's supervisor, symptoms or signs of heat illness
- The employer’s procedures for responding to symptoms of heat illness, including how emergency medical services will be provided if they become necessary
- Procedures for contacting emergency medical services, and if necessary, for transporting employees to a point where they can be reached by an emergency medical service provider
- How to provide clear and precise directions to the work site
- The procedures the supervisor is to follow when an employee exhibits symptoms consistent with possible heat illness, including emergency response procedures

Job Preparation

Identify when elements of the weather (heat) will be a factor in the safe completion of the assigned work tasks when completing your JTSA (Job Task Safety Analysis). Take necessary precautions.

Heat Cramps

Symptoms of heat cramps include the following:

- Cramps in skeletal muscles or abdominal muscles
- Cramps that recur
- Muscle pain that continues after cramps subside

Heat Syncope

Heat syncope is fainting caused by physical exertion in a hot environment.

Symptoms of heat syncope include the following:

- Body temperature above 40 degrees C or 104 degrees F

- Dizziness or lightheadedness
- Loss of consciousness
- Pale or sweaty skin

First Aid for Heat Syncope

- Move the person to a shaded/cool area to decrease body temperature.
- Monitor vital signs to ensure that the victim does not progress into another condition.
- Elevate legs to promote venous return to the body core.
- Give the victim plenty of fluids to drink.

Heat Rashes

Heat rashes are the most common problem in hot work environments. Prickly heat manifests as red papules and usually appears in areas where the clothing is restrictive. As sweating increases, these papules cause a prickling sensation. Prickly heat occurs in skin that is persistently wetted by unevaporated sweat; heat rash papules may become infected if they are not treated. In most cases, heat rashes disappear when the individual returns to a cool environment.

Heat Exhaustion

Symptoms of heat exhaustion include the following:

- Weakness and moist skin
- Mood changes such as irritability or confusion
- Upset stomach or vomiting
- Headaches
- Dizziness
- Blurred vision

First Aid for Heat Exhaustion

Follow the procedures below for treating heat exhaustion:

1. Lay the person down flat in a cool environment.
2. Loosen their clothing.
3. Give them plenty of fluids to drink.

Heat Stroke

When the body is unable to cool by sweating, several heat-induced illnesses, such as heat stress, heat exhaustion, and—the more severe—heat stroke can occur and can result in death.

Factors Leading to Heat Stroke

The following factors may contribute to heat stroke:

- High temperature and humidity
- Direct sun or heat
- Limited air movement
- Physical exertion
- Poor physical condition
- Some medicines
- Inadequate tolerance for hot workplaces

Symptoms of Heat Stroke

Symptoms of heat stroke include the following:

- Red face
- Dry, hot skin with no sweating
- Mental confusion or disorientation
- High core body temperature (greater than 105°F)
- Erratic behavior
- Shivering
- Seizures or convulsions
- Unconsciousness

First Aid for Heat Stroke

Start aggressive cooling of the person and get professional help immediately.

Prevention of Heat Illnesses

The following methods may help prevent or reduce heat illnesses:

- Know signs and symptoms of heat-related illnesses.
- Monitor yourself and coworkers.
- Block out direct sun or other heat sources.
- Use cooling fans/air-conditioning.
- Rest regularly.
- Drink lots of water—about one cup every 15 minutes.
- Wear lightweight, light-colored, loose-fitting clothes.
- Avoid alcohol, caffeinated drinks, energy drinks, or heavy meals.

Water is the first choice for rehydrating the body. Drinks containing electrolytes can be used provided they are not the sole source of fluid at the work site.

Medical Authorization Procedure

The purpose is to ensure that all employees who report for medical treatment have proper authorization for their visit. The supervisor should issue a Medical Authorization Form for the injured or ill employee to take to the doctor authorizing treatment by the Company. If an injury is serious enough to require immediate treatment, a Medical Authorization Form may be issued after treatment is obtained. Employees may return to work once the attending physician has completed the Return to Work form. Refer to the Medical Authorization Form and Return to Work Form enclosed at the end of this chapter.

To obtain medical treatment for an illness or injury, follow this procedure:

- The employee obtains a Medical Authorization Form from the supervisor before reporting to the medical provider for treatment of an injury or illness, except in critical cases.
- The supervisor completes the Medical Authorization Form.
- After treatment, the employee and the work site supervisor discuss all injuries to prevent a recurrence.
- The supervisor completes a Supervisor's First Report of Injury and an accident investigation report, if necessary. Refer to the Supervisor's First Report of Injury Form enclosed at the end of this chapter.

Release of Medical Information

Under the Health Insurance Portability and Accountability Act of 1996 ("HIPAA") and other applicable laws governing the privacy of medical information, medical providers can release protected health information only to those who have been authorized by the injured employee. The Release of Medical Information Form can be given to the doctor as proof that the injured employee has given the Operating Unit this right. Refer to the Release of Medical Information enclosed at the end of this chapter.

Since it may be impossible for seriously injured employees to sign this form immediately after injury, the Operating Unit should attempt to have this form completed, notarized, and filed for all employees before any event that may require medical attention.

Bloodborne Pathogens

These guidelines enable employees to protect themselves from the hazards associated with bloodborne pathogens. These guidelines apply at all locations where employees may be exposed to blood, other potentially infectious material, or medical or first aid supplies that have been contaminated with blood or potentially infectious material.

Employees with potential for exposure generally fall into one of the following categories:

- Employees whose routine job assignments involve exposure to blood or potentially infectious material. This category includes employees whose assigned duties include providing first aid to injured personnel.
- Employees whose routine job assignments do not involve exposure to blood or other potentially infectious material but who might be exposed if performing unusual tasks. This category includes employees who assist in providing first aid assistance to injured personnel.

Engineering Controls

At work locations where a first aid treatment area has been provided, nonabrasive soap and running water for hand washing should be available in or near the treatment area. If running water cannot be supplied, antiseptic hand cleanser or antiseptic towelettes must be provided.

Use an appropriately marked or labeled disposable biohazard container for collecting and disposing of all first aid supplies and PPE contaminated during treatment (regulated waste).

Work Practice Controls

When called to provide first aid to an injured person, follow these first-aid safety guidelines, in addition to the safety procedures given in the First Aid Safety Procedures enclosed at the end of this chapter:

- Use rubber gloves, included in the first aid kit, to protect from contact with blood or potentially infectious material.
- If mouth-to-mouth artificial resuscitation is necessary, use the mouth barrier device with one-way valve, included in the first aid kit, to prevent contact with blood or potentially infectious material.
- If more extensive exposure to blood or potentially infectious material is anticipated, wear additional PPE that has been provided. Additional equipment can include disposable gowns, coats, eye and face protection, or aprons that prevent blood or potentially infectious material from contaminating clothes.
- Before leaving the treatment area, remove all PPE and place it in a biohazard container for disposal.
- After providing care, wash hands with nonabrasive soap and running water. If hand-washing facilities are not available, wash hands using antiseptic hand cleanser or antiseptic towelettes. This is a temporary measure; wash hands with soap and running water as soon as possible.
- Do not eat, drink, smoke, apply cosmetics or lip balms, or handle contact lenses in treatment areas. Do not store food and drinks in the treatment areas.

Housekeeping

The following guidelines ensure that the treatment area, if provided, is kept clean and free from infectious materials:

- Regularly clean and disinfect the first aid treatment area, as specified in a written schedule.
- Clean all contaminated items and spill areas with a germicide, bleach, or other products commercially available for this use.
- Collect all first aid supplies and PPE contaminated during treatment in an appropriately marked or labeled disposable biohazard container.
- Dispose of the biohazard container and its contents daily in accordance with local requirements for this type of regulated waste.

Hepatitis B Vaccination

Employees whose routine job assignments involve exposure to blood or potentially infectious material are offered the hepatitis B vaccination series within 10 working days of their initial assignment.

Any other employee who has an exposure incident is also offered the vaccination series. If the vaccinations are declined, the employee must sign the Waiver of Hepatitis B Vaccination and the Employee Declination Statement form, which are placed in the employee's confidential medical file. These forms are enclosed at the end of this chapter.

Employees who decline the hepatitis B vaccination, either at the beginning of their assignment or after an exposure incident, may later choose to be vaccinated.

Post-Exposure Evaluation and Follow-Up

All employees involved in exposure incidents must be offered a confidential medical evaluation and follow-up that includes the following minimum elements:

- Documentation of the routes of exposure and the circumstances under which the exposure incident occurred in the Employee Incident Report. Refer to the Employee Incident Report enclosed at the end of this chapter.
- Identification and documentation of the source individual, if feasible and not prohibited by local or state law.
- Testing of the blood of the source individual, if feasible and after written consent is obtained, to determine the presence of HBV or HIV. (The results of this testing are made available to the exposed employee, and that employee is informed of the laws and regulations concerning disclosure of the identity and infectious status of the source individual.)
- Collecting and testing of the blood of the exposed employee for HBV and HIV as soon as possible after written consent is obtained from the exposed employee. (If the employee consents to baseline blood collection but not HIV testing, the sample must be preserved for 90 days. If, within those 90 days, the employee elects to have the HIV test, such testing must be done as soon as possible.)
- Post-exposure medical treatment, if indicated, in accordance with the recommendations of the U.S. Public Health Service.
- Counseling.
- Evaluation of illnesses reported by the exposed employee.

The healthcare professional providing the post-exposure hepatitis B vaccination and post-exposure evaluation must be provided with the following information:

- A copy of the Bloodborne Pathogen Regulation (OSHA 1910.1030).
- A description of the employee's duties as they relate to the exposure incident.
- Documentation of the routes of exposure and the circumstances under which the exposure occurred.
- The results of the blood testing of the source individual if available.
- All medical records relevant and appropriate to the treatment of the employee, including vaccination status that the Company is required to maintain.

The written opinion of the evaluating healthcare professional must be obtained and a copy provided to the exposed employee within 15 days after completion of the evaluation. The written opinion for the hepatitis B vaccination must only include whether the vaccination was indicated and whether the employee received one. The written opinion for post-exposure evaluation and follow-up must only include that the exposed employee has been informed of the results of the evaluation and about any medical condition resulting from exposure that requires further evaluation or treatment. All other findings must remain confidential and may not be included in the report.

Training

Employees who might be exposed to blood or other potentially infectious materials must be trained before exposure and annually thereafter. The training must be conducted by a person knowledgeable in the subject matter. Training is provided by the American Red Cross as an integral part of first aid/CPR training courses. The training must include the following:

- A copy and an explanation of the Bloodborne Pathogen Regulation (OSHA 1910.1030).
- A general discussion of bloodborne diseases, with emphasis on symptoms and modes of transmission of HBV and HIV.
- An explanation of bloodborne pathogen procedures and how employees can get a copy of them.
- An explanation of how to recognize tasks and occupational activities that might involve exposure to blood or potentially infectious material.
- An explanation of the use and limitations of the work practice controls and PPE that will be used to prevent or reduce exposures.
- Information about the selection, types, proper use, location, handling, removal, and disposal of contaminated PPE.
- Information about the hepatitis B vaccine, including its efficacy, safety, and method of administration; the benefits of being vaccinated; and the Company's policy to provide the vaccination free of charge.
- An explanation of the procedure to follow if there is an exposure incident, including how to report exposure incidents and what medical follow-up examinations will be provided.
- Information about post-exposure evaluations and follow-up examinations that will be provided to employees who have had an exposure incident.
- An explanation of signs, labels, or color coding that is used.
- An opportunity for asking questions of the person conducting the training.

Recordkeeping

A record of each exposure to blood or potentially infectious material must be created and kept confidential. The record must include:

- The name and social security number of the exposed employee.
- A copy of the hepatitis B vaccination status of the employee, including the dates of all vaccinations and any medical information related to the vaccinations.
- A copy of the results of examinations, medical testing, and follow-up procedures.
- A copy of the information that was provided to the healthcare professional.

- A copy of the written opinion of the healthcare professional.

All exposure and medical records:

- Must be kept confidential and separate from personnel files.
- May not be disclosed without the written consent of the employee.
- Must be maintained for at least 30 years past the exposed employee's termination date.

Detailed training records must be maintained for at least 30 years past the exposed employee's termination date. Refer to the Bloodborne Pathogen Training Program located at the end of this chapter. The training records must include the:

- Dates of the training sessions.
- Contents or a summary of the training sessions.
- Name and qualifications of the person conducting the training.
- Names, social security numbers, and job titles of those who were trained.

The exposure, medical, and training records associated with the bloodborne pathogens plan must be made available to employees.

Access to Employee Exposure and Medical Records

The purpose is to provide employees and their designated representatives a right of access to relevant exposure and medical records. Access by employees, and their representatives, is necessary to yield both direct and indirect improvements in the detection, treatment, and prevention of occupational disease.

Scope

This section applies to all employee exposure and medical records, and analyses thereof, made or maintained in any manner, including an in-house or contractual basis. The Company shall assure that the preservation and access requirements of this section are complied with regardless of the manner in which records are made or maintained.

Notification

Upon initial employment employees will be briefed and at least annually thereafter, informed via a bulletin board posting of the following:

- The existence, location and availability of employee records for exposure to toxic substances or harmful physical agents.
- The person responsible for maintaining and providing access to the records. Contact your Human Resources Manager or Safety Representative to initiate this request.
- The employee right of access to those records.
- The entire section pertaining to the Access to Employee Exposure and Medical Records is available for employee review.

Recordkeeping

- An Operating Unit's Human Resources Manager and/or Safety Department are responsible for maintaining and providing access to employees' medical records. These records are kept separately from other employee records.
- The medical records of employees who have worked for less than (1) year for the employer need not be retained beyond the term of employment if they are provided to the employee upon the termination of employment.
- Employee exposure records shall be maintained for the duration of employment and for 30 years thereafter and should include the following:
  - Environmental (workplace) monitoring including personal, area, grab, swipe (wipe over a designated area) type samples.
  - Biological monitoring—level of chemical in the blood, urine, hair, fingernails, and so on.
- Safety data sheets, a chemical inventory, or any other record that reveals where and when used and the identity (such as chemical, common, or trade name) of a toxic substance or harmful physical agent.

Access

- Each employee or designated representative has the right to request access to his/her records. The company shall ensure that access is provided in a reasonable time, place, and manner.
- The company will release an employee's medical records only if the employee has given specific, written consent (See the Release of Medical Information sample).
- If the company cannot reasonably provide access to the record within fifteen (15) working days, the company shall within the fifteen (15) working days apprise the employee or designated representative requesting the record of the reason for the delay and the earliest date when the record can be made available.
- In the case of an original X-ray, the employer may restrict access to on-site examination or make other suitable arrangements for the temporary loan of the X-ray.
- Records or copies will be provided at no cost to the employee.
- Whenever a record has been previously provided without cost to an employee or designated representative, the company may charge reasonable, non-discriminatory administrative costs (that is, search and copying expenses but not including overhead expenses) for a request by the employee or designated representative for additional copies of the record.
- No charge for an initial request for a copy of new information that has been added to a record which was previously provided.
- No charge for an initial request by a recognized or certified collective bargaining agent for a copy of an employee exposure record or an analysis using exposure or medical records.

Transfer of Records

- Should the Company cease business, the Company shall transfer all records subject to this section to the successor employer. The successor employer shall receive and maintain these records.
- Should the Company cease to conduct business, and there is no successor employer to receive and maintain the records subject to this standard, the company shall notify affected employees of their rights of access to records at least three (3) months prior to the cessation of business.

Sample 4-1. Medical Authorization Form

Type Company Name Here

Medical Authorization Form

Job No.	Date
______________________	______________________
Employee SSN	Employee ID#
______________________	______________________

To Dr.

____

____

T[illegible]ny gives [illegible]n for th[illegible]bo[illegible]ed [illegible]loye[illegible]be treated.

☐ **M[illegible]on A[illegible]epte[illegible]**

☐ **Medical Attention Refused**

Authorized Signature ____

Position/Title ____

Version 1, 09/01

Sample 4-2. Return to Work Form

Company Name

Return to Work Form

This form must be completed by the Supervisor and taken to the physician by the employee for each visit. This form must then be completed by the attending physician and returned to the employee. The employee must present this form to his or her Supervisor immediately after returning from each visit to the physician.)

Please render medical services to ____________________ who is em[illegible]ed by [COMPANY NAME] and is [illegible]med [illegible]e s[illegible]ned [illegible]jur[illegible]llness in t[illegible]urse of employment. If hospitaliz[illegible]nd/o[illegible]al t[illegible]equ[illegible]n excess [illegible] provided by the [illegible]ers' C[illegible]ti[illegible] of t[illegible]which [illegible] Company will [illegible]iable f[illegible] w[illegible] authorizat[illegible]tr[illegible]nent is [illegible]tained f[illegible]OMP[illegible] [illegible]s d[illegible]nated repres[illegible]

[C[illegible]PANY [illegible] requ[illegible]al[illegible]oy[illegible] wit[illegible]ctor-treatable work-related injuries or illnesses t[illegible] de[illegible]rug a[illegible]al[illegible]sc[illegible]ing [illegible] the following number listed below [illegible]ils.

Date: ____________________ [COMPANY NAME]

Phone Number ____________________ BY ____________________

TITLE ____________________

Version 1, 09/02

Sample 4-3. Physician's Release Form

Physician's Release

__________________________________, whom I have treated for an injury or illness, is hereby released to:

_____________________ Return to work with attention given to not aggravate the injury

_____________________ Other ____

____

_____________________ No additional treatment is required

_____________________ A follow-up appointment is scheduled on __________________
(Date)

_________________________________ _____________________________________
Physician Name (Print) Physician Signature

____
Date

Sample 4-4. Supervisor's First Report of Injury Form

Type Company Name Here

SUPERVISOR'S FIRST REPORT OF INJURY

PROJECT LOCATION	PROJECT NUMBER	DATE OF REPORT	CLIENT

NOTE

Must Be Completed And Submitted Within 24 Hours. Purpose - To Discover Cause And Prevent Recurrence Of On-The-Job Injuries. Injured Employee's Supervisor Is Responsible For The Accuracy And Completion Of All Forms. All Serious Injuries Must Be Reported Immediately By Telephone To Corporate Safety. Jobsite Safety Supervisor Will Assist In Completion Of This Form And All Incident Documentation's.

STEP 1 GENERAL INFORMATION

EMPLOYEE'S NAME ______________________

HOME ADDRESS ______________________

SOCIAL SECURITY NO. ______________________

OCCUPATION ______________________

LENGTH OF TIME EMPLOYED ______ AGE ______

DATE OF EMPLOYEE'S LAST ON-THE-JOB INJURY (If any) ______

WAGES $ ______ /HR. OR $ ______/WK. $ ______/mo.

MALE ☐ FEMALE ☐ MARRIED ☐ SINGLE ☐

STEP 2 LOCATION OF ACCIDENT

CITY ______ COUNTY/PARISH ______ STATE ______

QUANTA PROPERTY: YES ☐ NO ☐

EXACT LOCATION: ______________________

DATE OF ACCIDENT: ______________________

DAY OF WEEK: ______ TIME: ______ A.M. ______ P.M.

HOURS EMPLOYEE WORKED PRIOR TO ACCIDENT: ______

STEP 3 DETAILED INFORMATION

NAME OF SUPERVISOR/FOREMAN: ______________________

DATE SUPERVISOR NOTIFIED OF INJURY: ______________________

DATE LOST TIME BEGAN: ______________________

DATE EMPLOYEE RETURNED TO WORK: ______________________

STEP 4 NATURE OF INJURY

- ☐ ABRASION
- ☐ LACERATION
- ☐ PUNCTURE
- ☐ BRUISE
- ☐ FRACTURE
- ☐ SPRAIN - STRAIN
- ☐ FOREIGN BODY IN EYE
- ☐ BURN
- ☐ DROWNING
- ☐ ELECTROCUT[illegible]
- ☐ POISON OA[illegible]
- ☐ OTHER DER[illegible]IS
- ☐ HEAT EXHA[illegible]
- ☐ COLD INJU[illegible]
- ☐ OCCUPATION[illegible] (Specify) ______
- ☐ LOSS OF CO[illegible]OUSNE[illegible]
- ☐ HERNIA
- ☐ AMPUTATI[illegible]
- ☐ MULTIPLE IN[illegible]
- ☐ INHALATION
- ☐ OTHER ______

STEP 5 BODY PART INJURED

- ☐ HEAD (Specify) ______
- ☐ FACE (Specify) ______
- ☐ EYE ☐ Lt. ☐ Rt.
- ☐ NECK
- ☐ BACK
- ☐ CHEST
- ☐ ARM [illegible] ☐ Rt.
- ☐ HAN[illegible] ☐ Rt.
- ☐ ABD[illegible]
- ☐ GR[illegible]
- ☐ FI[illegible] (Sp[illegible]
- ☐ L[illegible] Rt.
- ☐ K[illegible] ☐ L[illegible] Rt.
- ☐ [illegible] Rt.
- ☐ [illegible]
- ☐ [illegible]
- ☐ [illegible] ☐ Lt. [illegible]
- ☐ [illegible] ☐ Lt. ☐ Rt.
- ☐ [illegible]CULATORY - RESPIRATORY
- ☐ MULTIPLE PARTS

STEP 6 HAZARDOU[illegible]TIONS

- ☐ IMPRO[illegible]UIPM[illegible]R
- [illegible]ACHI[illegible]
- [illegible]EFEC[illegible]OL O[illegible]MEN[illegible]
- [illegible]OOR [illegible]KEEPI[illegible]
- [illegible]PRO[illegible]GHTI[illegible]
- [illegible]PRO[illegible] (Dust, [illegible] etc.)
- [illegible]LIPPE[illegible] UNSAFE S[illegible]
- [illegible]ADEQ[illegible] WARNING SYSTEM[illegible]
- [illegible]AZAR[illegible]DRESS OR APPAR[illegible]
- [illegible]ORK [illegible]DURES
- [illegible]RAFF[illegible]
- [illegible]ADEQ[illegible] HELP FOR HEAVY LIFTING
- [illegible]AZAR[illegible]US WEATHER OR ENVIRONMENT
- [illegible] CONTACT WITH POISONOUS PLANTS, INSECTS, TOXIC CHEMICALS, SKIN IRRITANTS, BITES, ETC.
- ☐ EXCESSIVE NOISE
- ☐ OTHERS ______

STE[illegible]E

- ☐ [illegible]
- ☐ [illegible]
- ☐ [illegible] DIFFERENT LEVEL
- ☐ [illegible] SAME LE[illegible]
- ☐ [illegible]
- ☐ [illegible]
- ☐ [illegible] CONTACT
- ☐ [illegible]UGHT IN - UNDER - BETWEEN
- ☐ TEMPERATURE EXTREMES
- ☐ INHALE - ABSORB
- ☐ VEHICLE ACCIDENT
- ☐ BITE - STING
- ☐ BURN
- ☐ OTHER (Specify) ______

SUPERVISOR'S INVESTIGATION OF CAUSE

STEP 8 UNSAFE ACTS

- ☐ OPERATING WITHOUT AUTHORITY
- ☐ FAILURE TO WARN OTHERS
- ☐ OPERATING OR WORKING AT UNSAFE SPEED
- ☐ MAKING SAFETY DEVICES INOPERATIVE
- ☐ FAILURE TO SECURE OBJECTS
- ☐ USING UNSAFE EQUIPMENT OR EQUIPMENT UNSAFELY
- ☐ UNSAFE LOADING, LIFTING OR CARRYING
- ☐ UNSAFE POSITION OR POSTURE
- ☐ HORSEPLAY
- ☐ ACT OF ANOTHER PERSON
- ☐ FAILURE TO USE PERSONAL PROTECTIVE DEVICES
- ☐ HARD HAT
- ☐ EYE PROTECTION
- ☐ GLOVES
- ☐ SAFETY SHOES/BOOTS
- ☐ OTHER ______
- ☐ FAILURE TO OBSERVE REGULATIONS
- ☐ DISREGARD OF INSTRUCTIONS
- ☐ OTHER (Specify) ______

STEP 9 CONTRIBUTORY CAUSE

- ☐ INTOXICATION
- ☐ IMPROPER ATTITUDE
- ☐ WILLFUL DISREGARD OF INSTRUCTIONS
- ☐ VIOLENT TEMPER
- ☐ ABSENTMINDED - INATTENTION
- ☐ WILLFUL INTENT TO INJURE
- ☐ NERVOUS - EXCITABLE
- ☐ LACK OF SKILL
- ☐ BODILY DEFECTS
- ☐ FATIGUE
- ☐ PRE-EXISTING INJURY
- ☐ NO UNSAFE PERSONAL FACTOR

STEP 10 DISPOSITION OF ACCIDENT

- ☐ FIRST AID ONLY
- ☐ REQUIRED DOCTOR'S CARE
- ☐ HOSPITALIZED
- ☐ LOST TIME
- ☐ NO INJURY - NEAR MISS ONLY
- ☐ INJURY REQUIRING NO MEDICAL CARE
- ☐ INJURY REQUIRED TRANSFERRING EMPLOYEE TO ANOTHER JOB
- ☐ LIGHT DUTY ASSIGNMENT
- ☐ FATALITY

Version 1, 09/01

SAMPLE

(Supervisors First Report of Injury Form, Continued)

INVESTIGATION OF ACCIDENT:

Describe fully how accident occurred and state specifically what employee was doing when injured. (Attach additional comments if necessary.) Answer questions (who, what, when, where, why and how).

____

____

Describe injury fully ____

____

Name and Addresses of Witnesses ____

Who Instructed Employee in this Task? ____

MEDICAL INFORMATION:

Physician Address ____

____

Hospital Address ____

____

TREATMENT RENDERED BY PHYSICIAN:

☐ X-RAY	[illegible]MOVED [illegible] BOD[illegible]	☐ FLUS[illegible]
☐ HEAT COMPRESS	[illegible]LIED [illegible]	☐ [illegible]PPL[illegible]
☐ COLD COMPRESS	[illegible]IED [illegible]ST[illegible]	[illegible]AVE [illegible] PRESCRIPTION DRUG
☐ DRAINED	A[illegible] AS[illegible] AND[illegible]	☐ GAVE PRESCRIPTION DRUG
☐ SOAKED	E[illegible]ON	☐ SURGERY
☐ WHIRLP[illegible]	CL[illegible]	☐ OTHER TREATMENT

CORRECTIV[illegible]

What has bee[illegible]ed to [illegible]f thi[illegible]dent [illegible]ircle T for action taken and P for action planned.)

Reinstruction of person(s[illegible]ed	[illegible]	P	Improve maintenance	T	P
Secure prote[illegible] equipm[illegible]	T	P	Improve inspections	T	P
Improve ho[illegible]	T	P	Improve job hazard analysis	T	P
Install guard([illegible]	T	P	Assign employee to different type work	T	P
Correct physical condition	T	P	Other (explain) ______________________	T	P

EXPLAIN: (Specity the positive corrective action taken to prevent a similar accident in the future.)

____

____

REMEMBER: The accident investigation is not complete until: (1) THE TRUE CAUSE IS DETERMINED; AND (2) THE UNSAFE ACT OR CONDITION IS CORRECTED.

______________________ SAFETY SUPERVISOR	______________ DATE OF REPORT	______________________ LOCATION
______________________ SUPERVISOR'S SIGNATURE	______________ DATE OF REPORT	______________________ LOCATION

DISTRIBUTION: ORIGINAL REQUIRED OPERATIONS MANAGEMENT COPY 2 LOCATION FILE COPY 1 CORPORATE SAFETY DEPARTMENT HOUSTON, TEXAS COPY 3 OTHER -AS

Version 1, 09/01

Sample 4-5. Release of Medical Information

Employee Authorization for the Release of Medical Information

I, ________________________, do hereby authorize any physician, dentist, chiropractor, therapist, clinic, hospital or other health care provider or administrative staff, to release to ***[name of operating unit]***, all medical records related to my examination, evaluation, and/or treatment by such health care provider relating to my work related injury/illness, including but not limited to, the following:

1. All progress reports and summaries;
2. All clinical records;
3. Results of all laboratory tests, including x-rays;
4. Records of all prescribed medications and treatments;
5. All correspondence between my doctors or their administrative staffs or the administrative st[illegible] of all hospitals, clinics, or other medical treatment centers where I am, or have been, [illegible] from whom I received medical care;
6. All correspondence either by facsimile, electronic mail or hard copy b[illegible]en my doc[illegible]r their administrative staffs, or the administrative staffs of all h[illegible]itals, [illegible]ics, or oth[illegible] treatment centers where I am, or have been, a patient[illegible]n I [illegible] received m[illegible] and any insurance companies or their repr[illegible]ive[illegible] ny[illegible]s made o[illegible]behalf for medical treatment or for benefits of any[illegible] inc[illegible]g, b[illegible]t li[illegible] to, disabil[illegible]nefits, social security benefits, and V[illegible] Adr[illegible]tive[illegible]fits[illegible]
7. All correspondence[illegible] whatso[illegible]ure[illegible]hing[illegible]'s co[illegible]sation[illegible]lai[illegible] my behalf;
8. A[illegible]tements r[illegible] for me[illegible] su[illegible]
9. [illegible]s, corr[illegible]ce, or [illegible] y n[illegible] made by my [illegible]sicians, nurses, or any oth[illegible]rsons [illegible]me, [illegible] o[illegible] tre[illegible]nt.

A[illegible] the s[illegible] of [illegible] "A[illegible]riz[illegible] For Release of Medical Information" shall have the[illegible]nd e[illegible]gin[illegible]d s[illegible] be sufficient for the same purposes.

S[illegible] ____________ Date ____________

THE STATE OF __________ §
§
COUNTY OF ____________ §

The foregoing instrument was SWORN TO AND SUBSCRIBED BEFORE ME BY ________________________ AND GIVEN UNDER MY HAND AND SEAL OF OFFICE on this the ____________ day of ____________________________, A.D., __________.

____
Notary Public
State of ________________________

My commission expires: ______________

Sample 4-6. First Aid Safety Procedures

First Aid Safety Procedures

Before attempting to give first aid for bleeding or other potential exposure to bloodborne pathogens, follow these rules.

1. Wear rubber gloves. Do not reuse rubber gloves. Wash your hands with soap and water after removing gloves.
2. Wear safety goggles if there is potential for contaminants to splash into the eyes.
3. Wear a mask if there is potential for contaminants to splash into the mouth or nose.
4. Wear additional protective clothing if your skin is not covered.
5. If you become exposed to a bloodborne pathogen, wash the are[illegible] immed[illegible]y and repor[illegible] management so professional medical attention can be [illegible]ludi[illegible]ministratio[illegible] the Hepatitis B vaccine, if prescribed by a phy[illegible]an.
6. Ensure that regulated waste is [illegible]y ba[illegible] bel[illegible]d di[illegible]ed [illegible]cording to Infection Control Procedures.
7. Use a shield wh[illegible]forming [illegible]

Rec[illegible] Me[illegible]cal Facility: ______________________

Telephone: ______________________

Paramedics: ______________________

Hospital: ______________________

Version 2, 08/09

Sample 4-7. Waiver of Hepatitis B Vaccination

Waiver of Hepatitis B Vaccination

I, ____, understand that due to my potential occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring the hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with the hepatitis B vaccine at no charge to myself. However, I decline hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring hepatitis B, a serious disease. If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with the hepatitis B vaccine, I can receive the vaccination series at no charge to me.

____
Date Employee Signature

____
Date Witness

Version 1, 09/01

Sample 4-8. Employee Declination Statement

Employee Declination Statement

The following is Appendix A to Section CFR 1910.1030 (OSHA)—Hepatitis B Vaccine. Declination is mandatory if you **DO NOT** take the shots.

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with hepatitis B vaccine, at no charge to myself. However, I decline hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring hepatitis B, a serious disease. If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with hepatitis B vaccine, I can receive the vaccination series at no charge to me.

____
Signature

____
Date

Version1, 09/01

Sample 4-9. Employee Incident Report

Employee Incident Report

(Bloodborne Pathogen Exposure)

To be completed by the Quanta employee administering first aid.

Name	Job Classification
Jobsite Location	Job Number

Age	Social Security Number	Da... mployed

Witness (if any)	Signa...	...ate
Injured Em...yee Signat...		

Ac... nt Data

Da... u we... cide...
W... id it ccur?
Describe exactly what occurred:
What has been done to prevent this type incident from occurring again?

Cause of the incident (check all that apply):

_____ Cut	_____ Splash	_____ Improper work procedure
_____ Abrasion	_____ Unsafe act of worker	_____ Lack of PPE
_____ Bite	_____ Contaminated waste	_____ Other

Signature of Supervisor (Safety or Jobsite)   Name   Date

Version 1, 09/01

SAMPLE

Sample 4-10. Bloodborne Pathogen Training Program

Bloodborne Pathogen Training Program

I affirm that I have been trained regarding the following elements of the Bloodborne Pathogen Control Program:

- Hepatitis B virus vaccinations
- Use of personnel protective equipment
- Clean-up measures
- Waste disposal
- Record-keeping requirements

Employee Signature: ______________________

Employee Name: ______________________

Employee Social Security Number: ______________________

Regular Assignment: ______________________

Date: ______________________

Instructor: ______________________

Version1, 09/01

5

Accident Investigation and Incident/Injury Reporting Guidelines

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

Guidelines

The purpose of an accident investigation is to establish all relevant facts about how and why an accident occurred so conclusions can be drawn about what can be done to prevent recurrence. Preventing recurrence is the primary objective of accident investigations, and unless the facts pertaining to the accident are determined and understood, the Company is not in the position to select a remedy.

When to Investigate

Accidents should be investigated as soon as practical after they occur. The more time that is allowed to lapse before questioning witnesses, appraising the scope of the accident, or reenacting the accident, the greater the risk of not getting complete information on what happened and why. People forget details very quickly, particularly under the impact of emotional shock. They also sometimes imagine details that did not really occur, add "facts," fill in gaps, and exaggerate the truth, usually without being aware that they are doing so. What starts out as a possibility, conjecture, or plausible interpretation sometimes ends being presented as an ironclad fact.

The injured or involved person's version of an accident must be recorded as soon as practical before memory distorts what really happened. The scene of the accident also must be examined promptly before clues leading to what happened are removed or the work area is modified.

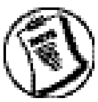
The investigation report should contain only the facts gathered during the incident investigation. Do not include opinions or speculations on the part of any persons involved in the investigation process.

Always check first with Corporate Safety Department and/or Corporate Legal Counsel before starting an investigation in a matter that involves a serious workplace injury or fatality, major property damage or possible economic loss, where there is a government investigation of any nature, or in any other situation where a risk of legal claims or litigation is possible.

What Accidents Should Be Investigated

All on-the-job accidents, near-misses, incidents, and vehicular accidents must be investigated.

In the case of serious accidents involving damage to property or equipment, a serious injury or fatality, where there is an ongoing government investigation, or where there are other unusual circumstances, contact Corporate Safety Department and/or Corporate Legal Counsel before initiating an investigation.



Remember: An accident investigation is not complete until:

- The cause of the accident is determined.
- The unsafe act or condition is corrected to prevent recurrence.

Who Should Investigate

First-line supervisors are responsible for the conditions in their departments or jobsite locations and the actions of the people under their responsibility. Supervisors are usually more qualified to investigate accidents because of their daily contact with jobs and working conditions and because they know their employees better than anyone else.

Finally, most corrective actions to prevent the recurrence of accidents are taken or ordered by supervisors. If supervisors do not investigate accidents and personally determine the causes, appropriate corrective actions might not take place. However, the site safety supervisor may assist with any accident investigation.

In the case of serious accidents involving damage to property or equipment, a serious injury or fatality, where there is an ongoing government investigation, or where there are other unusual circumstances, contact Corporate Safety Department and/or Corporate Legal Department before initiating an investigation.

How to Conduct an Accident Investigation

Accident investigations involve four steps:

1. Obtain the facts behind the accident and define aspects of the incident.
2. Analyze the facts to determine the causes of the incident.
3. Select a remedy to prevent recurrence of the incident.
4. Apply the remedy to prevent recurrence.

The following sections describe accident investigation guidelines. Supervisors must follow these guidelines while investigating an accident and complete the Supervisor's First Report of Injury form. This form is located at the end of this chapter.

Root Cause Analysis

Defining the Incident

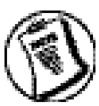
Define the incident under investigation, using the following guidelines:

- Describe the incident.
- Explain where the incident happened. Note the project location, client, unit, street, city, county, state, and other location details.
- Record the date and time of the accident and the weather conditions that were present.
- Describe the type and severity of any injury.
- Provide the injured employee's job definition and employee data. Explain the job involved in the incident, and indicate the employee's classification, skills, training, length of time in the craft, length of employment, and any other relevant information.

Determining Cause

After the incident has been defined, the causes contributing to the incident must be identified. Use the following guidelines to determine causes:

- Identify the immediate cause of the incident from a complete description of the incident created in the incident definition phase of the analysis.
- Identify any underlying root causes that might not be obvious from the description. Do not be too quick to establish the root cause.
- Identify any additional events or causal factors that contributed to the root cause of the incident.



Take time to evaluate the event and causes.

Identifying and Selecting Remedies

Based on the identified causes of the incident, determine ways to prevent further occurrences (who, what, where, when, and how, for example). Give updated data, if possible, about the medical condition of any injured employees.

Applying Selected Remedies

Take any steps practical to implement the remedies that have been determined to alleviate the circumstances leading to the initial incident. Proper implementation of remedies will help prevent similar incidents from occurring in the future.

Incident Investigation Procedures

The following sections describe the requirements of the incident investigation procedures.

Notifications

Notify the Operating Unit Safety Director when any of the following incidents occur:

- Injured employees require medical attention.
- Injured employees refuse medical attention.

- A back injury incident requires medical attention (document any reported first aid back injuries that do not require medical attention).
- Near-miss incidents with potential for loss of life or limbs occur.
- Near-miss incidents cause physical damage to equipment.
- Near-miss incidents that could have damaged equipment occur.
- Any employee alleges injury.
- Unsafe conditions are not resolved by project management.

Documentation must be forwarded to the Corporate Safety Department within 24 hours after any of the previously defined incidents occur.

Statements

Statements will be taken under the directions of Corporate Legal Counsel. All statements must be signed, dated, and witnessed. Statements must be legible and may be typed; however, the original form must accompany the typed copy. Obtain statements from the following individuals:

- Supervisor
- Injured employees
- Witnesses

Investigation

When investigating an incident, follow these guidelines:

- Walk the incident scene immediately after the incident.
- Set up a barricade around the incident scene to protect evidence and property.
- Photograph the incident scene when possible. Work with the client to obtain photographs when necessary.
- If photographs cannot be taken, obtain sketches of the incident scene.
- Take measurements, weights, and pictures of any item involved in the incident or causing the incident.

Incident and Injury Reporting Responsibilities

Managing the reporting and recording of any incident or injury is the key factor in detecting trends and establishing actions to prevent recurrence. It is imperative that all work-related injuries and illnesses be reported, recorded, and investigated.

Employees

Each employee must report immediately to his or her supervisor and/or to the project site safety supervisor all job-related injuries or illnesses, no matter how slight, that were sustained while working on the job. When reporting on-the-job injury or illness, the employee must:

- Report injuries and illnesses on the day they occur and before leaving the project site.
- Cooperate fully and assist with the investigation of all incidents, injuries, illnesses, and near-misses.
- Submit to a post-accident drug test and blood alcohol test if the injury or illness requires medical attention.
- Keep the Company informed of recovery status on a daily basis.
- Obtain a Return to Work Form from the treating physician before returning to work after an injury that caused lost working time. This release should indicate any temporary work restrictions that the Company must follow. Refer to this form at the end of this chapter.
- Immediately report all accidents occurring to the property of others to the project supervisor and client representatives who, in turn, notify the Company office and complete an accident report data form.
- Contact the Company Safety Department about all accidents involving Company owned, leased, or rented vehicles, no matter how trivial.
- Fulfill any additional customer or client reporting requirements.

Supervisor

When reporting accidents or incident injuries, supervisors must:

- Ensure that all employee injuries or illnesses, no matter how slight, receive immediate first aid and/or evaluation by a qualified, licensed health care provider.
- Record injuries or illnesses that require only first aid treatment in the project site first aid report.
- Have the employee transported by ambulance (in cases of emergency) or taken to the designated industrial clinic or emergency facility by a qualified person if it is determined that the employee requires additional medical attention for an on-the-job injury or illness.
- Complete the Medical Authorization Form and send this form with the injured employee to the medical clinic (see “Authorization for Medical Treatment” later in this chapter). Refer to this form located at the end of this chapter.
- Notify the Company Safety Department immediately if the injured or ill employee requires medical attention beyond project site first aid.
- Complete the Supervisor’s First Report of Injury form and forward it to the Company Safety Department within 24 hours.
- Provide light-duty work for injured or ill employees, where practical, that meet the treating physician’s guidelines. Follow the Company guidelines in the Return to Work program.

First Aid Register

The First Aid Register is maintained on all projects as the primary injury log. Enter all injuries and illnesses (job-related or personal) treated or reported (actual or alleged) into the log, no matter how minor. There are no exceptions to these record-keeping requirements.

Authorization for Medical Treatment

The supervisor requesting treatment completes the Medical Authorization Form and sends it with the employee on the initial visit to the doctor for treatment of the injury or illness. The Supervisor or another company representative should accompany the employee to the medical facility.

Supervisor's First Report of Injury

Complete the Supervisor's First Report of Injury for all injuries that require a visit to a physician for evaluation or treatment. The report is distributed as follows:

1. The report is faxed immediately to the Company Safety Department.
2. The original report is mailed to the Company Safety Office within 24 hours following the injury or illness.
3. The Safety Director reviews the report and routes it accordingly for review, follow-up, and corrective action.

Employer's Supplemental Report of Injury

In the event of any change in status of the injured or ill employee from that originally reported on the Supervisor's First Report of Injury, report the status change to the Claims Department. Two examples of a change in status are:

- An employee begins losing time.
- An employee has returned to work after a disabling injury.

Workers' compensation laws specific to each state apply in all cases.

Supervisor's Accident/Incident Investigation Report

The Supervisor's Accident/Incident Investigation Report is used in the investigation, recording, and analysis of any employee injury or illness requiring medical attention. The Supervisor's Accident/Incident Investigation Report is completed by the first-line supervisor with the assistance of the safety supervisor or project superintendent as soon as possible following the incident.

The reports will be distributed to the Company Safety Department and the appropriate Operating Unit. Any incident and injury investigation reports that must be forwarded to the owner or client must first be reviewed and approved by the Company Safety Department.

Witness Statement

Witness statements must be obtained from witnesses describing their complete, factual observations as soon after the accident or incident as possible. Ensure that witness statements are dated and signed by each witness. Secure the permanent addresses of witnesses for future reference.

Sample 5-1. Supervisor's First Report of Injury Form

Type Company Name Here

SUPERVISOR'S FIRST REPORT OF INJURY

PROJECT LOCATION	PROJECT NUMBER	DATE OF REPORT	CLIENT

Must Be Completed And Submitted Within 24 Hours. Purpose - To Discover Cause And Prevent Recurrence Of On-The-Job Injuries. Injured Employee's Supervisor Is Responsible For The Accuracy And Completion Of All Forms. All Serious Injuries Must Be Reported Immediately By Telephone To Corporate Safety. Jobsite Safety Supervisor Will Assist In Completion Of This Form And All Incident Documentation's.

STEP 1 GENERAL INFORMATION

EMPLOYEE'S NAME ______________________________

HOME ADDRESS ______________________________

SOCIAL SECURITY NO. ______________________________

OCCUPATION ______________________________

LENGTH OF TIME EMPLOYED _____ AGE _____________

DATE OF EMPLOYEE'S LAST ON-THE-JOB INJURY (If any) _____________

WAGES $ _____________ /HR. OR $ ___________/WK. $ ___________/mo.

MALE ☐FEMALE ☐MARRIED ☐SINGLE ☐

STEP 2 LOCATION OF ACCIDENT

CITY _______________ COUNTY/PARISH ____________ STATE _______

QUANTA PROPERTY: YES ☐ NO ☐

EXACT LOCATION: ______________________________

DATE OF ACCIDENT: ______________________________

DAY OF WEEK: ________________ TIME: _________ A.M. _________ P.M.

HOURS EMPLOYEE WORKED PRIOR TO ACCIDENT: _________________

STEP 3 DETAILED INFORMATION

NAME OF SUPERVISOR/FOREMAN: ______________________________

DATE SUPERVISOR NOTIFIED OF INJURY: ______________________________

DATE LOST TIME BEGAN: ______________________________

DATE EMPLOYEE RETURNED TO WORK: ______________________________

STEP 4 NATURE OF INJURY

- ☐ ABRASION
- ☐ LACERATION
- ☐ PUNCTURE
- ☐ BRUISE
- ☐ FRACTURE
- ☐ SPRAIN - STRAIN
- ☐ FOREIGN BODY IN EYE
- ☐ BURN
- ☐ DROWNING
- ☐ ELECTROCUTI[illegible]
- ☐ POISON OAK [illegible]
- ☐ OTHER DERM[illegible]
- ☐ HEAT EXHAUS[illegible]
- ☐ COLD INJURY
- ☐ OCCUPATIONAL ILLNESS (Specity) ______________
- ☐ LOSS OF CON[illegible]
- ☐ HERNIA
- ☐ AMPUTATION
- ☐ MULTIPLE INJURIES
- ☐ INHALATION
- ☐ OTHER _______________

STEP 5 BODY PART INJURED

- ☐ HEAD (Specify) _______________
- ☐ FACE (Specity) _______________
- ☐ EYE ☐ Lt. ☐ Rt.
- ☐ NECK
- ☐ BACK
- ☐ CHEST
- ☐ ARM [illegible] Rt.
- ☐ HAND [illegible] Rt.
- ☐ ABDO[illegible]
- ☐ GROI[illegible]
- ☐ FING[illegible]pecif[illegible] _______
- ☐ LEG [illegible]
- ☐ KN[illegible]
- ☐ AN[illegible]
- ☐ F[illegible] Lt. ☐ [illegible]
- ☐ T[illegible]pecity) _______________
- ☐ [illegible] Lt. ☐ Rt.
- ☐ EAR ☐ Lt. ☐ Rt.
- ☐ CIRCULATORY - RESPIRATORY
- ☐ MULTIPLE PARTS

STEP 6 HAZA[illegible]S

- ☐ [illegible]ROPER[illegible]ARDE[illegible]MEN[illegible] [illegible]HINE
- ☐ [illegible]ECTIV[illegible] OR E[illegible]ENT
- ☐ [illegible]R HO[illegible]
- ☐ [illegible]ROPE[illegible]
- ☐ [illegible]ROPE[illegible]ATION (Dust, fu[illegible]
- ☐ [illegible]PERY[illegible]HER UNSAFE SUR[illegible]
- ☐ [illegible]EQUA[illegible]RNING SYSTEMS
- ☐ [illegible]ARDO[illegible]SS OR APPAREL
- ☐ [illegible]K PR[illegible]RES
- ☐ [illegible]FFIC
- ☐ [illegible]EQUATE HELP FOR HEAVY LIFTING
- ☐ HAZARDOUS WEATHER OR ENVIRONMENT
- ☐ CONTACT WITH POISONOUS PLANTS, INSECTS, TOXIC CHEMICALS, SKIN IRRITANTS, BITES, ETC.
- ☐ EXCESSIVE NOISE
- ☐ OTHERS ____________________

STEP 7 [illegible]TYPE

- ☐ STR[illegible]GAINST
- ☐ STR[illegible]Y
- ☐ FAL[illegible]EL
- ☐ FAL[illegible]
- ☐ SLI[illegible]
- ☐ OVE[illegible]ERTION
- ☐ ELECTRICAL CONTACT
- ☐ CAUGHT IN - UNDER - BETWEEN
- ☐ TEMPERATURE EXTREMES
- ☐ INHALE - ABSORB
- ☐ VEHICLE ACCIDENT
- ☐ BITE - STING
- ☐ BURN
- ☐ OTHER (Specity)

____

____

____

SUPERVISOR'S INVESTIGATION OF CAUSE

STEP 8 UNSAFE ACTS

- ☐ OPERATING WITHOUT AUTHORITY
- ☐ FAILURE TO WARN OTHERS
- ☐ OPERATING OR WORKING AT UNSAFE SPEED
- ☐ MAKING SAFETY DEVICES INOPERATIVE
- ☐ FAILURE TO SECURE OBJECTS
- ☐ USING UNSAFE EQUIPMENT OR EQUIPMENT UNSAFELY
- ☐ UNSAFE LOADING, LIFTING OR CARRYING
- ☐ UNSAFE POSITION OR POSTURE
- ☐ HORSEPLAY
- ☐ ACT OF ANOTHER PERSON
- ☐ FAILURE TO USE PERSONAL PROTECTIVE DEVICES
- ☐ HARD HAT
- ☐ EYE PROTECTION
- ☐ GLOVES
- ☐ SAFETY SHOES/BOOTS
- ☐ OTHER _________________
- ☐ FAILURE TO OBSERVE REGULATIONS
- ☐ DISREGARD OF INSTRUCTIONS
- ☐ OTHER (Specity) _______________

STEP 9 CONTRIBUTORY CAUSE

- ☐ INTOXICATION
- ☐ IMPROPER ATTITUDE
- ☐ WILLFUL DISREGARD OF INSTRUCTIONS
- ☐ VIOLENT TEMPER
- ☐ ABSENTMINDED - INATTENTION
- ☐ WILLFUL INTENT TO INJURE
- ☐ NERVOUS - EXCITABLE
- ☐ LACK OF SKILL
- ☐ BODILY DEFECTS
- ☐ FATIGUE
- ☐ PRE-EXISTING INJURY
- ☐ NO UNSAFE PERSONAL FACTOR

STEP 10 DISPOSITION OF ACCIDENT

- ☐ FIRST AID ONLY
- ☐ REQUIRED DOCTOR'S CARE
- ☐ HOSPITALIZED
- ☐ LOST TIME
- ☐ NO INJURY - NEAR MISS ONLY
- ☐ INJURY REQUIRING NO MEDICAL CARE
- ☐ INJURY REQUIRED TRANSFERRING EMPLOYEE TO ANOTHER JOB
- ☐ LIGHT DUTY ASSIGNMENT
- ☐ FATALITY

Version 1, 09/01

(Supervisor's First Report of Injury Form, Continued)

INVESTIGATION OF ACCIDENT:

Describe fully how accident occurred and state specifically what employee was doing when injured. (Attach additional comments if necessary.) Answer questions (who, what, when, where, why and how).

____

____

Describe injury fully ______________________________

____

Name and Addresses of Witnesses ______________________________

Who Instructed Employee in this Task? ______________________________

MEDICAL INFORMATION:

Physician Address ______________________________

____

Hospital Address ______________________________

____

TREATMENT RENDERED BY PHYSICIAN:

☐ X-RAY	☐ [illegible]MOV[illegible] BOD[illegible]	☐ [illegible]USH[illegible]
☐ HEAT COMPRESS	☐ [illegible]PLIE[illegible]	☐ [illegible]PLIE[illegible] ANTISEPTIC
☐ COLD C[illegible]	☐ [illegible]	☐ GAVE NON-PRESCRIPTION DRUG
☐ DRA[illegible]	☐ [illegible]ELA[illegible] BANDA[illegible]	☐ GAVE PRESCRIPTION DRUG
☐ SO[illegible]	☐ [illegible]D O[illegible]	☐ SURGERY
☐ W[illegible]	☐ C[illegible]D	☐ OTHER TREATMENT

CORRE[illegible]

What has been don[illegible] planne[illegible] re[illegible] of [illegible] accident? (Circle T for action taken and P for action planned.)

Reinstruct[illegible] of pers[illegible] involv[illegible]	T	P	Improve maintenance	T	P
Secur[illegible]ent	T	P	Improve inspections	T	P
Improv[illegible]g	T	P	Improve job hazard analysis	T	P
Install guard(s)	T	P	Assign employee to different type work	T	P
Correct physical condition	T	P	Other (explain)	T	P

____

EXPLAIN: (Specity the positive corrective action taken to prevent a similar accident in the future.)

____

____

REMEMBER: The accident investigation is not complete until: (1) THE TRUE CAUSE IS DETERMINED; AND (2) THE UNSAFE ACT OR CONDITION IS CORRECTED.

______________________	______________	______________________
SAFETY SUPERVISOR	DATE OF REPORT	LOCATION
______________________	______________	______________________
SUPERVISOR'S SIGNATURE	DATE OF REPORT	LOCATION

DISTRIBUTION: ORIGINAL REQUIRED OPERATIONS MANAGEMENT COPY 2 LOCATION FILE COPY 1 CORPORATE SAFETY DEPARTMENT HOUSTON, TEXAS COPY 3 OTHER -AS

Version 1, 09/01

Sample 5-2. Return to Work Form

Company Name

Return to Work Form

This form must be completed by the Supervisor and taken to the physician by the employee for each visit. This form must then be completed by the attending physician and returned to the employee. The employee must present this form to his or her Supervisor immediately after returning from each visit to the physician.)

Please render medical services [illegible] who is emp[illegible] [COMPANY N[illegible]] and is [illegible] su[illegible] injury [illegible] th[illegible] of employment. [illegible]italiza[illegible] [illegible] t[illegible]ent is requi[illegible] of the limit [illegible] by the [illegible]' Co[illegible] f th[illegible] in which [illegible] occurred, the [illegible] will [illegible] for [illegible] w[illegible] authorization for such treatment is first obtained [illegible] [[illegible]PA[illegible]] [illegible] de[illegible]ated representative.

[illegible]ANY [illegible]ui[illegible] ll e[illegible]oyees with doctor-treatable work-related injuries [illegible] t[illegible] a[illegible]lcohol screening. Call the following number listed below for d[illegible]s.

Date: ______________________ [COMPANY NAME]

Phone Number ________________ BY ___________________________

TITLE ________________________

Version 1, 09/02

Sample 5-3 Physician's Release Form

Physician's Release

__________________________________, whom I have treated for an injury or illness, is hereby released to:

_____________________ Return to work with attention given to not aggravate the injury

_____________________ Other ____

____

_____________________ No additional treatment is required

_____________________ A follow-up appointment is scheduled on ________________
(Date)

_________________________________ Physician Name (Print)

______________________________________ Physician Signature

___________________________________ Date

Sample 5-4. Medical Authorization Form

Type Company Name Here

Medical Authorization Form

Job No. ____________________ Date ____________________

Employee SSN ____________________ Employee ID# ____________________

To Dr. ____________________

____

[illegible]ny gives [illegible] for t[illegible] ed [illegible] be treated.

☐ **M[illegible]n A[illegible]epted**

☐ **Medical Attention Refused**

Authorized Signature ____

Position/Title ____

Version 1, 09/01

SAMPLE

6

Hazard Communication

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

Definitions

CAS number—The identification number assigned by the Chemical Abstracts Service to specific chemical substances.

Chemical name—The scientific designation of a substance in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry or the system developed by the Chemical Abstracts Service.

Common name—Any designation or identification, such as code name, code number, trade name, or brand name, used to identify a substance other than by its chemical name.

Safety Data Sheet (SDS)—The written document that sets forth the specific information about a toxic or hazardous substance.

Technically qualified individual—A person who, because of education, training, or experience, understands the health risks associated with the toxic or hazardous substance or mixture that he or she handles or that is handled under his or her supervision and is familiar with the personal protective procedures to be followed in the use and handling of such substance.

Toxic or hazardous substance—Any gas, liquid, or solid that, through its chemical proportions, produces injurious or lethal effects on contact with body cells during normal operations.

General Requirements

Each site must comply with and maintain this program for the safe use of toxic and hazardous substances, which specifically addresses the following elements:

- Identification and coordination
- Multi-employer jobsites
- Labeling
- Safety Data Sheets
- Information and training
- Client hazard communication interface
- Effect on state right-to-know laws
- Filing and retention of data

Identification and Coordination

The following sources aid in evaluating chemicals:

- Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment, American Conference of Governmental Industrial Hygienists (ACGIH)
- The Registry of Toxic Effects of Chemical Substances, National Institute of Occupational Safety and Health (NIOSH)
- Safety Department

To properly adhere to the Hazard Communication Standard, identify each product currently on the project and future products as they arrive to ascertain whether these products could be considered hazardous or toxic. Table 6-1 lists some hazardous and toxic substances that are commonly encountered at jobsites.

The Safety Department coordinates with all field supervisors to conduct a complete physical inventory at the beginning of the project, and quarterly thereafter, of all products, such as liquids, solids, powders, pastes, and gases, to ensure that all products being used are a part of the Chemical Inventory and a SDS is available on each product.

Multi-Employer Jobsites

Where the employees of another contractor might be exposed, the general contractor's Safety Department maintains, at a central location, a complete set of SDS, along with information about precautionary measures necessary to protect employees and an indication of the type of labeling system in use for all toxic or hazardous substances available for use on the project. This information is available to all employees and subcontractors during normal working hours. This effort helps ensure that all employees have sufficient information to protect themselves in the workplace, regardless of which contractor uses the hazardous chemical. However, this does not relieve contractors from maintaining their own hazard communication programs.

This exchange of information is limited to those situations where exposure to employees of other contractors can occur.

Labeling

The following labeling guidelines must be observed:

- Each hazardous material container on the project must be labeled. If hazardous materials are received at the project without proper labels, set them aside and do not distribute for use until they are properly labeled.
- Labels must be prominently located on the container in its upright position when the container is in its usual position for use, so as to be legible. See the sample Hazardous Chemical Labels located at the end of this chapter.
- The label must include the chemical name, if applicable, of the toxic or hazardous substance in English and on a distinctly contrasting background. The label should also include the appropriate hazard warnings, safety measures required for safe usage, and name and address of the chemical manufacturer.
- Labels on containers exposed to the weather must not be defaced or obliterated by rain, snow, or other adverse elements of the weather, and the text must be clear and conspicuous at all times.
- If a labeled container is covered by a secondary container or a covering that remains in place while the contents of the container are withdrawn or used, the required labels must also appear on the secondary container or covering.
- Containers of mixtures must be labeled with the chemical name listed on the SDS for each toxic or hazardous substance in the mixture. Containers of mixtures should also be labeled with the common name of the mixture.
- All portable containers into which hazardous chemicals, such as acetone or gasoline, are transferred and are intended only for the immediate use of the employee who performs the transfer must be labeled with their contents.
- Unlabeled containers found in the workplace must be tested and labeled accordingly or disposed of properly.
- The labels now include a pictogram. The pictogram depicts the hazards in a picture format which makes it clear to the user that there are identified hazards inherent with the use of the product. Seeing a pictogram should necessitate that the employee read further about the warnings associated with using the product in a safe manner. See Hazardous Chemical Pictograms located at the end of this chapter.

Safety Data Sheets

Conduct a complete survey to determine what hazardous substances are present on the project, company premises, and property. Request necessary SDSs from the manufacturer and keep a current SDS on hand for each hazardous substance used.

Chemical manufacturers, importers, and distributors must ensure that SDS are provided with their next shipment of hazardous chemicals to all employers. Review each SDS to ensure that all information is provided.

Send a form letter to manufacturers or suppliers of hazardous substances who have not provided an SDS. Keep a dated copy of this request in the project file, and document any telephone conversations between a person on the project and the manufacturer or supplier in regard to the missing SDS.

Until the project has obtained the necessary SDS from the manufacturer or supplier, refer to SDS prepared and published by several commercial sources. These can be obtained from the Safety Department.

Make a copy of the SDS for each hazardous substance available, upon written request, to an employee, a subcontractor, a collective bargaining representative, or an employee's physician, when reasonable. An employee may view the SDS at any time, but adopt a reasonable method for acting upon such employee requests to avoid interruption of normal work operations.

Establish a "Hazard Communication" file of various SDS to support individual employee SDS information requests. If the SDS is not available at the project site when requested by an employee:

1. Contact the Safety Department.
2. Contact the manufacturer for the SDS. The project office must use diligent efforts to acquire all delinquent SDS from manufacturers and suppliers.

Information Contained in the Safety Data Sheets (SDS)

The Hazard Communication standard requires chemical manufacturers, distributors, or importers to provide Safety Data Sheets to communicate the hazards of hazardous chemical products. All SDS should be in uniform format, and include the section numbers, the headings, and associated information under the headings below:

Section 1 Identification – includes product identifier; manufacturer or distributor name, address, phone number; emergency phone number; recommended use; restrictions on use.

Section 2 Hazard(s) Identification – includes all hazards regarding the chemical; required label elements.

Section 3 Composition/Information on Ingredients – includes information on chemical ingredients; trade secret claims.

Section 4 First Aid Measures – includes important symptoms/effects, acute, delayed; required treatment.

Section 5 Fire Fighting Measures – lists suitable extinguishing techniques, equipment; chemical hazards from fire.

Section 6 Accidental Release Measures - lists emergency procedures; protective equipment; proper methods of containment and cleanup.

Section 7 Handling and Storage – list precautions for safe handling and storage, including incompatibilities.

Section 8 Emergency Controls/Personal Protection – lists OSHA's permissible exposure limits (PELs); Threshold Limit Values (TLVs); appropriate engineering controls; personal protective equipment (PPE).

Section 9 Physical and Chemical Properties – lists the chemical's characteristics.

Section 10 Stability and Reactivity – lists chemical stability and possibility of hazardous reactions.

Section 11 Toxicological Information – includes routes of exposure; related symptoms; acute and chronic effects; numerical measures of toxicity.

Section 12 Ecological Information

Section 13 Disposal Considerations

Section 14 Transport Information

Section 15 Regulatory Information

Section 16 Other Information – includes the date of preparation or last revision.

Information and Training

The supervisor and/or the Safety Department must train employees in the proper use of any toxic or hazardous substances to be used on the work site. The Safety Department determines what protective equipment is required and takes measures to make it available. Subcontractors must provide the training and protective equipment for their employees; however, the Safety Department monitors the activities of the subcontractors to ensure compliance.

Training for the Project Hazard Communication Program can be divided in the following three phases as necessary to aid in the training:

1. Information on the program contents, where SDS are located, and how to read and understand an SDS is given to each employee as an integral part of the new hire orientation. Hazard communication booklets made available by the corporate Safety Department explain the basic foundation of the program.
2. Hazard communication training is presented to all personnel who might work in an area where hazardous chemicals are used. This training addresses the following topics:
   - ❑ How chemicals enter the body
   - ❑ The importance of reading labels
   - ❑ Physical and health hazards of chemicals
   - ❑ Signs and symptoms of exposure
   - ❑ Emergency response procedures
   - ❑ How to use a SDS
3. Specific training for nonroutine tasks (for example, the cleaning of tanks or reactor vessels) and the hazards associated with chemicals contained in unlabeled pipes in the employees immediate work area is provided. Supervisors identify the above training needs before commencing work and the actual training activities with the Safety Department.

Employees will be informed of the location of the Hazard Communication Program, the SDS, the chemical inventory list, and who they should contact for questions regarding chemicals, chemical handling, or safety and health. This information is also included on the Hazard Communication (HAZCOM) poster and posted in a conspicuous place on the jobsite. Refer to the Hazardous Communication Poster located at the end of this chapter.

The Company maintains a record of all training or instruction given to employees. This record describes the instruction or training, the dates on which it was given, the names and social security numbers of the employees in attendance, and the person giving the training or instruction. Training shall be conducted in the native language of all employees. These records are maintained at the site for the duration of the project. Each employee is required to sign a training roster, which is also maintained as a record of training.

Client Hazard Communication Interface

Obtain from the client all pertinent information regarding hazardous chemicals or processes under client control that could affect Company employees and fully share all aspects of the Hazard Communication Program with clients.

GHS

The Hazard Communication standard is now aligned with the *Globally Harmonized System of Classification and Labeling of Chemicals (GHS).* This provided a common and coherent approach to classifying chemicals and communicating hazard information on labels and Safety Data Sheets. GHS will improve the quality and consistency of hazard information in the workplace, making it safer for workers by providing easily understandable information on appropriate handling and safe use of hazardous chemicals.

Effect on State Right-to-Know Laws

This Hazard Communication Program preempts all state (in states without OSHA-approved job safety and health programs) or local laws that relate to an issue covered by the federal standard without regard to whether the state law would conflict with, complement, or supplement the federal standard and without regard to whether the state law appears to be “at least as effective as” the federal standard.

The only state worker right-to-know laws authorized are those established in states and jurisdictions that have OSHA-approved state programs. These states and jurisdictions currently include Alaska, Arizona, California, Connecticut, Hawaii, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Nevada, New Mexico, New York, North Carolina, Oregon, Puerto Rico, South Carolina, Tennessee, Utah, Vermont, Virgin Islands, Virginia, Washington, and Wyoming.

Filing and Retention of Data

At project close-out, forward all hazard communication instruction, training, and retraining records to the corporate office for long-term storage.

Table 6-1. Materials Commonly Found on Jobsites That May Contain Hazardous Substances

Acetylene gas	Fiberglass, mineral wool	Paint
Adhesives	Foam insulation	Paint remover
Alcohol (ethyl, methyl)	Freon, 20, R20, and others	Paint stripper
Ammonia	Gasoline	Particle board
Antifreeze	Glues	Photographic developers
Arsenic compounds	Graphite	Polishes
Asbestos cement pipe	Greases	Propanol
Asphalt fumes	Hydraulic fluid	Resins, epoxy/synthetics
Bleaching agents	Hydrochloric acid	Sealers
Caulking, sealant agents	Inks	Shellac
Caustic soda	Insulation	Solder, flux
Cleaning agents	Lime (calcium oxide)	Solder, soft (lead, tin)
Coal tar pitch	Limestone	Solvents
Coatings	Lubricating oils	Sulfuric acid
Concrete curing compounds	Lye (sodium hydroxide)	Thinner, paint/lacquer
Cutting oil	Metals	Turpentine, gum spirit, and similar fluids
Diesel	Methyl ethyl ketone	Varnishes
Drywall	Motor oil	Waterproofing agents
Dusts	Motor oil additives	Waxes
Enamel	Muriatic acid	Welding rod
Etching agents	Oil de-emulsifier	Wood preservatives

Sample 6-2. Hazardous Chemical Labels

SAMPLE LABEL

PRODUCT IDENTIFIER

CODE ____________________

Product Name ______________

SUPPLIER IDENTIFICATION

Company Name ____________

Street Address ______________

City ____________ State _____

Postal Code ________ Country _____

Emergency Phone Number _________

PRECAUTIONARY STATEMENTS

Keep container tightly closed. Store in cool, well ventilated place that is locked.

Keep away from heat/sparks/open flame. No smoking.

Only use non-sparking tools.

Use explosion-proof electrical equipment.

Take precautionary measure against static discharge.

Ground and bond container and receiving equipment.

Do not breathe vapors.

Wear Protective gloves.

Do not eat, drink or smoke when using this product.

Wash hands thoroughly after handling.

Dispose of in accordance with local, regional, national, international regulations as specified.

In Case of Fire: use dry chemical (BC) or Carbon dioxide (CO_2) fire extinguisher to extinguish.

First Aid

If exposed call Poison Center.

If on skin (on hair): Take off immediately any contaminated clothing. Rinse skin with water.

HAZARD PICTOGRAMS

SIGNAL WORD

Danger

HAZARD STATEMENT

Highly flammable liquid and vapor.
May cause liver and kidney damage.

SUPPLEMENTAL INFORMATION

Directions for use

____

____

____

Fill weight: __________ Lot Number _____

Gross weight: ________ Fill Date: _____

Expiration Date: ________

Sample 6-3. Hazardous Communication Poster

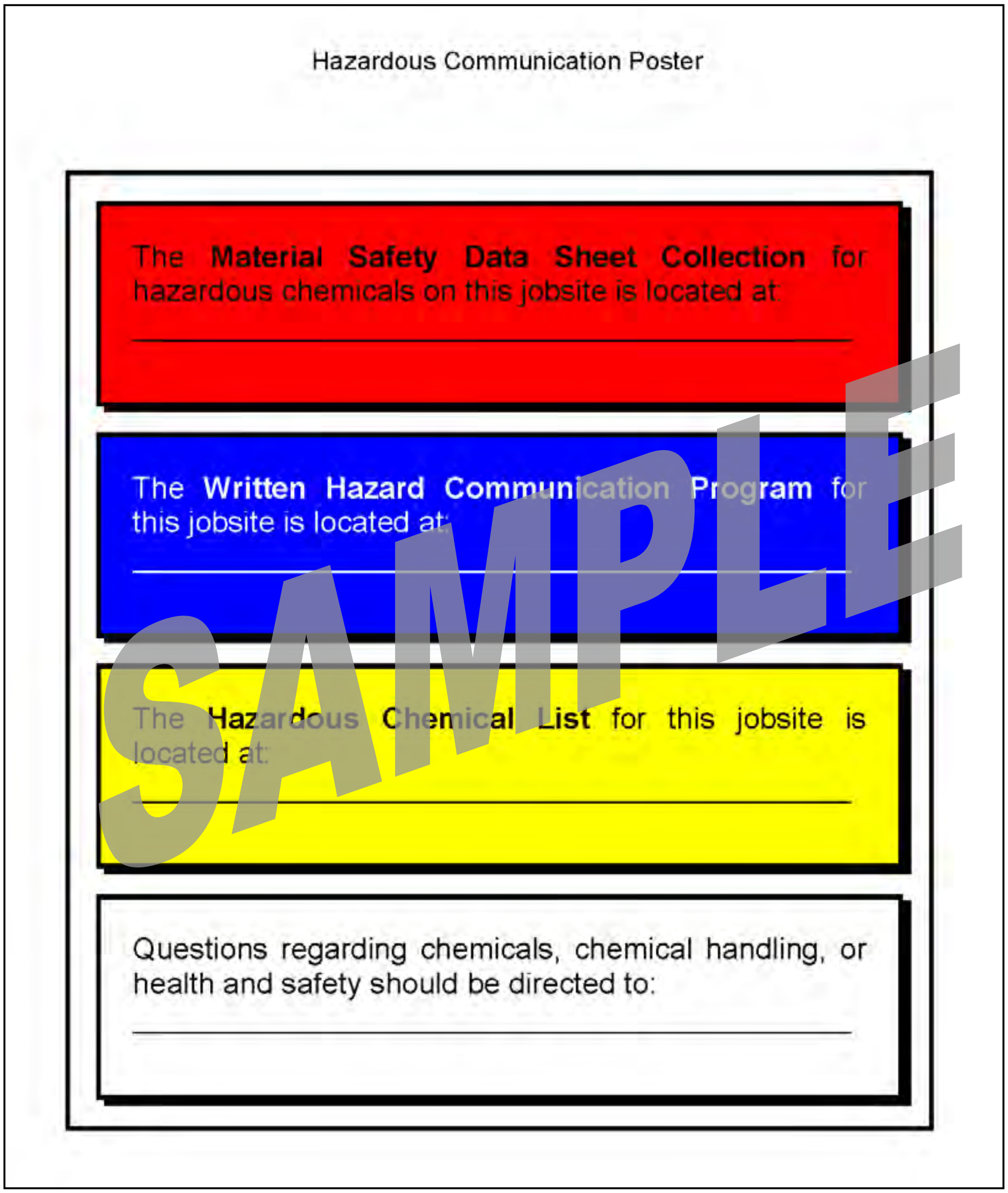


Table 6-4. Hazardous Chemical Pictograms

HCS Pictograms and Hazards

Health Hazard  • Carcinogen • Mutagenicity • Reproductive Toxicity • Respiratory Sensitizer • Target Organ Toxicity • Aspiration Toxicity	**Flame**  • Flammables • Pyrophorics • Self-Heating • Emits Flammable Gas • Self-Reactives • Organic Peroxides	**Exclamation Mark**  • Irritant (skin and eye) • Skin Sensitizer • Acute Toxicity (harmful) • Narcotic Effects • Respiratory Tract Irritant • Hazardous to Ozone Layer (Non-Mandatory)
Gas Cylinder  • Gases Under Pressure	**Corrosion**  • Skin Corrosion/ Burns • Eye Damage • Corrosive to Metals	**Exploding Bomb**  • Explosives • Self-Reactives • Organic Peroxides
Flame Over Circle  • Oxidizers	**Environment** (Non-Mandatory)  • Aquatic Toxicity	**Skull and Crossbones**  • Acute Toxicity (fatal or toxic)

7

Electrical Safety (Commercial, Industrial, and Residential Electrical Workers)

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes for commercial, industrial, and residential electrical workers.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

Definitions

Qualified Worker—An employee trained and authorized to perform the electrical work he or she will perform.

Unqualified Worker—Employees who have not been trained or authorized.

General Requirements

These guidelines apply to work on electric wiring, switches, switchgear, capacitors, breakers, panels, motors, batteries, and other related electrical equipment on commercial, industrial, and residential construction sites when work is performed on or near energized parts energized at 600 V or less. Whenever possible, work will be not be performed on known energized circuits or equipment. When this is not possible, the following rules will apply:

- All parties are to be notified before work begins and after work has been completed on energized circuits or equipment. This will prevent inadvertent contact with live parts by personnel, tools, and equipment.
- Testing equipment will be used to verify the status of all circuits.
- Lockout and tagout procedures will be followed.
- If there is any generator backup, it will be disabled by lockout and tagout when applicable.

- All required PPE must be worn.
- Barricades and warning signs will be placed in the area when there is exposure to energized electrical equipment.
- An inspection will be made for the presence of any flammables or combustibles materials in the area. When flammable or combustible materials are found, they shall be moved a safe distance away or properly stored.
- A fire extinguisher and first aid kit will be in the area while energized work is taking place.
- All noncurrent carrying metal parts of fixed or portable equipment shall be grounded unless specifically designed as double insulated.
- Only qualified and trained electricians will be allowed to work on energized circuits and equipment.
- A documented safety tailgate meeting and JTSA (job briefing) will be required before work begins.
- Employees should remove all jewelry (rings, watches, and so on) before performing work on energized circuits.

Hazard Control

For information regarding the potential hazard of electrical arc flash and for protection from arc flash, see Chapter 13 on Arc Flash Protection.

Engineering Controls

- All electrical distribution panels, breakers, disconnects, switches, and junction boxes must be completely enclosed.
- Water-tight enclosures must be used where there is a possibility of moisture entry either from operations or weather exposure.
- Explosion-proof containers must be used where there is a possibility of flammables, combustibles, or explosive dust or gases.
- Electrical distribution areas must be guarded against accidental damage. Some possible ways are by locating these areas in specifically designed rooms and by using substantial guard posts, rails, and other structural means.
- A clear approach and 3-ft (0.91-m) side clearance must be maintained for all distribution panels.
- All conduits must be fully supported throughout its length. Nonelectrical attachments to conduit are prohibited.

Administrative Controls

- Only trained and authorized employees may conduct repairs to electrical equipment.
- Contractors performing electrical work must hold a current license for the related work.

- Areas under new installation or repair must be guarded sufficiently with physical barriers and warning signs to prevent unauthorized entry.
- Access to energized electrical distribution rooms is limited to qualified employees who have a need to enter when electrical panels are open and work is being performed.
- All electrical control devices must be properly labeled.
- Work on energized circuits is prohibited unless specifically authorized by company management.
- All qualified employees must follow established electrical safety procedures and precautions.

Electrical Equipment

Electrical equipment must be free from recognized hazards that are likely to cause death or serious physical harm to employees. Safety of equipment must be determined using the following considerations:

- Suitability of equipment for an identified purpose is required. Suitability of equipment for an identified purpose may be evidenced by listing or labeling for that identified purpose.
- Mechanical strength and durability of parts designed to enclose and protect other equipment.
- Electrical insulation.
- Heating effects under conditions of use.
- Arc blasts / arcing effects.
- Classification by type, size, voltage, current capacity, and specific use.
- Other factors that contribute to the practical safeguarding of employees using or likely to come in contact with the equipment.

Identification of Disconnecting Means and Circuits

Each disconnecting means for motors and appliances must be legibly marked to indicate its purpose. Each service, feeder, and branch circuit, at its disconnecting means or overcurrent device, must be legibly marked to indicate its purpose. These markings shall be of sufficient durability to withstand the environment involved.

A disconnecting means is a switch or circuit breaker that is used to disconnect the conductors of a circuit from the source of electric current. Disconnect switches are important because they enable a circuit to be opened, stopping the flow of electricity, and thus can effectively protect workers and equipment.

Each disconnect switch or overcurrent device required for a service, feeder, or branch circuit must be clearly labeled to indicate the function of the circuit, and the label or marking should be located at the point where the circuit originates. For example, on a panel that controls several motors or on a motor control center, each disconnect must be clearly marked to indicate the motor to which each circuit is connected.

All labels and markings must be durable enough to withstand weather, chemicals, heat, corrosion, or any other environment to which they might be exposed.

Awareness Recognition for Unqualified Workers

Unqualified workers must receive instruction that includes an explanation of general electrical safety and precautions of warning signs and barricades to provide an awareness and understanding of electrical hazards, prior to beginning work.

Electrical Safety Rules for Unqualified Workers

- Do not perform any repairs to electrical equipment.
- Do not operate equipment if you suspect an electrical problem.
- Do not use water and electricity together.
- Even low AC or DC voltages (batteries and capacitors) can cause serious or fatal injuries.
- Do not use cords or plugs if the ground prong is missing.
- Work under the direction of a qualified employee.

Training for Qualified Employees

A qualified person shall be trained and knowledgeable of the construction and operation of equipment or a specific work method, and be trained to recognize and avoid the electrical hazards that might be present with respect to that equipment or work method. Such persons shall also be familiar with the proper use of special precautionary techniques, personal protective equipment (PPE), insulating and shielding materials, and insulated tools and test equipment. A person can be considered qualified with respect to certain equipment and methods but still be unqualified for others. Such persons permitted to work within limited approach of exposed energized conductors and circuit parts shall, at a minimum, be additionally trained in all of the following:

- The skills and techniques necessary to distinguish exposed energized parts from other parts of electrical equipment
- The skills and techniques necessary to determine the nominal voltage of exposed energized parts
- The approach distances specified in Table 7-1 and the corresponding voltages to which the qualified person will be exposed
- The decision-making process necessary to determine the degree and extent of the hazard and the PPE and job planning necessary to perform the task safely
- Necessary rescue techniques and the skills necessary to perform first aid and CPR

An employee who is undergoing on-the-job training and who, in the course of such training, has demonstrated an ability to perform duties safely at his or her level of training and who is under the direct supervision of a qualified person shall be considered to be a qualified person for the performance of those duties.

Table 7-1. Approach Distances For Qualified Employees—Alternating Currents

Voltage Range (phase to phase)	Minimum Approach Distance
300 V and less	Avoid contact
Over 300 V, not over 750 V	1 ft 0 in. (30.5 cm)

Personal Protective Equipment

Employees working in areas where exposed electrical sources are present will be provided and must use PPE. The following rules apply to the use and care of PPE:

- Rubber insulating gloves, rated for the voltage involved, and/or insulated tools, must be available for work on energized electrical equipment.
- Gloves shall be dielectrically tested per the inspection schedule found in Table 7-2. Gloves without a current test date shall not be used.
- Gloves shall be visually inspected and air-tested before each use. Some regulatory agencies and/or local jurisdictions may also require water testing of gloves.
- Defective or damaged gloves shall not be used.
- PPE must be used where exposed electrical sources are present.
- PPE must be designed for the work being performed and the environment in which it is used.
- PPE must be visually inspected and tested before each use. If any defect or damage is found, the equipment must be replaced, repaired, or discarded.
- Leather protectors must be worn over rubber gloves to keep from damaging the insulating properties of the PPE. Do not use leather glove protectors for any other work or without rubber gloves.
- Employees must wear nonconductive head protection wherever there is a danger of injury from electrical burns or shock from contact with exposed energized parts.
- Employees must wear ANSI-approved eye protection at all times. Whenever there is a danger of electrical arcs, flashes, or flying objects resulting from an electrical explosion, employees must wear additional face protection.
- Rubber insulating gloves shall be visually inspected and air-tested before each use. When required, rubber gloves must also be water tested.
- Fall protection equipment (FPE) will be provided and shall be worn when employees are exposed to a fall hazard. Employees will be trained on the proper use and inspection of FPE.
- The minimum PPE for energized work shall be a hardhat, safety glasses, electrically-rated insulated rubber gloves, and a long-sleeved flame retardant (FR) shirt. Short sleeves are not acceptable for energized work. See Chapter 13 “Arc Flash Protection” for more information on PPE requirements when employees are exposed to flames or electrical arcs.

Electrical Rubber Goods Inspection Schedule

Inspection requirements and dates for rubber goods are provided in Table 7-2.

Table7-2. Minimum Inspection Schedule for Electrical Rubber Goods

Type of Equipment	When to Test
Rubber insulating line hose	Upon indication that insulating value is suspect and after repair
Rubber insulating covers	Upon indication that insulating value is suspect and after repair
Rubber insulating blankets	Before first issue and every 12 months thereafter[1], upon indication that the insulating value is suspect, and after repair
Rubber insulating gloves	Before first issue and every 6 months thereafter[1], upon indication that insulating value is suspect, after repair, and after use without protectors
Rubber insulating sleeves	Before first issue and every 12 months thereafter[1], upon indication that insulating value is suspect, and after repair
[1] If the insulating equipment has been electrically tested but not issued for service, the insulating equipment may not be placed into service unless it has been electrically tested within the previous 12 months.	

Some operating companies, local bargaining contracts, or customer/client requirements might have a more stringent inspection/testing schedule. The most stringent requirements will take precedence.

Other Precautions for Personnel Activities

- Work shall not be performed near live electrical parts operating at >50 volts where there is a lack of illumination or an obstruction precludes observation of the work to be performed.
- Employees shall not wear conductive articles of jewelry and clothing (such as watch bands, bracelets, key chains, necklaces, metalized aprons, cloth with conductive thread, metal headgear, metal frame glasses or metal rings whether on the finger or any other part of the body) where they present a contact hazard with exposed live parts.
- Employees shall not wear plastic articles of jewelry and clothing (such as watch bands, bracelets, necklaces, or plastic rings whether on the finger or any other part of the body) where they present a melting hazard with exposed live parts.
- Conductive materials, tools, and equipment shall be handled in a manner that prevents accidental contact with live parts.
- Means shall be developed to ensure that conductive materials, tools and equipment approach no closer than permitted by Table 7-1.
- Means shall be developed to ensure that plastic materials, tools and equipment approach no closer than permitted by Table 7-1.
- When performing work in a confined space or enclosed space such as a manhole or vault that contains live parts operating a >50 volts or more or an electrical hazard exists, the employee shall use protective shields, barriers or insulating materials as necessary to avoid inadvertent contact with these parts.
- Re-closing a circuit that has been de-energized by a circuit protective device shall not be manually re-energized until it has been determined that the equipment and circuit can be safely energized.

Personal Protective Equipment and Tools

Employees must use personal protective equipment and approved tools when in the proximity of or when working on exposed energized parts. The following rules apply:

- When working on or near exposed energized parts, qualified employees must wear insulated gloves and/or use insulated tools or handling equipment rated for the voltage on which they are used. In cases where the insulation might be damaged, measures such as additional protective arc-rated clothing or arc-rated suits must be employed.
- Fuse handling equipment, insulated for the circuit voltage, must be used to remove or install fuses when the terminal is energized.
- Ropes and other handlines used near exposed energized equipment must be nonconductive and clean.
- Portable ladders shall have non-conductive side rails.

Warnings and Barricades

Warnings and barricades must be employed to alert unqualified employees, the general public, and other contractors of the present danger related to exposed energized parts. The following rules apply:

- Safety signs, warning tags, and other accident prevention devices must be used to warn individuals of the electrical hazards present, even temporarily, that might endanger them.
- When employees open energized panels, nonconductive barricades along with warning signs will be placed within a 3 ft (0.91 m) zone to prevent other individuals from accessing exposed energized parts or areas.
- Where barricades and warning signs do not provide adequate protection from electrical hazards, an attendant must be stationed to warn and protect individuals.

Clearance from Overhead Power Lines

Commercial, industrial, and residential electrical workers should maintain a minimum distance of ten (10) feet or more from overhead power lines according to the rated voltage on the line. Materials, aerial lifts, cranes and other mechanized equipment must maintain minimum approach distances from overhead power lines, as found in Table 7-3.

Table 7-3

Voltage Range Phase-to-Phase	Minimum Working Distances
Up to 50kV	10 feet (3.05 m)
Over 50 kV to 200 kV	15 feet (4.57 m)
Over 200 kV to 350 kV	20 feet (6.10 m)
Over 350 kV to 500 kV	25 feet (7.62 m)
Over 500 kV to 750 kV	35 feet (10.67 m)
Over 750 kV to 1000 kV	45 feet (13.72 m)
Source - Table A (1926.1408)	

Portable Electrical Equipment Safety Rules

Electrical equipment is defined as cord or plug-type electrical devices and includes the use of flexible or extension cords. Examples of portable electrical equipment include powered hand tools, powered bench tools, fans, and radios. The following safety rules apply to portable electrical equipment:

- Portable electrical equipment must be handled in such a manner that will not cause damage. Do not staple or hang power cords in a way that can cause damage to the outer jacket or insulation. Only use insulated hangers to hang cords and temporary wiring.
- Portable electrical equipment must be visually inspected for damage, wear, cracked or split outer jackets or insulation, and other damage, before use or before each shift. Any defects, such as cracked or split outer jackets or insulation, must be repaired, replaced, or placed out of service.
- Always check the compatibility of cord sets and receptacles for proper use. Cords will be protected by ground fault circuit interrupter (GFCI) pigtails or receptacles or by the use of an assured grounding program.
- Ground-type cord sets may only be used with ground-type receptacles when used with equipment requiring a ground-type conductor.
- Attachment plugs and receptacles may not be altered or connected in a way that would prevent the proper continuity of the equipment-grounding conductor. Adapters may not be used if they interrupt the continuity of the grounding conductor.
- Only portable electrical equipment that is double insulated or designed for use in areas that are wet or likely to contact conductive liquids may be used.
- PPE must be used when handling portable electrical equipment, extension cords, and portable lighting that is wet or covered with a conductive liquid.
- Flexible or extension cords will not be used in the following applications:
  - As permanent wiring
  - Suspended from nails, staples, or wires

  - Run through pinch points (doors, windows, holes in a wall) without protection
  - Using Romex as a homemade extension cord or flat cords
  - The application of electrical tape as a repair on damaged insulation
  - Cords that do not meet the use codes (ST, SO, STO, SJ, SJO, SJT, SJTO) or meet minimum size requirements are not permitted

Electrical Circuit Safety Procedures

Electrical power and lighting circuits are defined as devices specifically designed to connect, disconnect, or reverse circuits under a power load condition. When these circuits are employed, the following rules apply:

- Cable connectors, fuses, terminal plugs, or cable splice connectors may not be used, unless in an emergency, to connect, disconnect, or reverse circuits in place of proper electrical circuits. Use a disconnect designed to break or pick up load.
- Overcurrent protectors of circuits or connected circuits may not be modified, even on a temporary basis, beyond the installation safety requirements.
- Only trained and qualified employees may perform tests on electrical circuits or equipment.
- Test equipment and all associated test leads, cables, power cords, probes, and connectors must be inspected visually for external damage before use.
- Any damage or defective components must be repaired before use or be placed out of service.
- Test equipment must be rated to meet or exceed the voltage being tested and must fit the environment in which it is being used.
- Where flammable or ignitable materials are stored, even occasionally, electrical equipment capable of igniting them may not be used (except for low-voltage and explosion proof equipment), unless measures are taken to prevent hazardous conditions from developing.

Cable Cutting Safety Procedure

The following procedure is designed to minimize employee risk/exposure while cutting, removing, or relocating any type of energized insulated cable located in tray, aerial and conduit installations and direct buried. The following steps are required to ensure that the cable being worked on is correct and not energized. This procedure applies to any insulated cable that has been previously energized. It does not apply to new insulated cable in new construction where the cables have not been connected to an energy source.

- When multiple cables are present in the work area, identify the cable to be worked by electrical means, unless it is obvious by reason of distinctive appearance or location or by other readily apparent means of identification.
  - After the cable has been located, identify the cable with a distinguishing mark. All involved employees shall be made aware of that identifying mark.
- The person who will be cutting the cable must perform an independent verification from termination point to termination point.

- After the cable has been identified by the person planning to make the cut, the cable must be marked separately and independently of the original distinguishing mark. All involved employees must be made aware of that identifying mark.
- When possible, have a representative of the customer/client verify that the proper cable has been identified.
- Wear appropriate PPE for the task of cutting the cable. PPE may include rubber gloves, rubber sleeves, safety glasses, face shield, and fire retardant clothing.
- Never cut more than a single cable at a time. Never cut multiple cables.
- The lead person, foreman, or supervisor must be present when cutting the cable.

Standard Operating Procedures

Electrical Prework Procedure

Except in extreme cases, work on electrical equipment must be done with all electrical circuits in the work area de-energized by following the lockout/tagout procedure. When working on or near energized electrical circuits with less than 50 V to ground, the equipment does not have to be de-energized if there will be no increased exposure to electrical burns or explosion from electric arcs.

Treat all electrical circuits as energized until they have been de-energized, locked and tagged out, and tested by the following procedure.

To prepare for work on electrical systems or components, use the following procedure.

1. Be authorized to perform the work before commencing the work activity.
2. Conduct a JTSA before starting work.
3. Lock out and tag out all sources of electrical power.
    a. Verify the de-energized condition before working on any circuits or equipment.
    b. A qualified person must operate the equipment operating controls or otherwise verify that the equipment cannot be restarted.
    c. Verify proper operation of the voltmeter at a live electrical source of the same rated voltage as the circuit to be worked.
    d. Using the voltmeter, check all exposed circuits phase-to-phase and phase to ground for evidence of voltage or current in the circuit.
    e. If voltage is detected in any exposed circuit, stop and determine the source and procedure to eliminate voltage.
4. Conduct work on the circuit only after determining that there is no voltage in any of the exposed circuits.
5. Close all exposed circuits, boxes, controls, and equipment.
6. Remove the lockout/tagout device.
7. Obtain supervisor permission to energize circuits.

Working on or Near Exposed Energized Circuits

In the rare situation when energized equipment or energized equipment in close proximity cannot be de-energized, the following work practices must be used to provide protection for all hot work activities.

Unqualified employees are prohibited from working on or near exposed energized circuits.

- Obtain permission from the supervisor to work on or near energized electrical circuits.
- Conduct a JTSA before starting work.
- Lock out and tag out all circuits possible.
- Treat all circuits as energized.
- Remove all conductive clothing and jewelry (rings, metal watches, metal wrist and neck chains, metal writing instruments, metal earrings, and so on).
- Use proper PPE, shields, and barriers to provide effective electrical insulation from energized circuits. Proper PPE includes a hardhat, electrically rated insulated rubber gloves, long-sleeved (FR) shirt, safety glasses, and arc-rated face shield. Insulation may include aprons, rubber-soled shoes, and insulated shields.
- Provide adequate lighting. Do not enter areas with exposed energized parts unless illumination (lighting) is provided. Do not reach around obstructions into unlit areas where exposed energized parts are located.
- To avoid contact with exposed energized parts in confined spaces, employees entering a confined space must use protective barriers, shields, or equipment or insulated materials rated at or above the present voltage and follow the requirements of the Confined Space Entry program.
- Doors or other hinged panels must be constructed and secured to prevent them from swinging into an employee and causing contact with exposed energized parts.
- Housekeeping in areas of exposed energized parts and close contact may not be completed unless adequate safeguards, such as insulation equipment or barriers are present. Conductive cleaning material (steel wool or silicon carbide, for example) or liquids may not be used unless procedures such as lockout and tagout are in place and followed.
- Station another employee (safety observer) near the work area. The function of the safety observer is to quickly de-energize all sources of power or to pull the worker free from the electrical work area with a nonconductive safety rope or dielectric stick if contact is made with an energized electrical circuit.

Reenergizing Electrical Circuits after Work is Completed

These requirements shall be met in the order given before circuits or equipment are reenergized, even temporarily.

1. A qualified person must conduct tests and visual inspections, as necessary, to verify that all tools, electrical jumpers, shorts, grounds, and other such devices have been removed, so that circuits and equipment can be safely energized.

2. A qualified person must warn employees exposed to the hazards associated with reenergizing the circuit or equipment to stay clear of circuits and equipment.
3. The employee who applied locks and tags must remove them, or they must be removed under this individual's direct supervision. If this employee is absent from the workplace, then the lock or tag may be removed by a qualified supervisor designated to perform this task, provided that:
   - ❑ The supervisor verifies that the employee who applied the lock or tag is not available at the workplace.
   - ❑ The supervisor ensures that the employee and all other affected parties are aware that the lock or tag has been removed before the employee resumes work at that workplace.
4. Conduct a visual inspection to determine that all employees are clear of the circuits and equipment.
5. Megger for load.
6. Review operations manual when energizing equipment and check for any startup procedures.
7. Have a fire extinguisher in the area rated for electrical fires.
8. Wear all required PPE. The minimum required PPE includes:
   - ❑ Hardhat
   - ❑ Safety glasses
   - ❑ Long-sleeved FR arc-rated shirt or arc-rated suit
   - ❑ Arc-rated face shield
   - ❑ Rubber insulating gloves rated for the voltage

Entering Underground Structures (Enclosed Spaces)

See Chapter 22, "Confined Space and Vessel Entry Procedures," for more information on entering enclosed spaces.

- Before a manhole cover is removed, or an unvented vault is completely opened, a check shall be made to determine if any volatile gas or substance is present at the opening.
- Before an employee enters an enclosed space, such as a manhole or an unvented vault, the area shall be promptly protected with a barrier, temporary cover, or other suitable guard.
- When work is to be performed in a manhole or unvented vault:
  - ❑ No entry shall be permitted unless forced ventilation is used or the atmosphere is found to be safe by testing for oxygen deficiency and the presence of explosive gases or fumes.
  - ❑ If testing or other means detects unsafe conditions, the work area shall be ventilated and otherwise made safe before entry.
  - ❑ Provisions shall be made for an adequate continuous supply of air.
  - ❑ The manhole shall be inspected for other potential hazards such as water, animals, damaged cables, and so on.

- If, in an emergency, it becomes necessary for an employee to enter a manhole or vault where hazardous gas is present, the employee shall use an approved respirator and wear a safety harness with a lifeline attended by another trained employee stationed at the manhole or vault opening. If the atmosphere is oxygen deficient, a self-contained breathing apparatus (SCBA) must be worn.

Immediately call 911 when an emergency situation occurs in an enclosed or confined space. Only employees trained in emergency rescue procedures can enter an enclosed or confined space to perform a rescue. (Refer to Chapter 22 on Confined Spaces for more information.) Only employees trained and qualified to wear a respirator can use a respirator. (Refer to Chapter 41 for Respiratory Protection Program.)

- A ladder should be used to access or egress a manhole or vault. Climbing into or out of manholes or vaults by stepping on cables, conduits, pipes, equipment, or hangers is forbidden.
- While work is being performed in manholes, a trained attendant shall be available outside of the manhole to call for emergency help and/or render emergency assistance as required.
- Before any work is done on a cable, all cables shall be identified by an approved method. If there is any doubt as to the identification, work shall not be started until the cable is checked and identified by the proper authority.
- When working in manholes, unvented vaults, and other underground spaces, rescue equipment must be readily available outside of the opening to enable a rescue attempt. Proper planning will determine what equipment is necessary. Rescue equipment could include rescue tripods and a SCBA. Preplanning is necessary prior to entering these spaces. Contact your Safety Department for assistance prior to beginning the work.
- Employees working in or near underground spaces must be properly trained in the use of the rescue equipment.

Hazardous Energy Isolation Guide (Lockout and Tagout)

For information in addition to this section, see Chapter 12, "Lockout and Tagout".

Assured Electrical Equipment Grounding Program and/or Ground Fault Circuit Interrupters

Electrical workers must be protected by either an Assured Electrical Equipment Ground Program or by the utilization of GFCI on all temporary wiring. GFCI protection is the preferred method of providing worker protection.

Assured Electrical Equipment Grounding Program

An Assured Electrical Equipment Grounding Program is intended to protect Company employees and others from possible injury from or relating to accidental electrical shock. An assured grounding program is required unless the contractor can provide 100% utilization of GFCIs on the jobsite.

- The program includes all extension cord sets, receptacles that are not a part of the permanent wiring of a building or structure, and any equipment that is connected by extension cord and plug and is available for use or is used by employees.
- The jobsite supervisor shall designate one or more competent persons to implement this program.

Mechanical Conductor Requirements

A conductor used as a ground for extension cords and equipment must be identifiable and distinguishable from all other conductors (green or green with yellow stripe only).

No grounding conductor may be attached to any terminal or lead to reverse designated polarity.

A grounding terminal or grounding-type device on a receptacle, extension cord connector, or attachment plug may not be used for purposes other than grounding.

Inspection Procedures for Equipment

- Visual inspections

  Each cord set, attachment cap, plug and receptacle of cord sets, and any equipment connected by cord and plug (except cord sets that are fixed and not exposed to damage) must be visually inspected for the following external defects before use each day:

  - Deformed, loose, or missing pins
  - Damage to wire or equipment insulation
  - Indications of internal damage
  - Cuts and abrasions of cords

  Equipment, tools, and cords found to be defective must be taken out of service immediately, tagged "Do Not Operate," and returned for repair. Defective equipment may not be returned to the jobsite until properly repaired and re-inspected by a qualified individual.

- Electrical continuity tests

  The following tests must be performed on all cord sets, receptacles, and plug-type electrical equipment that is required to be grounded and is not part of the permanent wiring of a building or structure:

  - All electrical equipment grounding conductors must be tested for continuity and must be electrically continuous.
  - All cord sets, receptacles, attachment caps, or plugs must be checked to ensure correct attachment of the grounding conductor to the proper terminal (polarity check) and must be tested for continuity.
  - All required tests must be performed:
    - Before first use.
    - Before equipment is returned to service following any repairs.

- Before equipment is used after any incident that can be reasonably suspected to have caused damage.
- At intervals not to exceed three months.

The test records must show when the equipment was tested or identified by color coding, and the records must be maintained.

In all permanent buildings where construction operations are performed, continuity tests of all power outlets must be conducted every six months.

- Test coding

The Company will test and document all electrical equipment, cords, receptacles, and wiring on a monthly basis. Items tested will be color coded in accordance with the color code system shown in Table 7-4.

Exception to Required Color Code: Some clients might require a different color-coding system in a specific plant or jobsite location.

Table 7-4. Color-Coding Scheme

Color-Coding Scheme	
Month	**Color**
January	White
February	White/Yellow
March	White/Blue
April	Green
May	Green/Yellow
June	Green/Blue
July	Red
August	Red/Yellow
September	Red/Blue
October	Orange
November	Orange/Yellow
December	Orange/Blue
“Repair” Test	Add Brown

Summary

A copy of this “Assured Electrical Equipment Grounding Protective Program” including logs and/or the Color-Coding Scheme provided in Table 7-4 will be maintained at each jobsite and will be made available for inspection by any affected employee.

Ground Fault Circuit Interrupters

All 120-V single-phase, 15- and 20- A receptacle outlets on construction sites that are not part of the permanent wiring of a building or structure must have approved GFCIs for personnel protection. GFCIs must also be used in conjunction with all portable or mobile mounted generators.

GFCI protection can be provided either at the receptacle or by the use of a pigtail at the cord set.

GFCI pigtails should be kept in a tool trailer until needed and may be assigned to crews like any other piece of safety equipment. Normally, the jobsite safety supervisor, in conjunction with the project supervisor, will determine where GFCIs are to be used.

GFCIs should be inspected and tested on a monthly basis and the log completed and maintained. A copy of this "GFCI Program" will be maintained at each jobsite and will be made available for inspection by any affected employee. Refer to the Monthly GFCI Test Report located at the end of this chapter.

Safety Meetings

Safety meetings are an integral part of a proactive safety management process. There are many types of safety meetings held.

Daily, before the start of work, the crew generally should hold a documented tailgate safety meeting. The meeting should focus on safety issues relevant to the work processes to be performed that day, along with reminders regarding the safe use and inspection of the tools and equipment required for the tasks to be performed that day. The crew should also discuss any near-misses, noncompliance, or other safety issues that were encountered the previous day.

A weekly safety meeting will be held on each jobsite. The purpose is to cover subjects of great importance and relevance to the success of the job. The subjects discussed and attendance will be documented by signing a meeting roster. These meetings supplement and support the safety training provided for all employees. Weekly safety meetings will generally last between 15 and 30 minutes.

The topics may be:

- Pre-chosen and information sent to the field by the Corporate Office and/or Operating Unit.
- Pertinent to the work being performed.
- Tools and equipment being used in the field.
- Work procedures and policies of the client/customer.
- Issues related to the crew's activities.
- "Special" safety meetings, which may be called when:
  - An incident occurs on a jobsite.
  - Non-compliance was observed.
  - New work practices and/or policies are implemented.
  - New tools and/or equipment are introduced into the work area.
  - Other reasons.

Job Task Safety Analysis

Each day, before the start of each workday, the supervisor/foreman (person in charge) or their designee, should conduct a job briefing or Job Task Safety Analysis (JTSA) with the employees involved (see Chapter 29). The purpose of the JTSA is to identify the hazards associated with the scope of work, determine the safety precautions that will be implemented, and the required PPE by the crew performing the work assignment. The JTSA helps ensure that all members of the crew understand the work assignment and acknowledge that they understand and will follow the safety plan established to complete the work assignment. The JTSA should be documented and signed by all crewmembers. Refer to Sample 7-2. The following are requirements for the JTSA:

- The foreman (person in charge) should assemble the crew at the job site and explain the work to be done, and outline the steps to be followed.
- The foreman (person in charge) and the members of the crew will identify the hazards of the job. The crew should identify appropriate controls to eliminate, mitigate, control, or reduce the accident-producing potential of the hazards.
- If the hazards cannot be eliminated from the jobsite, the JTSA should list how the hazards can be mitigated, controlled, or reduced. This may be done by:
    - Dedicated assignment of work responsibilities.
    - Methods to isolate or control the hazard.
    - Other forms of protection (PPE, training, others) to reduce the hazard to the employees.
- The foreman (person in charge) must ensure that each member of the crew understands all instructions given.
- If the work or operations to be performed during the workday or shift are repetitive and similar, at least one JTSA should be conducted before the start of the first job of each day or shift. An additional JTSA should be completed and a meeting held with the members of the crew if significant changes that might affect the safety of the employees occur during the course of the work. Significant changes include changes in the scope of the work, work assignments, crew structure, crew leadership, environmental conditions or when other hazards (not originally noted) are determined to be present in the workplace.
- The discussion should be in such detail that all employees, by virtue of training and experience, can reasonably be expected to recognize and avoid the hazards involved in the job. A more extensive discussion should be conducted if the work is complicated or particularly hazardous or if the employee cannot be expected to recognize and avoid the hazards involved in the job.
- The foreman (person in charge) is responsible for accounting for all employees after the completion of each job.

References

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Sample 7-1. Monthly GFCI Test Report

MONTHLY GFI TEST REPORT
TEMPORARY PANELS/TEMPORARY TURTLES

JOB NUMBER: ______________________________

JOB LOCATION: ______________________________
UNIT #: ______________ DATE: ______________ TIME: ______________

PERSON PERFORMING TASK: ______________________________

VISUAL INSPECTION:
OK: ___ COMMENTS: ______________________________
____
____
DATE CORRECTED: ______________________________

GFCI BREAKER TEST:
OK: ___ COMMENTS: ______________________________
____
____
DATE CORRECTED: ______________________________

RECEPTACLES:
OK: ___ COMMENTS: ______________________________
____
____
DATE CORRECTED: ______________________________

WEATHERPROOF COVERS:
OK: ___ COMMENTS: ______________________________
____
____
DATE CORRECTED: ______________________________

GROUNDING:
OK: ___ COMMENTS: ______________________________
____
____
DATE CORRECTED: ______________________________

RISER:
OK: ___ COMMENTS: ______________________________
____
____
DATE CORRECTED: ______________________________

OTHER COMMENTS OR SUGGESTIONS: ______________________________
____
____
____

Sample 7-2. Job Task Safety Analysis—Commercial, Industrial, and Residential Electrical Workers

Job Task Safety Analysis - Commercial, Industrial & Residential Electrical

Company Name:	**Date:**	**Time:**	**Job #:**
Location:		**City:**	**State:**
Describe job task:			
Competent Person Trenching/Excavation:			**Soil Classification:**
Person responsible for First Aid / CPR:			
Name and Location of Emergency Medical Facility:			
Location of the AED:			**Emergency Contact Number: 911**

	Yes	N/A
PPE Required		
Hardhat	☐	☐
Safety Glasses/Goggles	☐	☐
Hearing Protection	☐	☐
Leather Gloves	☐	☐
Boots/Foot Protection	☐	☐
Face Shield	☐	☐
Welding Hood	☐	☐
Chemical Gloves	☐	☐
Dielectric Gloves	☐	☐
Protective Sleeves	☐	☐
Air Test (Electrical PPE)	☐	☐
Class 2 Reflective Vest	☐	☐
Class 3 Reflective Vest	☐	☐
Respirators	☐	☐
Fall Protection		
Competent Person	☐	☐
Guardrails	☐	☐
Safety Nets	☐	☐
Full Body Harness/Lanyard	☐	☐
Positioning Device	☐	☐
Warning Line	☐	☐
Safety Monitor	☐	☐
Barricaded/Control Zone	☐	☐
Falling Object Protection	☐	☐
Daily Inspections	☐	☐
Aerial Lifts		
Qualified Oper[illegible]	☐	☐
Daily Inspe[illegible]	☐	☐
Grounded [illegible]	☐	☐
Warning [illegible]	☐	☐
Controls [illegible]	☐	☐
Wheel C[illegible]	☐	☐
Ladders		
Daily Inspe[illegible]	☐	☐
Warn../Usage Labels A[illegible]	☐	☐
3 Feet Above [illegible]nding	☐	☐
Ladder[illegible]	☐	☐

	Yes	N/A
Confined Space		
Competent Person	☐	☐
Permitted/Non-Permitted	☐	☐
Calibrated Monitor	☐	☐
Continous Monitoring	☐	☐
Hole Watch	☐	☐
Man Hole Guard	☐	☐
Forced Ventilation	☐	☐
Rescue Equipment	☐	☐
Resc. Team/Serv. Identified	☐	☐
Hot Work Permit	☐	☐
Warning Signs	☐	☐
Written Program on Hand	☐	☐
Contractors Notified	☐	☐
Confined Space Log Book	☐	☐
Excavations		
Competent Person	☐	☐
Utilities Located	☐	☐
Integrity of Adj. Structures	☐	☐
Soil Classification	☐	☐
Location of Spoil Bank	☐	☐
Overhead Load Protect.	☐	☐
Water in Trench	☐	☐
Ladders/Ramps [illegible]	☐	☐
[illegible]ders Secure[illegible]	☐	☐
[illegible]ng/Benchin[illegible]	☐	☐
[illegible]g System	☐	☐
[illegible]ted Data	☐	☐
[illegible]here Tes[illegible]	☐	☐
[illegible]riodic In[illegible]on	☐	☐
[illegible] System	☐	☐
E[illegible]y/Resc[illegible]ip.	☐	☐
[illegible]	☐	☐
[illegible]ed a[illegible]ble)	☐	☐
Sing[illegible]ips	☐	☐
Clea[illegible]rooms	☐	☐
Hand Wash Station	☐	☐

	Yes	N/A
Traffic Control		
Traffic Control Plan	☐	☐
Right/Left Lane Closed	☐	☐
Sign - Flagman Ahead	☐	☐
Sign - Construction Ahead	☐	☐
Arrow Board	☐	☐
Message Board	☐	☐
Traffic Control Zone	☐	☐
Advance Warning Area	☐	☐
Transition Area	☐	☐
Buffer Space	☐	☐
Work Area	☐	☐
Termination Area	☐	☐
Barricades/Cones	☐	☐
Stop/Slow Paddles	☐	☐
Cranes/Digger Derricks		
Qualified Operator	☐	☐
Annual Inspection	☐	☐
Daily In[illegible]	☐	☐
Cr[illegible]	☐	☐
Qu[illegible]	☐	☐
Ou[illegible]ads	☐	☐
Ri[illegible]uipme[illegible]cted	☐	☐
Qu[illegible]	☐	☐
W[illegible]	☐	☐
Lo[illegible]	☐	☐
Pro[illegible] Susp. Loads	☐	☐
Medi[illegible]		
Tr[illegible]R/FA Employees	☐	☐
Fir[illegible]n	☐	☐
Blo[illegible] Pathogen Kit	☐	☐
Oc[illegible]on Med List	☐	☐
Hospital Location	☐	☐
Arc Flash Protection		
FR Clothing	☐	☐
FR Flash Suit	☐	☐
Arc-rated Face Shield	☐	☐
Insulated Blankets	☐	☐
Protective Barrier	☐	☐

	Yes	N/A
Electrical		
Daily Inspection of Tools/Cords	☐	☐
GFCI/Assured Grounding	☐	☐
Energized Work Permit	☐	☐
Insulated Tools	☐	☐
Voltage Tested	☐	☐
Elevated Structures Inspected	☐	☐
Minimum Safe Distances	☐	☐
Energized/Deenergized	☐	☐
Lockout/Tagout		
Competent Person	☐	☐
Lockout Procedure	☐	☐
Voltage Mete[illegible]	☐	☐
Gr[illegible]	☐	☐
E[illegible]	☐	☐
Ga[illegible]		
S[illegible]pright	☐	☐
V[illegible]	☐	☐
C[illegible] Fuels	☐	☐
C[illegible]y Labeled	☐	☐
S[illegible]o Prevent Falling	☐	☐
I[illegible]s/Certificates	☐	☐
S[illegible]way f[illegible]	☐	☐
F[illegible]	☐	☐
V[illegible]	☐	☐
Sc[illegible]		
C[illegible]petent Person	☐	☐
Daily Inspections	☐	☐
Access Ladders	☐	☐
Secured/Braced	☐	☐
Guardrails	☐	☐
Supported Scaffolding	☐	☐
Suspension Scaffolding	☐	☐
Administrative Issues		
OSHA Poster	☐	☐
MSDS Manual	☐	☐
Written Safety Program	☐	☐
Permits	☐	☐
Daily AED Check	☐	☐

Work as[illegible]not addressed above shall be outlined below

____

____

____

All employees must print and sign their names below

Printed Name	Signature	Printed Name	Signature
1.		6.	
2.		7.	
3.		8.	
4.		9.	
5.		10.	

Foreman Signature ______________________ **Safety Rep. Signature** ______________________

NOTE: Additional Job Briefing will be required when scope of work changes and/or conditions change

1. Have overhead lines been located and have proper precautions been identified?
2. Have all employees received and are qualified to perform the tasks to which they have been assigned?
3. List injuries, incidents, first aid and near miss cases that occur at the job site during the course of the day:

8

Electrical Safety (Overhead Distribution and Transmission Workers)

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes for overhead distribution and transmission workers.

Scope

These guidelines apply to all Operating Unit facilities and project sites that perform work on electric power transmission and distribution lines and equipment.

Definitions

Alive or live (also energized)—Electrically connected to a source of potential difference or electrically charged so as to have potential different from that of the earth or different from that of adjacent conductors or equipment.

Authorized person—One who has the authority to perform specific duties under certain conditions or who is carrying out orders from a responsible authority.

Automatic circuit recloser—A self-controlled device for automatically interrupting and reclosing an alternating-current circuit, with a predetermined sequence of opening and reclosing followed by resetting, hold closed, or lockout.

Barricade—A physical obstruction such as tapes, cones, or A-frame type wood, construction fencing, or metal structures intended to provide a warning about and to limit access to a hazardous area.

Barrier—A physical obstruction that is intended to prevent contact with energized lines or equipment to prevent unauthorized access to a work area.

Bond—The electrical interconnection of conductive parts designed to maintain a common electrical potential.

Bus—A conductor or a group of conductors that serve as a common connection for two or more circuits.

Cable—A conductor with insulation, or a stranded conductor with or without insulation and other coverings (single conductor cable), or a combination of conductors insulated from one another (multiple-conductor cable).

Cable sheath—A conductive protective covering applied to cables.

Circuit—A conductor or system of conductors through which an electric current is intended to flow.

Clearance (between objects)**—**The clear distance between two objects measured surface to surface.

Clearance (for work)—Authorization to perform specified work or permission to enter a restricted area.

Conductor—A material, usually in the form of a wire, cable or bus bar, used for carrying an electrical current.

Contract employer—An employer, other than the host employer, that performs electrical transmission and distribution work.

Covered conductor—A conductor covered with a dielectric having no rated insulating strength or having a rated insulating strength less than the voltage of the circuit in which the conductor is used.

Current-carrying part—A conducting part intended to be connected in an electric circuit to a source of voltage. Non-current parts are those not intended to be so connected.

De-energized—Free from any electrical connection to a source of potential difference and from electric charge; not having a potential that is different from the potential of the earth.

Designated person—See Authorized person.

JTSA—Job Task Safety Analysis or “job briefing” is a meeting held and documented to identify hazards associated with the job, work procedures involved, special precautions, energy source controls, and PPE requirements.

Energized (also alive or live)—Electrically connected to a source of potential difference or electrically charged so as to have a potential different from that of the earth or different from that of adjacent conductors or equipment.

Exposed (not isolated or guarded)—(a) Exposed circuits or lines are in such a position that in the event of failure of supports or insulation, contact with another circuit or line can result. (b) Exposed equipment is an object or device that can be inadvertently touched or approached by any person. It is applied to objects not suitably guarded or situated.

Fall Protection Equipment (FPE)—Any equipment, device or system that prevents an accidental fall from elevations or that mitigates the effect of such fall.

Ground—A conducting connection, whether planned or unplanned, between an electric circuit or equipment and the earth, or to some conducting body that serves in place of the earth.

Grounded—Connected to earth or to some conducting body that serves in place of the earth.

Guarded—Protected by personnel, covered, fenced, or enclosed by means of suitable casings, barriers, rails, screens, mats, platforms, or other suitable devices in accordance with standard barricading techniques designed to prevent dangerous approach or contact by persons or objects.

High wind—A wind of such velocity that one or more of the following hazards would be present:

1. The wind could blow an employee from an elevated location,
2. The wind could cause an employee or equipment that is handling material to lose control of the material, or
3. The wind could expose an employee to other hazards.

High wind is normally considered as winds exceeding 40 miles per hour (64.4 kilometers per hour) or 30 miles per hour (48.3 kilometers per hour) if the work involves material handling unless precautions have been taken to protect employees from the hazardous effects of the wind.

Host employer—An employer that operates or who controls the operating procedures for an electric power generation, transmission, or distribution installation on which a contract employer is performing work.

Insulated—Separated from other conducting surfaces by a dielectric substance or air space, permanently offering a high resistance to the passage of current and to disruptive discharge through the substance or space.

Isolated—Not readily accessible to persons unless special means for access are used.

Personal fall arrest system—A system used to arrest an employee in a fall from a working level.

Primary voltage—Any electrical circuit that normally operates at more than 600 V.

Qualified person—

- A person who is familiar with the construction and/or operation of electrical power generation, transmission, and distribution lines and equipment and who is fully aware of the hazards involved through knowledge, training, and experience; or
- A person who has passed a journeyman's examination for the particular branch of the electrical trade with which he or she is connected; or
- A person who has successfully demonstrated his or her ability and is recognized by management as qualified to perform the duties to which he or she has been assigned.

Shall—When the word "shall" appears in the wording of a guideline, the guideline is to be obeyed as written.

Should—When the word "should" appears in the wording of a guideline, the guideline is to be obeyed as written when it is reasonable and practical to do so.

Statistical sparkover voltage—A transient overvoltage that produces a 97.72 percent probability of sparkover (that is, two standard deviations above the voltage at which there is a 50 percent probability of sparkover).

Statistical withstand voltage—A transient overvoltage level that produces a 0.14 percent probability of sparkover (that is, three standard deviations below the voltage at which there is a 50 percent probability of sparkover).

Switch—A device for opening or for changing the connection of a circuit.

System operator—A qualified person designated to operate the system or its parts.

Tailgate safety training—A short informal discussion of the work to be accomplished and the safety measures to be incorporated. Normally conducted by the supervisor or employee in charge of the work.

Unqualified worker—Employees who have not been trained or authorized by Company management to perform electrical work.

Unsafe conditions—A phrase used to indicate dangerous, hazardous, defective, or unusual conditions that could lead to accidents.

Vault—An enclosure, above or below ground, that personnel may enter and that is used for installing, operating or maintaining equipment or cable.

Voltage—The effective (root mean square) potential difference between any two conductors or between a conductor and ground. The nominal voltage of a system or circuit is the value assigned to a system or circuit of a given voltage class for the purpose of convenient designation.

Wood Pole Fall Restriction Device – A device that, when properly adjusted and combined with other subcomponents and elements, allows the climber to remain at his or her work position with both hands free and that performs a fall restriction function if the climber loses contact between his or her gaffs and the pole.

Best Practices

The Company participates in an OSHA partnership comprised of electrical transmission and distribution construction contractors, trade associations, unions, and government representatives. The Partnership has developed and will continue to develop Best Practices for safe work practices in the industry. A "Best Practice" is a process or method that, in the judgment of the Partnership members, incorporates the soundest methods for reducing the frequency of incidents and ensuring employee safety.

For information on the Best Practices, see the "Best Practices" (Appendix A) section in the Company *Safety, Health, and Environmental Program Manual.*

Training Requirements

Employees shall be trained in, and familiar with, the safety-related work practices, safety procedures, and other safety requirements in this section that pertain to their respective job assignments.

Employees shall also be trained in and familiar with any other safety practices, including applicable emergency procedures, such as pole-top, bucket, and manhole rescue, related to their work and necessary for their safety and the safety of their fellow employees.

The degree of training shall be determined by the risk to the employee for the hazard involved.

NOTE

Employee training is not confined to this section and can be found throughout this manual in more specific sections. Training may be classroom or on-the-job. The training shall establish employee proficiency in the work practices required. Employment records that indicate that an employee has successfully completed the required training may be used to demonstrate proficiency.

When accepting records of previous training to fulfill the required training requirements, the Company should use an examination or interview to make an initial determination that the employee understands the relevant safety-related work practices before they perform the work. Supervisors should supervise the employee closely until that employee has demonstrated proficiency.

Qualified Employees

Qualified employees shall be trained and competent in:

- The skills and techniques necessary to distinguish exposed live parts from other parts of electrical equipment.
- The skills and techniques necessary to determine the nominal voltage of exposed live parts.
- The skills and techniques necessary to determine the minimum approach distances corresponding to the voltages to which the qualified employee will be exposed and the skills and techniques necessary to maintain those distances.
- The proper use of the special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools for working on or near exposed energized parts of electrical equipment.
- The recognition of electrical hazards to which the employee may be exposed and the skills and techniques necessary to control or avoid those hazards.

Additional Training

An employee shall receive additional training (or retraining) under any of the following conditions:

- If an inspection indicates that the employee is not complying with the safety-related work practices required, or
- If new technology, new types of equipment or changes in work procedures necessitate the need for training, or
- If the employee must use safety-related work practices that are not normally used during the employee's regular job duties.

Information Transfer

Host Employer

Before work begins, the host employer shall inform contract employers of:

- The characteristics of the host employer's installation that are related to the safety of the work to be performed.
- Conditions that are related to the safety of the work to be performed that are known to the host employer.
- Information about the design and operation of the host employer's installation the contract employer needs to make the necessary assessments.
- Any other information about the design and operation of the host employer's installation that is known by the host employer that the contract employer requests and that is related to the protection of the contract employer's employees.

Contract Employer

- The contract employer shall ensure that each of its employees is instructed in the hazardous conditions relevant to the employee's work that the contract employer is aware of as a result of information communicated to the contractor by the host employer.
- Before work begins, the contract employer shall advise the host employer of any unique hazardous conditions presented by their work.
- The contract employer shall advise the host employer of any unanticipated hazardous conditions found during the contract employer's work. The contract employer shall provide this information to the host employer within two working days after discovering the hazardous condition.

The contract employer and the host employer shall coordinate their work rules and procedures so that each employee is protected.

The transfer of information should be documented. A form has been provided for a means of communicating the requirements of Information Transfer between the host employer, the contract employer and the employees performing the work. See Sample 8-2.

Medical Services

When employees are performing work on, or associated with, exposed lines or equipment energized at 50 volts or more, persons with first-aid and CPR training shall be available as follows:

- For field work involving two or more employees at a work location, at least two trained persons shall be available.
- For fixed work locations such as substations, the number of trained persons shall be sufficient to ensure that each employee exposed to electrical shock can be reached within 4 minutes by a trained person. However, where the existing number of employees is insufficient to meet this requirement, each employee at the work location shall be a trained employee.

Arc Flash Protection

Assessment

The Company must assess the workplace to identify employees exposed to hazards from flames or from electrical arcs and ensure that employees who face such exposures wear the proper Personal Protective Equipment (PPE) and receive the required protection.

The assessment should consider sources of electrical arcs, including:

- Energized circuit parts not guarded or insulated,
- Switching devices that produce electrical arcs in normal operations,
- Sliding parts that could fault during operation (for example, rack-mounted circuit breakers), and
- Energized electrical equipment that could fail (for example, electric equipment with damaged insulations or with evidence of arcing or overheating)

Identify employees exposed to hazards from flames. Factors to consider include:

- The proximity of employees to open flames, and
- Whether there is a reasonable likelihood that an electric arc or an open flame can ignite flammable material.

The assessment should consider the probability that an electric arc will occur in the work area.

Estimating Incident Heat Energy

The Company must make a reasonable estimate of the heat energy to which an employee would be exposed if an arc occurs. To perform an assessment requires various parameters. Much of the information necessary to perform the estimate must come from the Host Employer. (See the "Information Transfer" section.) The information necessary to perform the estimate includes:

- Fault current
- Expected length of the electric arc
- Clearing time for the fault
- Distance between the employee and the arc

Incident heat energy is measured in cal/cm^2. Fire-retardant (FR) clothing which is arc-rated according to the exposure is required when the estimated incident heat energy exceeds 2.0 cal/cm^2.

Selecting Protective Clothing and Other Protective Equipment

The employee shall wear protective clothing and other protective equipment with an arc rating that is equal to or greater than the estimated incident heat energy that the employee has the potential to be exposed to. Arc-related protective clothing should be capable of preventing second-degree burns to an employee exposed to that incident heat energy from an electric arc. Arc-rated protective equipment may include protection for the employee's hands, face, and head.

Personal Protective Equipment

Employees working in areas where exposed electrical sources are present and contact is possible will be provided with and shall use PPE. The following rules apply to the use and care of PPE:

- PPE shall be used where exposed electrical sources are present and contact is possible.
- PPE should be designed for the work being performed and the environment in which it is used.

- PPE should be visually inspected before each use. If any defect or damage is found, the equipment should be replaced, repaired, or discarded.
- Leather protectors shall be worn over rubber gloves to keep from damaging the insulating properties of the PPE. Do not use leather glove protectors for any other work or without rubber gloves. Rubber glove protectors should not be worn as work gloves.
- Employees shall wear nonconductive ANSI Z-89.1 Type 1, Class E head protection at all times when in the field.
- Employees shall wear approved ANSI Z-87.1 safety glasses at all times when in the field.
- Whenever there is a danger of electrical arcs, flashes, or flying objects resulting from an electrical explosion, other protective equipment may be required.
- Chainsaw chaps shall be worn when operating a chain saw on the ground.
- Rubber insulating equipment shall be inspected for damage before each day's use and immediately following any incident that can reasonably be suspected of causing damage.
- Fall protection equipment (FPE) will be provided and shall be worn when employees are exposed to a fall hazard. Employees will be trained on the proper use and inspection of fall protection equipment.
- Other PPE may be required per the Arc Flash Assessment.

For more information about performing a hazard assessment, see Chapter 29, “Hazard Recognition”. For other PPE requirements, see Chapter 25, “Personal Protective Equipment”.

Electrical Rubber Goods Inspection Schedule

The inspection schedule provided in Table 8-1 will be followed, as a minimum, for rubber goods:

Table 8-1. Minimum Inspection Schedule for Electrical Rubber Goods

Type of Equipment	When to Test
Rubber insulating line hose	Upon indication that insulating value is suspect and after repair
Rubber insulating covers	Upon indication that insulating value is suspect and after repair
Rubber insulating blankets	Before first issue and every 12 months thereafter[1], upon indication that the insulating value is suspect, and after repair
Rubber insulating gloves	Before first issue and every 6 months thereafter[1], upon indication that insulating value is suspect, after repair, and after use without protectors
Rubber insulating sleeves	Before first issue and every 12 months thereafter[1], upon indication that insulating value is suspect; and after repair

[1] If the insulating equipment has been electrically tested but not issued for service, the insulating equipment may not be placed into service unless it has been electrically tested within the previous 12 months.

Some operating companies, local bargaining contracts, and customer/client requirements may have a more stringent inspection/testing schedule. The most stringent requirements will take precedence.

Selection of Rubber Gloves

When selecting the proper gloves for the potential exposure, refer to Table 8-2.

Table 8-2. ANSI/ASTM D 120 Glove Specifications

Glove Color	Class	Maximum Use Voltage (AC rms Volts)
Red	0	1,000
White	1	7,500
Yellow	2	17,000
Green	3	26,500
Orange	4	36,000

Personal Protective Clothing

When employees are exposed to flames or electrical arcs, employees shall wear clothing per the following minimum requirements:

- **Shirts**—FR arc-rated long sleeve shirt (minimum of ARC 2 and rated according to the exposure)
- **Jackets or coats**—When worn, FR arc-rated (minimum of ARC 2 and rated according to the exposure)
- **Rainwear** —When worn, FR arc-rated (minimum of ARC 2 and rated according to the exposure)
- **Pants**—FR arc-rated (minimum of ARC 2 and rated according to the exposure)
- **Coveralls**—When worn, FR arc-rated (minimum of ARC 2 and rated according to the exposure)
- **Headgear**—When wearing winter hard hat liners, FR required

Employees shall wear approved fire-retardant (FR) clothing which is arc-rated according to the exposure to protect their bodies. The outermost garment worn on the body shall be FR. Clothing that is 100% cotton may only be worn underneath the outer FR layer of clothing. All undergarments should be 100% cotton or other natural fibers. Clothing made from the following types of fabric, either alone or in blends,is prohibited: acteate, nylon, polyester, and rayon.

A hazard assessment should be made prior to the start of each job. The assessment should determine to what extent the employee may be exposed to flames or electrical arcs and determine the maximum heat energy that the employee could potentially be exposed to in a fault. The assessment should also determine the parts of the employee's body that might be exposed to flames or electrical arcs and determine if additional personal protective equipment is required. The result of the hazard assessment may determine that the exposure requires a greater level of arc-rated FR protection.

Protective Equipment and Tools

Employees should use general protective equipment and tools when in the proximity of or when working on exposed energized parts. The following rules apply:

- When working on or near exposed energized parts, qualified employees should use insulated tools or handling equipment suitable for the voltage present and the working environment.

- Fuse handling equipment, insulated for the circuit voltage, should be used to remove or install fuses.
- Ropes and other hand lines used near exposed energized lines or equipment should be nonconductive and clean.
- Portable electrical equipment should be handled in such a manner that will not cause damage. Do not staple or hang power cords in a way that can cause damage to the outer jacket or insulation.
- Portable electrical equipment should be visually inspected for damage, wear, cracked or split outer jackets or insulation, and other damage before use or before each shift. Any defects, such as cracked or split outer jackets or insulation should be repaired, replaced, or placed out of service. Only cord sets rated for hard or extra hard duty may be used.
- Always check the compatibility of cord sets and receptacles for proper use.
- Ground-type cord sets may only be used with ground-type receptacles when used with equipment requiring a ground-type conductor.
- Attachment plugs and receptacles may not be altered or connected in a way that would prevent the proper continuity of the equipment-grounding conductor. Adapters may not be used if they interrupt the continuity of the grounding conductor.
- Only portable electrical equipment that is double insulated or designed for use in areas that are wet or likely to contact conductive liquids may be used. Never use portable electric equipment requiring an extension cord when working from a bucket or off a pole.
- PPE should be used when handling portable electrical equipment that is wet or covered with a conductive liquid.
- Locking-type connectors should be properly secured after connection to a power source.
- When strap hoists are used on energized conductors, an insulating link shall also be used to increase the integrity of the strap hoist and the insulating qualities.

Safety Meetings

Safety meetings are an integral part of a proactive safety management process. There are many types of safety meetings held.

Daily, before the start of work, the crew generally should hold a documented tailgate safety meeting. The meeting should focus on safety issues relevant to the work processes to be performed that day, along with reminders regarding the safe use and inspection of the tools and equipment required for the tasks to be performed that day. The crew should also discuss any near-misses, noncompliance, or other safety issues that were encountered the previous day.

A weekly safety meeting will be held on each jobsite. The purpose is to cover subjects of great importance and relevance to the success of the job. The subjects discussed and attendance will be documented by signing a meeting roster. These meetings supplement and support the safety training provided for all employees. Weekly safety meetings will generally last between 15 and 30 minutes.

The topics may be:

- Pre-chosen and information sent to the field by the Corporate Office and/or Operating Unit.
- Pertinent to the work being performed.
- Tools and equipment being used in the field.
- Work procedures and policies of the client/customer.
- Issues related to the crew's activities.
- "Special" safety meetings, which may be called when:

- ❑ An incident occurs on a jobsite.
- ❑ Non-compliance was observed.
- ❑ New work practices and/or policies are implemented.
- ❑ New tools and/or equipment are introduced into the work area.
- ❑ Other reasons.

Job Task Safety Analysis

Each day, before the start of each workday, the supervisor/foreman (person in charge) or their designee, should conduct a job briefing or Job Task Safety Analysis (JTSA) with the employees involved (see Chapter 29). The purpose of the JTSA is to identify the hazards associated with the scope of work, determine the safety precautions that will be implemented, and the required PPE by the crew performing the work assignment. The JTSA helps ensure that all members of the crew understand the work assignment and acknowledge that they understand and will follow the safety plan established to complete the work assignment. The JTSA should be documented and signed by all crewmembers. Refer to Sample 8-1. The following are requirements for the JTSA:

- The foreman (person in charge) should assemble the crew at the job site and explain the work to be done, and outline the steps to be followed.
- The foreman (person in charge) and the members of the crew will identify the hazards of the job. The crew should identify appropriate controls to eliminate, mitigate, control, or reduce the accident-producing potential of the hazards.
- If the hazards cannot be eliminated from the jobsite, the JTSA should list how the hazards can be mitigated, controlled, or reduced. This may be done by:
  - ❑ Dedicated assignment of work responsibilities.
  - ❑ Methods to isolate or control the hazard.
  - ❑ Other forms of protection (PPE, training, others) to reduce the hazard to the employees.
- The foreman (person in charge) must ensure that each member of the crew understands all instructions given.
- If the work or operations to be performed during the workday or shift are repetitive and similar, at least one JTSA should be conducted before the start of the first job of each day or shift. An additional JTSA should be completed and a meeting held with the members of the crew if significant changes that might affect the safety of the employees occur during the course of the work. Significant changes include changes in the scope of the work, work assignments, crew structure, crew leadership, environmental conditions or when other hazards (not originally noted) are determined to be present in the workplace.
- The discussion should be in such detail that all employees, by virtue of training and experience, can reasonably be expected to recognize and avoid the hazards involved in the job. A more extensive discussion should be conducted if the work is complicated or particularly hazardous or if the employee cannot be expected to recognize and avoid the hazards involved in the job.
- The foreman (person in charge) is responsible for accounting for all employees after the completion of each job.

Existing characteristics and conditions of electric lines and equipment specific to electrical transmission and distribution industry that need to be determined before work on or near the lines or equipment begins They are:

- The nominal voltages of lines and equipment.
- The maximum switching-transient voltages.

- The presence of hazardous induced voltages.
- The presence of protective grounds and equipment grounding conductors.
- The locations of circuits and equipment, including electric supply lines, communication lines, and fire-protective signaling circuits.
- The condition of protective grounds and equipment grounding conductors.
- The condition of poles.
- Environmental conditions relating to safety.

Electrical Switching and Tagging

Introduction

When work requires that electrical switching and tagging procedures be performed on transmission or distribution circuits, the utility or other customer/client's program will take precedence over company internal work procedures. All employees should understand the general rules regarding switching and tagging and understand how to obtain a clearance from the system operator. Therefore, the Company should ensure that every employee is trained and understands the procedure that is in place at the work site.

Training

The employer should provide training to ensure that the purpose and function of the energy control program is understood and followed by employees. The knowledge and skills required for the safe application, use, and removal of the energy controls are required by employees. Each employee should receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy insulation, isolation and control.

Switching and Tagging General Practices

- A switch, fuse, tap, or any other device should not be tagged or operated without the specific instructions of the customer's representative (switching supervisor or dispatcher).

NOTE

All switching and tagging shall be performed according to the system operator's switching/tagging procedure. No employee shall perform switching and tagging procedures without authorization by the system owner. Employees performing switching and tagging shall be properly trained.

- The person receiving the orders is responsible for and should personally direct the switching procedures. All switching instructions given by the customer's dispatcher should be documented in writing, and copies should be maintained at the field office. In each case, the Dispatcher's instructions should be read back to the dispatcher to ensure the accuracy of information. Switching orders are not transferable.
- Where equipment or switches are isolated or bypassed for testing, maintenance, or construction and arrangements have been made with the customer's representative, the isolated equipment or switch can be operated.
- The supervisor or person in charge of the work should determine with the customer's switching supervisor or dispatcher the necessary switching and tagging arrangements.

- A supervisor or person in charge shall not work under the clearance of another employee or crew. If protection is required for more than one crew working on the same job, the person in charge of each crew should have the circuit or equipment tagged to him or her and should obtain clearance.
- The clearance request for transmission or distribution circuits should be coordinated according to the customer's clearance procedures.
- All information required on tags should be properly and legibly entered on each tag.
- To release a tag, or give up clearance, the person for whom the tag or clearance was issued shall contact the switching supervisor or dispatcher and release that tag in the following manner:
  1. The supervisor or person for whom the tag or clearance was made should identify himself or herself.
  2. The supervisor should determine that the person releasing the tag is the person for whom the tag was made.
  3. The employee should identify the circuit or equipment upon which he or she has been working.
  4. The employee should state that all employees and equipment are clear of the circuit or equipment, that grounds have been removed and state its condition so far as the work is concerned.
- In the event that it is absolutely necessary to place a piece of equipment in service but the equipment has been tagged to a person who is not available to remove it, the tag may be released by using the following steps:
  - ❑ The Company demonstrates that the specific procedure provides equivalent safety to the removal of the device by the authorized employee who applied it;
  - ❑ Verification that the authorized employee who applied the device is not available;
  - ❑ All reasonable efforts are made to contact the authorized employee to inform that person that the lockout or tagout device has been removed; and
  - ❑ Ensure that the authorized employee has the knowledge before they resume work on the system.
- The field office should maintain a file of all switching orders.

De-energizing Lines and Equipment

A designated employee should inform system operator that a particular section of line or equipment is to be de-energized. The designated employee becomes the employee in charge and is responsible for the clearance.

All switches, disconnects, jumpers, taps, and other means through which known sources of electric energy may be supplied to the particular lines and equipment to be de-energized should be opened. Such means shall be rendered inoperable, unless its design does not so permit, and tagged to indicate that employees are at work.

Automatically and remotely controlled switches that could cause the opened disconnecting means to close shall also be tagged at the point of control. The automatic or remote control feature shall be rendered inoperable, unless its design does not so permit.

Tags shall prohibit operation of the disconnecting means and should indicate that employees are at work.

After the applicable requirements for de-energizing lines and equipment as stated above have been followed and the employee in charge of the work has been given a clearance by the system operator, the lines and equipment to be worked should be checked for voltage to ensure that they are de-energized and protective grounds shall be installed as required.

If two or more independent crews will be working on the same lines or equipment, the crews shall coordinate their activities with a single authorized employee in charge of the clearance for all of the crews and follow these requirements as if all of the employees formed a single crew.

To transfer the clearance, the employee in charge (or, if the employee in charge is forced to leave the worksite due to illness or other emergency, the employee's supervisor) should inform the system operator; employees in the crew shall be informed of the transfer; and the new employee in charge should be responsible for the clearance.

To release a clearance, the employee in charge shall:

- Notify employees under his or her direction that the clearance is to be released;
- Determine that all employees in the crew and equipment are clear of the lines and equipment;
- Determine that all protective grounds installed by the crew have been removed; and
- Report this information to the system operator and release the clearance.

The person releasing a clearance should be the same person that requested the clearance, unless responsibility has been properly transferred.

Tags may not be removed unless the associated clearance has been released.

Only after all protective grounds have been removed, after all crews working on the lines or equipment have released their clearances, after all employees are clear of the lines and equipment, and after all protective tags have been removed from a given point of disconnection, may action be initiated to reenergize the lines or equipment at that point of disconnection. The person in charge should inspect the line to ensure that these requirements have been met. The inspection should be documented.

Aerial Basket (Bucket Truck) Operations

- Employees shall visually check the bucket truck at the first job of the day where a bucket is used. With the bucket empty, the lower controls shall be operated and checked before anyone goes aloft. The bucket should be operated through its full range of motion.
- If, during the operation of the mechanical equipment, that equipment could become energized, the operation shall comply with:
  - The energized lines or equipment exposed to contact shall be covered with insulating protective material that will withstand the type of contact that could be made during the operation; or
  - The mechanical equipment shall be insulated for the voltage involved. The mechanical equipment shall be positioned so that its uninsulated portions cannot approach the energized lines or equipment any closer than the minimum approach distances established for the work: or
  - Each employee shall be protected from hazards that could arise from mechanical equipment contact with energized lines or equipment. The measures used shall ensure that employees will not be exposed to hazardous differences in electric potential. Unless the methods in use can protect each employee from the hazards that could arise if the mechanical equipment contacts the energized line or equipment, the measures used shall include all of the following techniques:
    - Using the best available ground to minimize the time the lines or electric equipment remain energized,
    - Bonding mechanical equipment together to minimize potential differences,
    - Providing ground mats to extend areas of equipotential,
    - Use of isolation mats for access and egress to the EPZ, and

    - Employing insulating protective equipment or barricades to guard against any remaining hazardous electrical potential differences.

- No one on the ground should operate the lower controls to the bucket truck or basket while someone is in the basket except in an emergency or when following the direct orders from the employee in the basket.
- The truck should be parked out of traffic whenever possible.
- Employees should make sure that the brakes are set and the wheels are chocked before setting up the bucket truck.
- When the vehicle is provided with outriggers, they should be used.
- Before operating outriggers and/or stabilizers, employees should:
    - First check to see that everyone is at a safe distance from the equipment.
    - Notify employees outriggers are being deployed.
    - Outrigger pads should be placed under each outrigger and/or stabilizer.
    - Position the outrigger pads on firm ground. Use cribbing and/or mats under the outrigger pads, when necessary, to provide a solid footing.
    - Make sure the equipment is level before operating the boom.
- Employees in a basket shall wear an approved body harness with a shock-absorbing lanyard and/or self-retracting lanyard (SRL) properly attached to the boom or factory approved attachment point.
- Employees should not climb into or out of the basket while the basket is elevated, under normal operating conditions. Employees should not belt off to a structure while working in the basket.
- The operating control box should be kept clear of materials and tools. No ropes or objects, except approved storage containers, should be allowed to hang on the outside of the basket when employees are working in an energized area.
- The boom should be cradled and secured when the bucket truck is being moved.
- Employees should not ride in a basket when the bucket truck is moving.
- Remove all tools and equipment hanging from the bucket before the truck is moved.
- The manufacturer’s designated load limit shall not be exceeded in the loading of a bucket.
- Employees shall position themselves below energized equipment when working on it, when practical. Work shall be performed only on one conductor at a time.
- Climbing hooks should not be worn by employees who are working in a bucket.
- On a two-man bucket truck, no change in bucket position should be made without the knowledge of both employees except in case of an emergency.
- No tools or equipment should be rigged to the basket in such a manner as to cause the bucket to become unstable.
- Good housekeeping should be exercised in the bucket.
- Each aerial lift truck should be equipped with a first aid kit. This kit should contain supplies for the treatment of electrical burns and/or a water gel burn blanket.
- Booms should be periodically cleaned and inspected.
- When performing work around or on high voltage lines, electrically test each insulated aerial device every 12 months or when any repair is made that can alter the insulating quality of the unit. Ensure that all electrical tests conform to the requirements of ANSI A92.2.

Bucket Truck Testing Procedures

- Dielectric test areas should be barricaded and/or guarded. In field-testing of aerial lift devices or other insulated equipment, at least one of the following means should be used to prevent unauthorized employees from entering:
  - The test area should be guarded by the use of distinctively-colored safety tape or rope that is supported approximately waist high and to which safety signs stating, "High Voltage—Stay Away" are attached.
  - The test area should be guarded by a barrier or barricade that limits access to the test area to a degree equivalent, physically and visually, to the barricade specified in the preceding paragraph.
  - The test area should be guarded by one or more test observers who are stationed so that the entire area can be monitored.
- Aerial lift devices and other insulating equipment should be grounded during dielectric testing.

Rescue Operations

General

- Rescue and resuscitation techniques should be reviewed and practiced at least once a year.
- Each jobsite should have a documented emergency action plan. This plan should identify medical facilities for emergency and non-emergency situations, jobsite location, directions to medical facilities, and emergency contacts.
- Determine, prior to the start of each job, that a means of communication is available for contacting and summoning emergency help. Remember that cell phones do not work in all remote areas.
- Radio calls for emergency medical assistance in ***life threatening*** situations should be identified with the words, "Mayday, Mayday." Calls for other emergency situations should be identified with the words, "This is an emergency." All other radio communication should cease while the emergency is underway.
- When radios are not available, call 911 and report the emergency.
- The supervisor should be notified of emergency situations, and the supervisor should call for emergency assistance as needed. The supervisor should follow Company policy for incident reporting.
- An AED and first aid kit shall be available onsite.

Pole Top Rescue

- Rescuers should use extreme caution to prevent themselves from becoming victims. To remove the victim, de-energize the circuit. Rescuers should use adequate protection for their safety.
- A hand line should be used whenever an employee climbs poles. Hand lines should be non-conductive rope, sized accordingly for the working load limit (WLL) for the weight to be raised or lowered and equipped with an approved safety hook and block. The hand line should be attached to the pole above the cross arm, to the cross arm, or other suitable attachment point.

- The hand line can be attached to the center back D-ring if the employee is wearing a full-body harness. If the employee is not wearing a full body harness, the hand line rope can be wrapped around and secured under the victim's arms and tied to secure the victim before to lowering the victim down the pole.
- The rescuer should cut or disconnect the lanyard or pole strap and proceed to lower the victim to the ground as soon as possible.
- After the victim reaches the ground, appropriate first aid/CPR should be started as soon as possible.
- Have the AED available and ready to use should it be needed.

Tower Rescue

- Rescuers should use extreme caution to prevent themselves from becoming victims. To remove the victim, de-energize the circuit. Rescuers should use adequate protection for their safety.
- A hand line should be used whenever an employee climbs a tower. Hand lines should be non-conductive rope, sized accordingly for the working load limit (WLL) for the weight to be raised or lowered and equipped with an approved safety hook and block. Other tower rescue devices, such as tower rescue kit, may be implemented.
- A full body harness should be worn and used by employees working on transmission towers more than 4 ft (1.83 m) above the ground. A full body harness with a center back D-ring provides a point to attach a rescue line.
- The rescuer should proceed to lower the victim to the ground as soon as possible.
- After the victim reaches the ground, appropriate first aid/CPR should be started as soon as possible.
- Have the AED available and ready to use should it be needed.

Aerial Basket Rescue

- A full body harness with a shock-absorbing lanyard and/or SRL should be worn and used by employees working from aerial devices.
- The rescuer should proceed to lower the victim to the ground or to the cab screen as soon as possible using the lower controls on the equipment.
- Some aerial devices do not allow for the bucket to be lowered all the way to the ground. In those cases, the rescuer may use a hand line, attached to the pole, as an extraction device to remove the employee from the basket.
- Do not attempt to use the lower controls or go near the bucket truck until it is determined that there is no voltage at the truck, or you have a safe method to cycle the lower controls.
- The victim should be removed from the basket as soon as possible so that CPR can be administered. No attempt should be made to ventilate the lungs or massage the heart while the victim is in the basket.
- After the victim is on the ground, appropriate first aid/CPR can be started as soon as possible.
- Have the AED available and ready to use should it be needed.

Water Rescue

- When employees are engaged in work where the danger of drowning exists, the employees are required to wear a U.S. Coast Guard approved personal flotation device.

- Before and after each use, the buoyant work vests or life preservers should be inspected for defects that would alter their strength or buoyancy. Defective units should not be used.
- Ring buoys with at least 90 ft (27.43 m) of line should be provided and readily available for emergency rescue operations. The distance between ring buoys should not exceed 200 ft (60.96 m).
- At least one lifesaving skiff should be immediately available at locations where employees are working over or adjacent to water.
- After the victim is safely rescued from the water, appropriate first aid/CPR can be started as soon as possible.
- Have the AED available and ready to use should it be needed.

Working on Overhead Distribution and Transmission Lines and Equipment

- Only qualified employees may work on or with exposed energized lines or parts of equipment. Only qualified employees may work in areas containing unguarded, uninsulated energized lines or parts of equipment operating at 50 V or more. Electric lines and equipment should be considered and treated as energized until they have been de-energized in accordance with proper procedures for de-energizing lines and equipment. (Refer to section De-energizing Lines and Equipment for more information)
- At least two employees should be present, with one of the employees on the ground, while the following types of work are being performed:
    - Installation, removal, or repair of lines that are energized at more than 600 V.
    - Installation, removal, or repair of de-energized lines if an employee is exposed to contact with other parts energized at more than 600 V.
    - Installation, removal, or repair of equipment, such as transformers, capacitors, and regulators, if an employee is exposed to contact with parts energized at more than 600 V.

NOTE

The preceding condition of having two employees present while working does not apply to the following operations.

- The requirement of having two employees present while working does not apply to the following operations:
    - Routine switching of circuits, if conditions at the site allow the work to be done safely.
    - Work performed with live-line tools (hot sticks), if the employee is positioned so that he or she is not within reach of or otherwise exposed to contact with energized parts.
    - Emergency repairs to the extent necessary to eliminate hazards and safeguard the general public.
- Extreme caution should be exercised when working on energized lines in inclement weather.
- Employees doing work on energized lines should devote their undivided attention to the work at hand.
- When practical, all protective equipment should be installed from a level below the conductor or equipment. The removal of protective equipment must be done with equal care in reverse order.
- Employees working on energized lines and equipment should position themselves below the work whenever possible.

- When work is in progress on or near energized circuits on wood poles, employees on the ground should avoid standing on or touching grounds.
- When two or more employees are working within reach of each other, they should not work simultaneously on different phases or items at different potentials.
- Strap hoist or rope blocks are preferred for use on energized conductors at distribution voltages. When strap hoists are used on energized conductors, an insulating link shall also be used to increase the integrity of the strap hoist and the insulating qualities.
- When it is necessary to lay an energized conductor on a conductive part, both the conductor and conductive part should be covered with approved insulating equipment and the cross arm or pole should be covered with an approved guard.
- A system neutral shall not be opened until the proposed opening has been properly jumpered or bypassed.
- All energized conductors, including system neutral, and equipment within 5 ft (1.52 m) of the employee's work position must be covered with insulating protective equipment.
- Rope allowed to contact energized conductors of 69 kV or greater should be inspected daily. Rope used for live-line, bare-hand work should be tested daily.
- Employees should not reach beyond the protective equipment.
- All circuits and equipment should be considered energized at full voltage until de-energized, tested for voltage, and properly grounded.
- Where a possibility of back feed or induced voltage exists, protective grounds should be installed before the conductor or equipment is considered de-energized.
- Overhead series street lighting circuits and equipment should be considered energized, at full line voltage potential, unless they are de-energized, tested and properly grounded.
- Crossarm braces should not be relied upon to support an employee's weight.
- When work is being performed overhead, employees should maintain a minimum of a 10 ft (3.05 m) radius from the base of the pole, except to assist the person doing the overhead work.
- All equipment and tools to be used aloft must be raised and lowered by aerial basket, hand line, canvas bucket, or other suitable container. Heavy items should be raised and lowered by crane or hoist. Items should not be thrown or dropped from overhead positions.
- When working along streets, highways, or railroad right of way, employees should exercise care to keep hand lines from blowing into the lane of traffic.
- When working at night, floodlights or other portable lights for emergency lighting should be used to perform the work safely. Headlights and flashlights are not adequate lighting for night work.
- The stress on a pole should not be changed by adding or removing any conductor or guy until it is determined that the pole will withstand the altered stress or the pole should be supported while this work is being done.

Minimum Approach Distances

The minimum approach distances for voltages less than 72.5 kilovolts can be found in Table 8-3.

No employee may approach or take any conductive object closer to exposed energized parts than the established minimum approach distance unless:

- The employee is insulated from the energized part (insulating gloves and sleeves);

- The energized part is insulated from the employee and any other conductive object at a different potential;
- The employee is insulated from any other conductive object, as during live-line bare-hand work.

Refer to Table 8-3 for minimum approach distances.

Table 8-3. AC Minimum Approach Distances

Voltage Phase-to-Phase	Distance Phase-to-Ground Exposure		Distance Phase-to-Phase Exposure	
0.751 to 5.0 kV	0.63m	2.07ft	0.63m	2.07ft
5.1 to 15.0 kV	0.65m	2.14ft	0.68m	2.24ft
15.1 to 36.0 kV	0.77m	2.53ft	0.89m	2.92ft
36.1 to 46.0 kV	0.84m	2.76ft	0.98m	3.22ft
46.1 to 72.5 kV	1.00m	3.29ft	1.20m	3.94ft
These minimum approach distances can be used provided the jobsite is at an elevation of 900 meters (3000 feet) or less. If working above 900 meters (3000 feet) above mean sea level, the distances must be calculated using the altitude correction factor.				

For voltages over 72.5 kilovolts, the minimum approach distance can be calculated by determining the maximum anticipated per-unit transient overvoltage, phase to ground, through an engineering analysis or assume a maximum anticipated per-unit transient overvoltage, phase to ground or use the minimum approach distance found in Table 8-4.

Table 8-4. AC Minimum Approach Distances

Voltage Phase-to-Phase	Distance Phase-to-Ground Exposure		Distance Phase-to-Phase Exposure	
72.6 to 121.0 kV	1.13m	3.71ft	1.42m	4.66ft
121.1 to 145.0 kV	1.30m	4.27ft	1.64m	5.38ft
145.1 to 169.0 kV	1.46m	4.79ft	1.94m	6.36ft
169.1 to 242.0 kV	2.01m	6.59ft	3.08m	10.10ft
242.1 to 362.0 kV	3.41m	11.19ft	5.52m	18.11ft
362.1 to 420.0 kV	4.25m	13.94ft	6.81m	22.34ft
420.1 to 550.0 kV	5.07m	16.63ft	8.24m	27.03ft
550.1 to 800.0 kV	6.68m	22.57ft	11.38m	37.34ft
1. These minimum approach distances can be used provided the jobsite is at an elevation of 900 meters (3000 feet) or less. If working above 900 meters (3000 feet) above mean sea level, the distances must be calculated using the altitude correction factor. 2. The phase to phase minimum approach distances may be used provided that no insulated tool spans the gap and no large conductive object is in the gap. 3. The clear live-line tool distance shall equal or exceed the values for the indicated voltage ranges.				

When performing electric transmission and distribution work at elevations above 900 meters, the minimum approach distances should be adjusted by the appropriate factor in Table 8-5 for the elevation of the work.

Table 8-5. Altitude Correction Factor

Altitude Above Sea Level (meters)	Factor
0 to 900 m	1.00
901 to 1200 m	1.02
1201 to 1500 m	1.05
1501 to 1800 m	1.08
1801 to 2100 m	1.11
2101 to 2400 m	1.14
2401 to 2700 m	1.17
2701 to 3000 m	1.20
3001 to 3600 m	1.25
3601 to 4200 m	1.30
4201 to 4800 m	1.35
4801 to 5400 m	1.39
5401 to 6000 m	1.44

Instead of using the minimum approach distances contained in Table 8-3 or Table 8-4, a person knowledgable and competent in the field of electric transmission and distribution system design, can perform an engineering analysis and determine the maximum transient overvoltage. When the engineering analysis of the system shows the maximum transient overvoltage is lower and the minimum approach distance can be lowered from the distance shown in Table 8-3 or Table 8-4, the minimum approach distances can be adjusted accordingly. To reduce the distances, we must ensure that any conditions assumed in the analysis, for example, blocking the recloser on a circuit or installing portable protective gaps, are present during energized work. To calculate the minimum approach distances for voltages over 72.5 kV, use Table 8-6.

Table 8.6 AC Live-Line Minimum Approach Distance

For phase to phase system voltages of more than 72.5 kV nominal

MAD= $0.3048(C+a)V_{L\text{-}G}TA+M$, where

C= 0.01 for phase to ground exposures that the employer can demonstrate consist only of air across the approach distance (gap),

0.01 for phase to phase exposures if it can be demonstrated that no insulated tool spans the gap and That no large conductive object is in the gap, or

0.11 otherwise

$V_{L\text{-}G}$= phase to phase rms voltage, in kV

T= maximum anticipated per-unit transient overvoltage; for phase to ground exposures, T equals $T_{L\text{-}G}$, the maximum per-unit transient overvoltage, phase to ground, determined by the employer; for phase to phase exposures, T equals $1.35T_{L\text{-}G}+0.45$

A= altitude correction factor. See Table 8-5.

M= 0.31 m, the inadvertent movement factor

a= saturation factor, as follows

Phase to Ground Exposures					
$V_{Peak}=T_{L\text{-}G}V_{L\text{-}G}\sqrt{2}$	635 kV or less	635.1 to 915 kV	915.1 to 1050 kV	More than 1050 kV	
a	0	$(V_{Peak}-635)/140{,}000$	$(V_{Peak}-645)/135{,}000$	(VPeak-675)/125,000	
Phase to Phase Exposure					
$V_{Peak}=(1.35T_{L\text{-}G}+0.45)V_{L\text{-}G}\sqrt{2}$	630 kV or less	630.1 to 848 kV	848.1 to 1131 kV	1131.1 to 1485 kV	More than 1485 kV
a	0	$(V_{Peak}-630)/155{,}000$	$(V_{Peak}-633.6)/152{,}207$	$(V_{Peak}-628)/153{,}846$	$(V_{Peak}-350.5)/203{,}666$

Methods of Controlling Possible Transient Overvoltage

There are several means of controlling overvoltages that occur on transmission systems. The operation of circuit breakers or other switching voltages can be modified to reduce switching transient overvoltages. Overvoltages can also be held to an acceptable level by installing surge arrestors or portable protective gaps on the system. The use of switching restrictions can also minimize overvoltages.

Operation of Circuit Breakers

The maximum transient overvoltage that can reach the worksite is often the result of switching on the line on which employees are working. Disabling automatic reclosing during energized line work, so that the line will not be reenergized after being opened for any reason, limits the maximum switching surge overvoltage to the larger of the opening surge or the greatest fault-generated surge, provided that the devices (for example, insertion resistors) are operable and will function to limit the transient overvoltage and that circuit breaker restrikes do not occur. The insertion resistors must properly function to limit the overvoltage level. If the automatic recloser cannot be disabled, other methods of controlling the switching surge may be necessary.

When working on double circuit construction, surges on an adjacent line can cause significant overvoltages. The engineering analysis must account for coupling to adjacent lines.

Surge Arrestors

The use of modern surge arrestors allows a reduction in the basic impulse-insulation levels of much transmission system equipment.

Switching Restrictions

Another form of overvoltage control involves establishing switching restrictions, whereby the employer prohibits the operation of circuit breakers until certain system conditions are present. Switching is restricted by using a tagging system, similar to that used for a permit, except that the common term used for this activity is a "hold-off" or "restriction". These terms indicate that the restriction does not prevent operation, but only modifies the operation during the live-line work activity.

Capacitors

- Before working on capacitors, employees should ensure that the capacitors are de-energized, shorted out, and properly grounded.
- Employees should wait five minutes before shorting out a capacitor to allow the capacitor to drain itself by built-in discharging devices.
- Live-line tools (8 ft (2.44 m) minimum) should be used to short out and ground capacitors.
- When capacitors are removed from service, they should be shorted out and remain shorted until they are placed back into service. They must remain shorted when discarded.
- A load-break device should be used when opening any disconnect that is associated with a capacitor.
- When closing a capacitor bank that is controlled by a time clock or other remote device, check to ensure that oil switches are open, and set the time clock to close in the capacitors. If other electrical closing devices are available, they should be used.
- All other line capacitor banks should be closed by using an extendo type of stick when the employee is on the ground or by using a minimum 8 ft (2.44 m) hot stick when the employee is in a bucket.

Current and Potential Transformers (Distribution)

- When necessary, instrument transformers should be de-energized before any repairs are made on them.
- Before starting any primary metering job, voltage checks should be made on meter cabinets, conduits, and associated equipment to determine if they have become energized due to instrument transformer or other equipment failure.

- The secondary side of a current transformer should be properly wired or shunted before the primary side is energized.
- When inserting test jacks into switchboard draw-out type meters or into meter test blocks, test leads and equipment should be checked to ensure that current transformer secondary circuits are not open-circuited.
- When an open circuit exists in the secondary of a high-voltage current transformer, the current transformer should be de-energized before the secondary is closed. If an open circuit in a low-voltage current transformer secondary is encountered, rubber insulating gloves should be worn to close the secondary. If arcing exists, extra care should be taken or the circuit de-energized before the secondary is closed.
- All secondary connections to primary metering instrument transformers should be visually inspected by a qualified employee before energizing. This includes checking secondary connections on pole-mounted clusters.
- The absence of voltage on the low-voltage side of a voltage transformer should not be considered positive indication that the high-voltage side is de-energized.
- Before clearing a high-voltage circuit, all voltage transformers should be disconnected from the circuit.

Climbing Poles and Structures

- Fall Protection Equipment (FPE) shall be used ascending, descending, changing position, and when in the working position while on a wooden pole. The wood pole fall restriction device shall be engaged ground-to-ground when ascending, descending, changing position, and when in the working position.
- Climbing equipment should be inspected prior to use. Safety straps shall be equipped with double locking snap hooks.
- Before climbing poles and structures, an inspection by a qualified person should be performed to determine if it can be climbed safely.
- An inspection should be made to determine if the poles or structures can sustain the additional or unbalanced stresses to which they will be subjected from climbing or from adding or removing conductors or equipment.

If the pole or structure cannot withstand the loads imposed, it should be braced, guyed, or otherwise supported in order to prevent failure. In all cases where load or stresses are imposed, a competent person should complete a detailed Job Hazard Analysis to determine alternative means of supporting the structure.

Inspection of Poles and Structures

Before climbing poles and structures, an inspection by a qualified person should be performed. When inspecting the pole, the following conditions should be checked. Pole damage must be communicated back to the Host Employer (see Information Transfer).

General Condition

The pole should be inspected for buckling at the ground line and for an unusual angle with respect to the ground. Buckling and odd angles may indicate that the pole is rotten or is broken.

Cracks

The pole should be inspected for cracks. Horizontal cracks perpendicular to the grain of the wood may weaken the pole. Vertical ones, although not considered to be a sign of a defective pole, can pose a hazard to the climber, and employees should keep their gaffs away from such cracks while climbing.

Holes

Hollow spots and woodpecker holes can reduce the strength of a wood pole.

Shell Rot and Decay

Rotting and decay are cutout hazards and are possible indications of the age and internal condition of the pole.

Knots

One large knot or several smaller ones at the same height on the pole may be evidence of a weak point on the pole.

Depth of Setting

Evidence of the existence of a former ground line substantially above the existing ground level may indicate the pole is no longer buried to a sufficient extent.

Soil Conditions

Soft, wet, or loose soil may not support any changes of stress on the pole.

Burn Marks

Burning from transformer failures or conductor faults could damage the pole so that it cannot withstand mechanical stress changes.

Testing of Wood Poles

The following tests are recognized as acceptable methods of testing wood poles:

Hammer Test

Tap the pole sharply with a hammer weighing about 3 lb (1.36 kg), starting near the ground line and continuing upward circumferentially around the pole to a height of approximately 6 ft (1.83 m). The hammer will produce a clear sound and rebound sharply when striking sound wood.

Decay pockets will be indicated by a dull sound or a less pronounced hammer rebound. Also, prod the pole as near the ground line as possible using a pole prod or a screwdriver with a blade at least 5 inches (12.70 cm) long. If substantial decay is encountered, the pole is considered unsafe.

Rocking Test

Apply a horizontal force to the pole and attempt to rock it back and forth in a direction perpendicular to the line. Caution should be exercised to avoid causing power lines to swing together. The force may be applied either by pushing with a pike pole or pulling with a rope. If the pole cracks during the test, it shall be considered unsafe.

- If the pole or structure cannot withstand the loads, which will be imposed, it shall be braced, guyed, or otherwise supported so as to prevent failure.
- Before climbing a pole or structure, the employee should become acquainted with the physical layout and condition of the conductors, poles, guys, and equipment on the structure on which work is to be performed.

- When climbing, employees should avoid standing on any foreign equipment, which may be attached to the pole or structure or located near it. Employees should not trust their weight to pins, braces, guy wires, lines, or other such equipment that may be unstable.
- When climbing wooden poles, care should be exercised to set the gaff securely in the pole and to avoid weather cracks, knots, holes, nails, signs, grounds, or other pole attachments. All non power company-owned signs should be removed from wood poles before climbing above them.
- When attaching the safety strap snap to the D-ring of a body belt, employees should visually verify that the snap is attached to the D-ring before relying on the strap to support their weight.
- The safety belt should not be placed above the top-most attachment of the pole, at the end of an arm, on crossarm braces, or in any place where it may possibly slip off. The safety belt shall not be placed around pins or similar parts of the structure that might break.
- Climbers should not be worn on the ground unless the employee plans to immediately climb another pole. If there are obstructions such as fences, large rocks, or uneven terrain, climbers need not be removed before walking from one pole to another.
- Employees should use a gaff gauge to ensure gaffs are properly sharpened and within safe length (1-1/4-inch minimum) limits.
- When climbers are stored, the gaffs should be covered with approved protectors.
- When two or more employees are to work on the same pole, one should reach the working position before the other leaves the ground. Descending the pole should be done one at a time.
- A hand line should be hung from the structure anytime employees are working on the pole.
- An employee who has been trained in pole top/tower rescue techniques and who has tools and the ability to climb the structure should be on the ground whenever employees are working aloft. The ground employee should have the climbing tools out and ready for use.
- When climbing poles that support energized parts, first aid supplies for the treatment of electrical burns and/or a water gel burn blanket should be readily available at the work location.

Verifying Utility Locations and Potholing

Prior to starting any digging operations, local One Call locator services (811) must be contacted within established or customary local response times, advised of the proposed work, and asked to establish the location of the utility underground installations before the work begins.

The following guidelines should be followed to ensure safety during any work operations where underground utilities might be encountered:

- The location of all identified utilities should be verified using nondestructive methods of excavation.
- If any risk to the utility from the work activity is present, a “window” must be excavated at or near the utility to visually monitor the potentially hazardous situation.
- Exposed existing utilities should be adequately protected and supported.
- When crossing or running parallel to existing utilities within 3 ft (0.91 m), the utilities should be visually confirmed by exposing the buried utility at appropriate intervals.

- Because of a high risk and hazard potential, a competent person should visually confirm the location of gas lines, electrical utilities, fiber, and communication lines within the immediate vicinity of the work taking place.
- Contract documents and state and local regulations should be checked to determine responsibility for verifying locations of unmarked utilities.
- When utilizing high-pressure water for verifying utility locations, the proper PPE should include long-sleeved arm protection, dielectric shoes/boots or overshoes, safety glasses and face shield, and appropriately rated rubber insulating gloves.

As a general guide to identifying utilities, the standard surface marking colors are shown in Table 8-7.

Table 8-7. Surface Marking Colors

Color	Utility
Red	Electric power, including street lighting
Yellow	Gas, oil, steam, and petroleum
Blue	Water and irrigation
Green	Sewer and storm drains
Orange	Fiber optic, telephone, and cable TV
Pink	Temporary survey markings
White	Proposed construction area or work limits
Purple	Reclaimed water

Fall Protection

- Fall-arrest equipment or work positioning equipment with a wood pole fall restriction device attached should be used by employees ascending, descending, changing positions, and when in the working position while on a wooden pole.
- Personal fall-arrest systems should be rigged to prevent an employee from free-falling more than 6 ft (1.83 m) or contacting any lower level.
- If vertical lifelines or droplines are used, not more than one employee may be attached to any one lifeline.
- Unless designed for that purpose, snaphooks may not be connected to loops made in webbing-type lanyards.
- Snaphooks may not be connected to each other.
- Each employee working from a tower shall wear a full body harness and use an approved fall protection method.
- Each employee working from a bucket shall wear a full body harness and have their lanyard attached to the proper anchorage point.
- Each employee working from a hook ladder should wear a full body harness and use an approved fall protection method. (Examples are shock-absorbing lanyard that has one end attached to the rear center D-ring of the body harness and the opposite end attached to a rope grab attached to a 5/8-inch rope; self-retracting lifeline (SRL), or other approved methods).
  - Each employee should be attached to a separate lifeline.
  - The rope should be attached to the crossarm or structure by means of a locking carabiner attached to a tie-off adapter and should be long enough to hang past the bottom of the hook ladder.
  - Employees may omit the lifeline if a 6 ft (1.83 m) (maximum length) shock-absorbing lanyard attached to a tie off adapter will provide enough length to access the work area.

- In lieu of this method, employees may use self-retracting lifelines (SRL) to ascend and descend hook ladders. Each SRL should be attached to the structure by use of a tie-off adapter or other approved anchorage point. The snap end of the SRL should be directly attached to the rear dorsal D-ring of the body harness. Shock absorbing lanyards should not be used in conjunction with an SRL.

Foundation Construction

- Employees working around hole digging equipment should stand clear of dirt being thrown off augers.
- Utility companies, owners, and local one-call locator services should be contacted within established or customary local response times, advised of the proposed work, and asked to establish the location of the utility underground installations before the excavation is started.
- Holes should not be left open overnight. They should be barricaded or covered with a suitable covering capable of sustaining the maximum intended load that may be imposed on the cover. Covers should be marked “HOLE” or "COVER" to identify the potential hazard underneath. This provision does not apply to cast iron manhole covers or steel grates used on streets or roadways.
- All employees working around concrete trucks should be warned and made aware of the injuries associated with the concrete chutes.
- Chutes, pipes, and funnels used to pour concrete that have become damaged should not be used and should be removed from service.
- Employees contacting wet cement should wear appropriate protective gloves.
- Dust masks will be made available for employees operating jack hammers, pavement breakers, and cut-off saws.

For more information regarding the safety requirements around drilled holes, please refer to the “Best Practices: Drilled Holes - Pier or Direct Embed Foundations” document.

- Drilled holes for structure foundations or direct embed poles greater than 30 inches in diameter shall have a ***Protection Zone*** placed around the hole before it reaches six (6) feet in depth. The Zone can be a guardrail system or steel casing.
- Employees should avoid the edge of excavated holes. Employees whose work requires that they be at the edge of an excavated hole, shall use appropriate fall protection/prevention such as a full-body harness attached to a suitable anchorage with a self-retracting lanyard (SRL).
- All full-body harnesses used for drilling holes for structure foundations or direct embed transmission poles must be specifically selected and approved for this type of work.
- Employees should use safe lifting techniques when handling rebar.
- Employees should not be inside rebar cages while the cages are being constructed or positioned.
- Rebar cages should be adequately supported by stands, blocking, or bracing while being constructed to prevent rolling or collapse.
- Rescue equipment should be available onsite where employees are working around holes. Employees should be trained in proper hole rescue procedures.

Transportation of Explosives

- Transportation of explosives should meet the provisions of all federal, state, and local Department of Transportation (DOT) and/or Department of Alcohol, Tobacco & Fireman (ATF) regulations.
- Motor vehicles or conveyances transporting explosives should only be driven by, and be in the charge of, a licensed driver who is qualified to handle and transport explosive materials. The driver should be familiar with the local, state, and federal regulations governing the transportation of explosives, and have the appropriate HAZMAT endorsement on their license.
- No person may smoke or carry matches or any other flame-producing device, nor should firearms or loaded cartridges be carried while in or near a motor vehicle or conveyance that is transporting explosives.
- Explosives, blasting agents, and blasting supplies should not be transported with other materials or cargoes. Blasting caps (including electric) should not be transported in the same vehicle with other explosives unless transported in specialized containers approved for the transportation of explosives by the DOT.
- Vehicles used for transporting explosives should be strong enough to carry the load without difficulty and should be in good mechanical condition.
- When explosives are transported by a vehicle with an open body, a Class II magazine or original manufacturer’s container should be securely mounted on the bed to contain the cargo.
- All vehicles used for the transportation of explosives should have tight floors. Any exposed spark-producing metal on the inside of the body should be covered with wood or other nonsparking material to prevent contact with containers of explosives.
- Every motor vehicle or conveyance used for transporting explosives should be marked or placarded on both sides and on the front and rear with the word “Explosives” in red letters. The placard should be at least 4 inches (10.16 cm) in height with a white background. In addition, the motor vehicle or conveyance may display a red flag measuring 18 inches (45.72 cm) by 30 inches (76.20 cm) with the word “Explosives” painted, stamped, or sewed on it. The letters should be white and at least 6 inches (15.24 cm) in height, and the flag should be visible from all directions.
- Each vehicle used to transport explosives should be equipped with a fully charged fire extinguisher that is in good condition. An Underwriters Laboratory-approved extinguisher of not less than 10-ABC rating meets the minimum requirement. The driver should be trained in the use of the extinguisher on the vehicle.
- Motor vehicles or conveyances carrying explosives, blasting agents, or blasting supplies should not be taken inside a garage or shop for repairs or servicing.

Blasting Operations

- All blasting operations should be in accordance with all federal, state, and local regulatory requirements.
- A blaster should be qualified, by reason of training, knowledge, or experience, in the field of transporting, storing, handling, and using explosives and should have a working knowledge of the state and local laws and regulations that pertain to explosives and licensed where required.
- Blasters are required to furnish satisfactory evidence of competency in handling explosives and performing in a safe manner the type of blasting that will be required.
- The blaster should be knowledgeable and competent in the use of each type of blasting method used.

- Procedures that permit safe and efficient loading should be established before loading is started.
- All drill holes should be large enough to enable the cartridges of explosives to be inserted.
- Tamping should be done only with wood rods or plastic tamping poles without exposed metal parts, but nonsparking metal connectors may be used for jointed poles. Violent tamping should be avoided. The primer should never be tamped.
- No holes should be loaded except those to be fired in the next round of blasting. After loading, all remaining explosives and detonators should be immediately returned to an authorized magazine.
- Drilling should not be started until all remaining butts of old holes are examined for unexploded charges. Any charges that are found should be re-fired before work proceeds.
- No person should be allowed to deepen drill holes that have contained explosives or blasting agents.
- No explosives or blasting agents should be left unattended at the blast site.
- Machines and tools not used for loading explosives into bore holes should be removed from the immediate location of holes before explosives are delivered. Equipment should not be operated within 50 ft (15.24 m) of loaded holes.
- Do not use two-way radios and cell phones—a static charge from these devices might ignite the explosives.
- No activity other than loading holes with explosives is permitted in a blast area.
- Power lines and portable, electric cables for equipment being used should be kept a safe distance from explosives and blasting agents being loaded into drill holes.
- Holes should be checked before loading to determine depth and conditions. There should be no drilling within 50 ft (15.24 m) of a hole that has been loaded with explosives if the explosives have failed to detonate.
- When more than one loading crew is loading a long line of holes, the crews should be separated by practical distance and have proper supervision.
- No explosive should be loaded or used underground in the presence of combustible gases or combustible dusts.
- Warning signs indicating a blast area should be maintained at all approaches to the blast area.
- Drill holes that are not water-filled should be allowed to cool before explosives are loaded.
- No loaded holes should be left unattended or unprotected.
- The blaster should keep an accurate, current record of explosives, blasting agents, blasting supplies and IMPLO products used in a blast and should keep an accurate running inventory of all explosives and blasting agents stored on the operation.

Live-Line Insulator Washing (Wet Washing)

- Only employees trained in the safe work practices required for live-line insulator washing may wash insulators on energized equipment.
- Although live-line washing is considered a normal cleaning procedure, equipment may be de-energized with customer permission. If the equipment cannot be de-energized, the automatic reclosing device of the circuit to be washed should be made inoperative.
- Water with a resistance of 800 ohms per inch or greater should be used.

Water resistance varies with outside temperatures: as the temperature rises, resistance falls. For example, water that tests at 1000 ohms per inch at 60° F (16° C) is allowed to stand in a tank exposed to direct sunlight. At 80° F (27° C), the water resistance may drop to 820 ohms per inch.

- Each tank of water should be tested before each use.
- Water nozzles are of a special design developed by the Bureau of Test and Inspections and have highly polished steel orifices. The nozzles should be returned to the Bureau when the stream pattern shows signs of noticeable change. Leakage currents in the water stream increase as the size of the nozzle orifice increases. Orifice sizes are normally 3/16, 7/32, and 1/4 inches in diameter, with 1/4 inches being the most common.
- The optimum pressure at the nozzle should be between 500 and 700 psi.
- Whenever possible, employees should direct the spray into the wind when washing. Care should be taken to avoid over-spray onto automobiles, clotheslines, building, and so on. Employees should make every effort to notify property owners before starting the washing process.
- Lower levels must be washed first. When washing at higher levels, employees should try to keep contaminated drippage clear of clean insulation below.
- When washing pin-type, pedestal-type, or post-type insulators, apparatus bushings, lightning arrestors, or coupling capacitors installed in an upright position, start washing at the bottom and wash upward toward the conductor.
- When washing suspension insulators, employees should start washing at the conductor and wash upward toward the structure.
- If a flashover starts during the washing process, employees should keep the water stream into the arc.
- When washing insulators supported by grounded steel structures, either from the ground or from the tower, the water nozzle should be grounded to the tower.
- Two nozzles should always be used when washing energized substations. The washers should stand approximately 90 degrees from each other and should wash the same insulator or part together.
- One hose operator should be the lead washer, and the second hose operator should follow the lead washer’s stream.
- Insulators on wooden structures should not, under any circumstances, be washed with the hose operator standing on the same structure supporting the energized conductors or parts.
- When the washing process is underway, an employee should be stationed at the machine to monitor the water resistance and the status of the machine. This employee should stand on a grounding mat attached to the washing machine. The washing machine should be grounded to the substation grid when working in a substation or to a driven ground rod.
- When washing from an aerial lift, the hose should be secured to the boom of the aerial lift.
- The minimum safe working distances outlined in Table 8-8 should be followed.

Table 8-8. Working Distance In Feet

Voltage Phase-to-Phase	3/16-in Nozzle	1/4-in Nozzle
4 to 22 kV	8 ft	
30 to 50 kV	10 ft	
55 to 80 kV	12 ft	
Above 80 kV	See MAD Tables	

Meter Testing and Installation

- Before starting work on a meter installation, all meter parts should be treated as energized until tested for voltage. If a neutral or ground is disconnected, all meter parts will be treated as energized until a permanent or temporary ground is installed.
- Only approved equipment may be used in testing for voltage or in testing for polarity. Only approved tools may be used.
- All tools, leads, jumpers, and test equipment should be frequently inspected. No defective tools or equipment may be used.
- When testing, one hand should be used when possible to make connections to energized points.
- Before installing a meter in a new or previously vacated meter socket, a visual check should be made of the meter (including the nameplate and meter base) and enclosure to ensure that the proper meter is being used and the equipment is in good working condition.
- On all reconnects and new services, tests should be made for back feed, proper phasing and voltage, and grounded conductors before installing a meter.
- When inserting socket-type meters into socket bases or adapters, load-side prongs should be inserted before line-side prongs. Meter removal should be performed in reverse order.
- When inserting a socket-type meter, the meter cover should not be struck with the hand or other objects. Should breakage occur or exist, all broken glass should be removed from the meter and the customer’s premises and disposed of in a safe manner. Broken or cracked glass should be removed before shipping.
- Before bypassing any meter device with jumpers, a check should be made to ensure that all electrical connections are tight and, by use of a voltage tester, to ensure that the polarity of all jumpers is correct.
- Extreme caution should be used when working on or near a 480 V meter installation.
- Approved rubber insulating gloves with leather protectors should be worn when working on energized equipment.
- Arc-rated face shields should be worn when working on energized metering equipment, large wire trough installations, large group metering installations, or when a hazardous condition exists that might cause a flash or injury to the face or eyes.
- An arc-rated face shield is required when working on energized meters and/or when removing and replacing meters. (See Chapter 13, “Arc Flash Protection”.)
- When installing or removing 277/480 V or 240/480 V meters, an approved meter safety holder should be used.
- Meters should not be tested, installed, or removed where explosive gases are suspected.

- If a visual inspection of the metering installation reveals that the removal of the meter might cause a fault, no attempt should be made to remove the meter until the service has been de-energized.
- Customer loads should be turned off before installing or removing meters. Never remove or install a meter if the main disconnect cannot be opened.
- Meter socket bypass handles should not be used as service load-break devices.
- If a meter socket is to be left energized, a proper meter or approved socket cover should be installed and sealed, or other protective measures taken.
- Portable test equipment leads should be connected to the test equipment before energizing the test circuit.
- Potential test leads and jumpers used in testing watt-hour meters should be properly fused.
- Approved fuse pullers should be used to remove cartridge-type fuses.
- When removing or installing a bolted-in, polyphase, self-contained meter, the meter socket should be de-energized, unless approved insulated (rated) tools are being used and the customer main disconnect is open.
- Special care should be taken when setting or removing network meters so that the fifth terminal on the meter or socket is not damaged.

Pole Loading, Unloading, and Hauling

- During pole loading or unloading operations, employees should not stand between the pole pile and the loading or transporting equipment.
- At least two employees, a driver and a spotter, should be assigned to pole hauling. The spotter should assist the driver with loading and unloading poles and watching traffic at the side and rear of the truck.
- Slings should be used to load and unload poles. Pole tongs should not be used to load or unload poles. Employees should not be permitted to reach under suspended loads while attaching or removing the sling.
- Employees should not stand or pass beneath suspended loads.
- Unloading poles from rail cars is hazardous and should be done only by experienced personnel.
- All unauthorized personnel should be kept clear of all pole-handling operations.
- If when unloading poles from a rail car, it becomes necessary to move the car, only an agent of the railroad may do so.
- A winch line or other tightening device of adequate strength to hold the load should be secured around the load before removing bands or stakes from rail cars.
- Employees and equipment should be positioned in such a way as to avoid injury or damage should a load of poles get out of control.
- To control or guide a pole during the loading or unloading process, tag lines should be used. When using a tagline, the tagline should be placed on the end of the poles. Taglines should be of sufficient length to keep employees a safe distance from the load. Employees guiding suspended poles should do so only from the ends of the suspended load.
- Employees handling poles should wear a hardhat, safety glasses, and work gloves. Care should be taken to avoid unnecessary contact with treated poles to reduce the possibility of chemical burns.
- When poles should be rolled from a pile or from a trailer to the ground, a line, cant hook, or other approved tools should be used.

- Poles should be securely fastened to the trailer when being hauled. During daylight hours, a red flag should be fastened to the far end of the pole that protrudes farthest to rear. After dark, a steady, burning red light should be used instead of a flag. (State law may dictate type and/or color of light to be used in night operations.)
- When hauling transmission poles or when hauling any poles in heavy traffic areas, use a follow vehicle. The follow vehicle should utilize their emergency flashers and have strobe lights mounted, and in use, where it can be seen from all directions.
- When the driver is maneuvering corners, other motorists should be given as much advance warning as practical.
- A pole trailer with a pintle hook attachment should be properly connected to its towing vehicle with safety latches and chains. The safety chains should be capable of supporting the gross weight of the pole trailer should a failure occur.
- Poles temporarily stored along the streets or highways should be placed behind the curb or beyond the ditch line and be blocked so that they cannot roll. Poles stored within 15 feet of the street or highway should have cones placed around them.
- Routinely inspect the pole trailer for signs of stress and cracked or fatigued metal members. Immediately remove from service a damaged trailer until proper repairs have been completed.
- Employees should not be on a pole pile or pole trailer when poles are being placed or removed.
- When loading or unloading poles on public highways, advance warning signs, flagpersons (if needed due to blocking lanes), emergency flashers, and strobe lights (if so equipped) should be used.

Radiation Hazards

- No employees shall look into an open waveguide or antenna connected to an energized microwave source.
- When an employee works in an area where the electromagnetic radiation could exceed established safe levels, the Company shall take measures to ensure that the employee's exposure does not exceed safe levels. Such measures may include administrative and engineering controls and personal protective equipment.

For more information regarding radiation hazards, please refer to Chapter 21, "Radiation Hazards."

Setting and Pulling Poles

- Only qualified operators, or operator apprentices under the direct observation and direction of a qualified operator, may set or pull poles.
- Determine the weight of the pole to be set.
- Poles being raised or lowered should be handled with the butt end heavy. When a standing pole is cut off, it should be kept under control at all times.
- All truck outriggers should be properly extended when setting or pulling poles. Outrigger pads and/or mats should be used under outriggers for increased stability.
- While a pole is suspended from the derrick or the winch line of the truck, the truck should not be moved.

- Holes should not be left open overnight. They should be barricaded or covered with a suitable covering capable of sustaining the maximum intended load that may be imposed on the cover. Covers should be marked “HOLE” or "COVER" to identify the potential hazard underneath. This provision does not apply to cast iron manhole covers or steel grates used on streets or roadways.
- When setting or pulling poles between or near energized lines, any employee who might contact or come in close proximity to the pole or truck should wear rubber gloves, rubber sleeves, di-electric overshoes, di-electric boots, and/or use insulated pole tongs. The boom and cable should be kept clear of conductors.
- When setting or pulling poles, where the voltage allows, the conductors and pole should be covered with approved insulating equipment. Line covers may be equipped with tag ropes to pull the cover along the conductor as the pole is being raised so that the pole, boom, or winch line is always protected and inside of the line cover.
- Where the voltage is too high to use line cover, the minimum approach distance for the voltage involved should be maintained and a spotter assigned or conductors should be de-energized.
- When setting or pulling poles in close proximity to an energized circuit, the automatic reclosing apparatus protecting the circuit should be rendered inoperative.
- When using pole claws or when piking poles, extreme caution should be used to keep the pole under control at all times.
- Employees should not be on poles that are being plumbed or tamped unless the poles are properly secured.
- Do not use digger derrick or material-handler winch rope to pull poles. Use a pole jack with proper chain to pull poles.
- When setting or pulling concrete or steel poles between or near energized lines, special attention should be exercised to keep the pole under control. Where the voltage allows, the conductors should be covered with insulating equipment, and the pole itself should be covered with pole guards.
- When setting or pulling slip-joint, steel poles, a steel plate or chain hoist (three-ton minimum) should be rigged across the splice on both sides of the pole to keep the pole sections from slipping apart.
- The operator should be at the controls whenever the crane and/or digger derrick is supporting a load.
- Employees should avoid the edge of excavated holes. Employees whose work requires that they be at the edge of an excavated hole 30 inches or greater in diameter shall use appropriate fall protection/prevention such as a full-body harness with a rope attached to a suitable anchorage or a barricade system to prevent an employee from falling in the hole.

For more information regarding the safety requirements around holes, please refer to the “Best Practices: Drilled Holes - Pier or Direct Embed Foundations” document.

- Chainsaw chaps shall be worn when using a chainsaw to cut poles while standing on the ground.

Supporting Poles During Excavation

- Extreme caution should be taken when excavating or digging next to or in close proximity of an existing pole or structure. Means should be devised to ensure that the pole or structure is supported during the excavation process. A digger derrick equipped with pole claws or temporary bog shoe may be used for support.
- A qualified operator should be at the controls and the vehicle should be running whenever the excavation process is in the near vicinity of the pole being held. The operator should remain at the controls until the excavation process has cleared the pole and the proper support has been installed.

Voltage Regulators

Before opening or closing regulators, the employee should verify that the regulator is in the neutral position and the control power is off.

Additionally, a written step-by-step procedure should be developed and followed for all regulator switching in conjunction with the system operator's procedures.

Testing Procedures

- When phasing a circuit, testing for voltage, or testing for polarity, only approved equipment rated for the anticipated voltage may be used.
- When testing energized circuits or equipment, all temporary leads used in testing should be adequately supported to prevent injury.
- The lack of voltage on the low-voltage side of a transformer should not be considered a positive indication that the high-voltage side is de-energized.
- Transformer banks that are to be taken out of service to replace the bank, to replace a single transformer, to change the service, or in a conversion should have the rotation and the voltage tested and verified with approved rotation and voltmeters. Before the bank is reenergized, where possible, the main breaker should be opened and the voltage and rotation verified to be back in the original state. When the voltage and rotation are verified as correct, the main breaker may be closed.

Transformers (Distribution)

- Transformers should be energized and de-energized with the use of an insulated live-line tool, such as a switch stick or grip-all stick.
- Transformers rated at 25 kV or greater shall be de-energized with a load-break tool attachment.
- All grounds and neutrals should be disconnected last and reconnected first.
- When energizing a transformer from an aerial lift, the operator should position the basket as far as practical from the transformer and should not position the basket under the transformer.
- Employees working from the pole should descend from the pole and energize the transformer using an extendable live-line tool.
- Before energizing any transformer, the supervisor or lineman should determine that the transformer is of the correct size and voltage rating.
- Voltage should be checked on all transformers before the service is connected to the transformer secondary bushings.

- Rotation and voltage should be checked and recorded before de-energizing all transformer banks and should be verified to be correct after the bank is reenergized. Where possible, the customer should be isolated from the bank until rotation and voltage have been determined to be correct.
- In delta secondary transformer banks, the “wild leg” or 208 V leg should be identified and marked before the bank is de-energized, and the leg should be verified to be in the correct location after the bank is reenergized.
- No employee may be under any transformer being installed for any reason at any time until the transformer is secured to the structure by the transformer hanging brackets. Employees climbing poles that have transformers mounted on them should avoid climbing under the transformer.
- Transformer cases should be grounded or should be considered to be energized at primary voltage.
- Transformers should be installed using manufactured transformer gins, digger derricks, or block and tackle. In no case may transformers be hoisted by a hand line. Pole line hardware, such as L-brackets and cross arms, should not be used to support rigging used to hoist a transformer.

Use and Care of Tools

- Metal tapes, tapes having metal strands woven in the fabric, brass-bound rulers, metal scales, and metal gauges should not be used when working on or near energized conductors or equipment. Only non-conductive measuring tools should be used around energized lines or equipment.
- Hand lines should be non-conductive rope sized accordingly for the working load limit (WLL) for the weight to be raised or lowered and equipped with an approved safety hook and block.
- Each employee should inspect his or her climbing tools, body belts, safety belts, lanyards and/or full body harnesses before each use.
- A gaff should not be less than 1-1/4 inch (3.18 cm) long, measured on the inside. Gaff protectors must be used when climbers are not in use.
- Tools carried in the tool belt should be secured so that they cannot fall. Large tools should not be carried in the tool belt.
- The tool bucket should be kept free of broken glass, broken pieces of porcelain, nails, and other materials that might damage rubber gloves or other protective equipment.
- Tools should not be thrown from the ground to the working position or from the working position to the ground.
- Insulation on hand tools must not serve as a substitute for rubber gloves.
- When not in use, pruning tools, handsaws, axes, hatchets, and machetes should be covered with an approved sheath.
- Employees working from a pole and using power saws should use extreme caution to avoid cutting their safety straps.
- All tools should be periodically inspected and any defective tools removed from service and tagged, regardless of ownership.
- All live-line tools, insulated platforms, barriers, and cover-up materials should be inspected visually before use. Where hazardous defects are indicated, the equipment should be removed from service and tagged.

Wire-Stringing Operations

- If the conductors being installed or removed cross over energized conductors in excess of 600 volts, and if the design of the circuit-interrupting devices protecting the lines so permits, the automatic reclosing feature of the circuit-interrupting device shall be made inoperative (non-automatic) and tagged according to the procedures of the system operator.
- When removing empty conductor reels and loading full ones, all persons not actively engaged in the work should stay a safe distance away.
- Employees should avoid placing themselves in “caught between” situations when loading, unloading, or handling reels.
- Extreme caution is required when digging holes for guard structures to avoid cutting or damaging buried utilities.
- Prior to any digging operations begin, local One Call locator services must be contacted within established or customary local response times, advised of the proposed work, and asked to establish the location of the utility underground installations before any digging begins.
- Extreme caution should be taken when setting or removing guard structures near energized equipment. Employees handling or guiding the pole butt should wear rubber gloves, rubber sleeves, di-electric overshoes, di-electric boots, and/or use insulated pole tongs. Minimum approach distance (Table 8-3 or Table 8-4) should be observed when installing guard poles and when hanging guard arms in proximity to high voltage power lines.
- Extreme care should be taken by employees hanging guard arms near energized equipment. Only qualified climbers may climb guard poles that are set in proximity of energized lines or equipment. Employees should stay on the opposite side of the upright from the energized equipment, and employees should maintain complete control of slings used to hang guard arms. Under no circumstances may slings be whipped around guard arms.
- Guard poles set within 15 ft (4.57 m) of a roadway should have reflective markers or traffic cones in place to warn passing motorists.
- Entrances to puller or tensioner setups that pull directly off a main road should be marked with advance warning signs in both directions of travel.
- Care should be taken to ensure that mud does not build up on the highway where equipment enters and exits from puller and tensioner setups.
- When in use, all pulling and tensioning equipment should be grounded by attaching a 4/0 ground conductor between the body of the puller, tensioner, or reel stand and a ground rod that is installed to a depth of at least 5 to 8 ft (1.52 to 2.44 m) or a known ground such as a substation grid.
- Employees should not touch equipment unless rubber gloves, rated for the exposure voltage, are being worn and/or equal potential grounding (EPZ) methods are in place.
- A traveling ground should be installed between the tensioning reels and the first structure in order to ground each bare conductor and subconductor during the stringing operations.
- During transmission stringing operations, each bare conductor and subconductor (excluding ADSS fiber-optic cable) should be grounded at the first structure using an approved grounding block adjacent to the tensioning and pulling machine and at increments of no more than 2 miles (6.44 km) apart.
- Grounds are to be installed and removed only with an approved insulated hot stick.
- The grounds should be left in place until the conductor installation is complete. The grounds must be removed as the last phase of the stringing operations.

- Grounds shall be installed on each conductor and subconductor and at all catch-off points, including snubs and dead ends before attaching the catch-off rigging.
- Grounds shall be installed within 10 ft (3.05 m) on either side of where conductors are being spliced on the ground.
- Rubber insulating gloves should be worn or equipotential grounding zone (EPZ) shall be in place when adjusting reel stand brakes while standing on the ground.
- Wire being strung, removed, or sagged close to energized lines or equipment should be handled with rubber protective equipment unless an equipotential zone has been established.
- Wires or rope being pulled in or out should not be allowed to sag to less than 18 ft (5.49 m) over a street or highway. Install guard structures when necessary.
- Rope, lines, cables, or wires hanging from poles, structures, or equipment should be tended or properly secured.
- Employees should not stand in loops of rope or wire or tie wire or rope around the body.
- Reliable communications, through two-way radios or equivalent means, should be maintained between the reel tender and the pulling rig operator. The preferred method is to have radios mounted on the puller and tensioner or use portable radios. In the event that this system fails, as a temporary alternative, a radio mounted in a separate vehicle may be used as long as the vehicle in which the radio is mounted is bonded to the puller or tensioner with a minimum 2/0 ground conductor.

Refer to Chapter 11, Equal Potential Grounding and Bonding Work Zone Safety.

- A transmission clipping crew should have a minimum of two structures clipped between the clipping crew and the conductor being sagged. When working on bare conductors, clipping and tying crews should work between grounds at all times and should install a working ground at their work location. The grounds should remain in place until the conductors are clipped.

Spacer Cart Operations

- Prior to utilizing a spacer cart, a site-specific safety plan will be developed to identify the hazards associated with this operation. The plan should be submitted to the Safety Department for review.
- Spacer cart operations will not begin until it has been verified that the circuit is de-energized and grounded, except when performing barehand work procedures.
- Prior to starting spacer cart operations, the carts should be inspected and all safety chains should be intact and in working condition. No carts should be used without safety chains.
- During spacer cart operations, employees will be anchored with a full body harness and a shock-absorbing lanyard. The site-specific safety plan should address proper anchorage points for the work operation being performed.
- Spacer cart operations should stop during stormy or extremely windy conditions.
- Caution should be taken to ensure that spacer carts, when crossing over roadways and other existing lines, do not contact the objects being crossed over.
- Never fuel a spacer cart motor while the motor is running. Never pour fuel into a hot motor. Allow the motor time to cool off before fueling. Ensure a properly rated fire extinguisher is available in the spacer cart.

- Be alert for moisture, fog, ice, or snow on the conductor that may affect the drive wheel traction of the spacer cart.
- When utilizing a hook ladder for entry or exit from a spacer cart, the hook ladder should be secured to the structure and rigged with 100% fall protection; the employee can also be attached to a retractable lanyard that is secured to the structure prior to exiting the cart. A rescue plan must be established before the start of this operation. In an emergency, the cart operator may use an emergency lowering device with 100% fall protection.
- At no time can a hand line be used to enter or exit a spacer cart.
- At no time will the spacer cart be utilized as a man basket except during rescue procedures when the entire cart can be lowered to the ground with the employee secured.
- Extreme caution should be used when spacing up to a running angle. Due to the angle of the wire, the operator may not operate the cart through the angle.

Working on Downed Lines and Equipment

- "Attached to the circuit" is defined as lines or equipment that are connected to the electrical circuit or customer load.
- Downed lines and equipment still attached to the circuit should be considered energized at full voltage until de-energized, tested for voltage, and grounded.
- Before beginning work, the person in charge should take measures to protect employees and the public, identify special hazards related to induced voltage and back feed, and develop a plan of action. A tailgate safety meeting should be documented and should include information about the actions taken in the previous statement when a crew is involved.
- Employees doing work on downed lines and equipment should exercise extreme caution and devote their undivided attention to the work at hand.
- Employees should work on downed lines or equipment as energized at full voltage unless both ends of the line are visible from the point of work, isolated, or the line has been tested and grounded.
- When feasible, establish an EPZ.
- Wear all appropriate PPE.

Work Area Protection

For more information, see Chapter 28, "Work Zone Safety."

- Guidelines for specific work area protection situations should be followed, as described in the Manual on Uniform Traffic Control Devices.
- Signs, and in some cases lights, should be placed well in advance of the work area and in accordance with approved standards to allow the motorist time to adjust to upcoming conditions. As much advance warning shall be given as practical.
- All signs should be located on the side of the roadway and maintained at right angles to, and facing, oncoming traffic.
- Only approved warning devices may be used. Signs may be equipped with orange flags for better visibility.
- Signs should be removed when the work has been completed. If work is temporarily suspended, signs should be covered or removed.

- When the work area is adjacent to or encroaches on a lane of traffic, cones should be used as delineators to channel traffic away from the work area. The taper should be long enough that vehicles approaching the restriction side by side have sufficient distance in which to adjust their respective speeds and merge to a single lane before the end of the transition.
- Every effort should be made to move traffic around the work area as safely and expeditiously as possible. If there is enough room for two vehicles to pass each other, cones should be used to divide the space into two lanes. Maintain a ten (10) foot minimum lane width or nine (9) foot for low volume/low speed roads when establishing travel lanes.
- If there is only room for one-way traffic, the entire lane should be blocked off.
- In light traffic areas, it may be necessary to designate a member of the crew as a flagperson. Only qualified employees who have been properly trained can flag traffic. A flag person should use an approved stop/slow paddle. All employees working within 15 feet of the roadway should wear a minimum of a Class 2 reflective vest. Class 3 reflective vests may be required under certain circumstances.
- Under extremely heavy traffic conditions, a second flagperson may be required. Each flag person should be able to see and communicate with the other clearly to coordinate their signals.
- Be aware of all local and/or state regulations when establishing work zones that impede the natural flow of traffic.

Warnings and Barricades

Warnings and barricades should be employed to alert unqualified employees, the general public, and other contractors of the present danger related to exposed energized parts. The following rules apply:

- Safety signs, warning tags, should be placed on the rear of trucks and equipment used in energized work areas to warn of the electrical hazards present, even temporarily, that may endanger them.
- Nonconductive barricades should be used with safety signs to prevent individuals from accessing exposed energized parts or areas that have the potential to become energized, such as wire string areas. (Refer to Chapter 11 for more information for EPZ work area controls.)
- Where barricades and warning signs do not provide adequate protection from electrical hazards, an attendant should be stationed to warn and protect individuals.

Sample 8-1. Job Task Safety Analysis—Power

Job Task Safety Analysis - Power

Company Name:	Date:	Time:	Job #:
Location:		City:	State:
Describe job task:			
Competent Person Trenching / Excavation:		Soil Classification:	
Person responsible for First Aid / CPR:			
Name and Location of Emergency Medical Facility:			
Location of AED:		Emergency Contact Number: 911	

Each checklist item has boxes for Yes and N/A.

PPE Required
- Hardhat
- Safety Glasses/Goggles
- Hearing Protection
- Leather Gloves
- Dielectric Overshoes
- Face Shield
- Welding Hood
- Chemical Gloves
- Dielectric Gloves
- Protective Sleeves
- Air Test (Electrical PPE)
- Class 2 Reflective Vest
- Class 3 Reflective Vest
- Respirators

Fall Protection
- "Buck Squeeze"
- Full Body Harness/Lanyard
- Climbing Belt
- Qualified Climber
- 100 % Fall Protection-Tow…
- Warning Line
- Safety Monitor
- Barricaded/Control Zo…
- Falling Object Protecti…
- Daily Inspections

Aerial Lifts
- Qualified Operator
- Wheels Chocked
- Grounded & Barricad…
- Warning Labels
- Controls Labeled
- Lower Controls Operational

Ladders
- Daily Inspection
- Warn./Usage Labels Affixed
- 3 Feet Above Landing
- Ladder Secured

Confined Space
- Competent Person
- Permitted/Non-Permitted
- Calibrated Monitor
- Continuous Monitoring
- Hole Watch
- Man Hole Guard
- Forced Ventilation
- Rescue Equipment
- Resc. Team/Serv. Identified
- Hot Work Permit
- Warning Signs
- Written Program on Hand
- Contractors Notified
- Confined Space Log Book

Excavations
- Compete… …son
- Utiliti…
- Integ… Structures
- Soil…
- Loc… …Bank
- Ov… L… …tection
- W… Tre…
- L… Ram… …le 1)
- L…
- S…
- …ated Data
- …sphere Tested
- …y/Periodic Inspection
- Warning System
- Emergency/Rescue Equip.
- Log Book

Sanitation
- Water (Marked as Potable)
- Single Use Cups
- Clean Restrooms
- Hand Wash Station

Traffic Control
- Traffic Control Plan
- Right/Left Lane Closed
- Sign - Flagman Ahead
- Sign - Construction Ahead
- Arrow Board
- Message Board
- Traffic Control Zone
- Advance Warning Area
- Transition Area
- Buffer Space
- Work Are…
- …inati…
- …cade…
- …Slow…
- …Digg… …ic…
- …fied…
- …al In…
- …Insp…
- …Extin…
- …fied… …Person
- …gger
- …ction… …nsp. Loads
- …l Soc…
- …ning Signal/Light
- Load Charts
- Rigging Equipment Inspected
- Qualified Riggers
- Crane Signals Posted

Medical
- Trained CPR/FA Employees
- First Aid Kit
- Bloodborne Pathogen Kit

Administrative Issues
- OSHA Poster
- MSDS Manual
- Written Safety Program
- Permits
- Daily AED Check

Electrical
- Daily Inspection of Tools/Cords
- GFCI/Assured Grounding
- Energized Work Permit
- Survey of Daily Cond… …ns
- Operating V…
- Elev… …ected
- Min… …istances
- Ene… Deenergized
- Arc… …ace Shi…
- FR…
- Gro…
- Equ… …al Zone
- Liv… Tools Tested
- Bla… …sted
- One…
- Equ…
- Tes…

…kout/Tagout
- Competent Person
- Lockout Procedure
- Electrical Flow Tester
- Voltage Tested

Gas Cylinders
- Stored Upright
- Valve Caps in Place
- Oxygen 20 Feet From Fuels
- Containers Properly Labeled
- Secured to Prevent Falling
- Inspections/Certificates
- Stored Away From Heat
- Proper Ventilation
- Warning Signs

Clearance Issued (Yes / N/A)
- #__________
- Time:__________
- By:__________

Work assignments not addressed above shall be outlined below

All employees must print and sign their names below

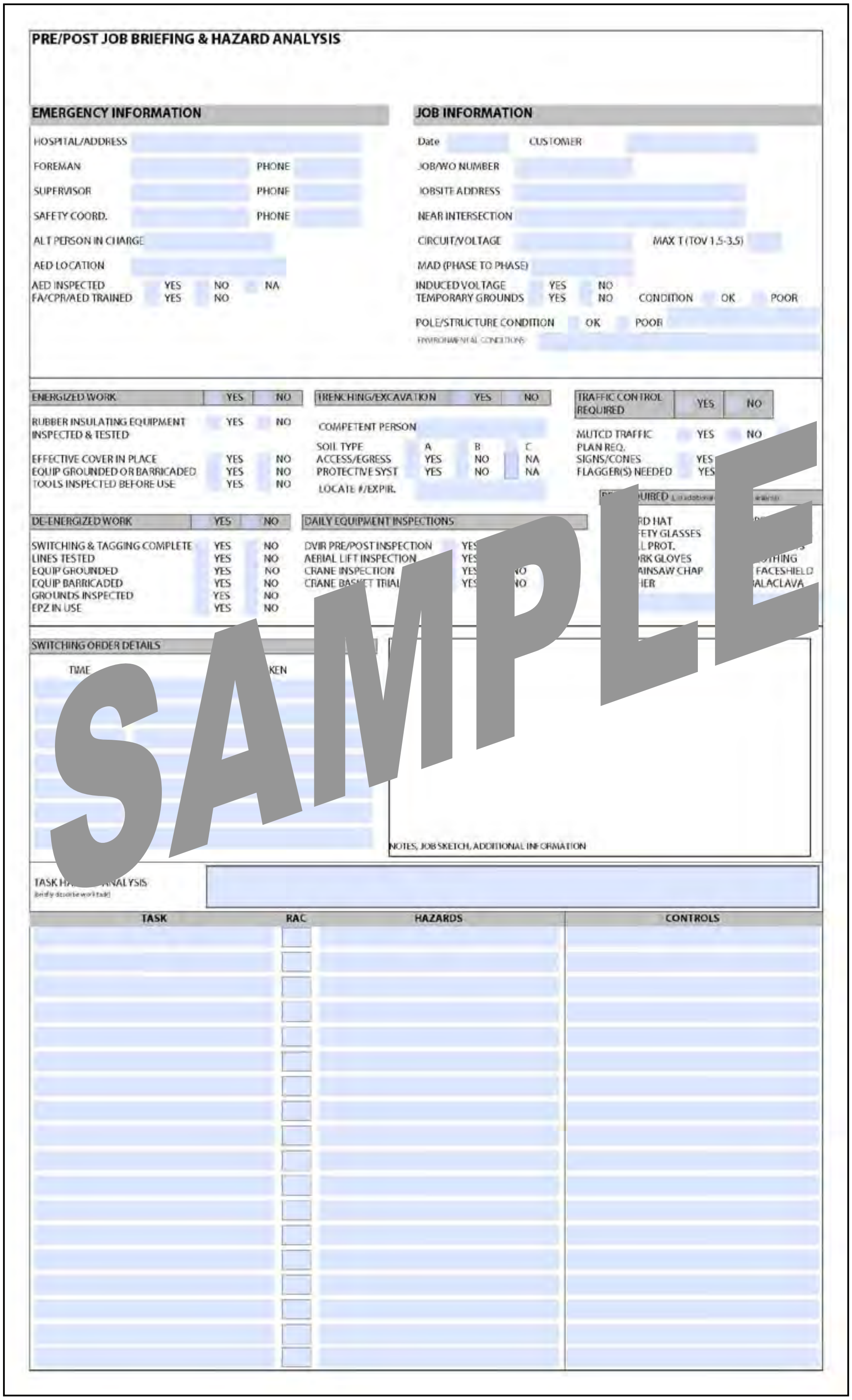
Printed Name	Signature	Printed Name	Signature
1.		6.	
2.		7.	
3.		8.	
4.		9.	
5.		10.	

Foreman Signature ________________ Safety Rep. Signature ________________

NOTE: Additional Job Briefing will be required when scope of work changes and/or conditions change

1. Have all overhead lines (parallel, crossings, etc) been located and have proper precautions been identified?
2. Have all employees received training and are qualified to perform the tasks to which they have been assigned?
3. List injuries, incidents, first aid and near miss cases that occur at the job site during the course of the day:

Sample 8-2. Pre/Post Job Briefing & Hazard Analysis


PRE/POST JOB BRIEFING & HAZARD ANALYSIS

EMERGENCY INFORMATION

HOSPITAL/ADDRESS
FOREMAN PHONE
SUPERVISOR PHONE
SAFETY COORD. PHONE
ALT PERSON IN CHARGE
AED LOCATION
AED INSPECTED YES NO NA
FA/CPR/AED TRAINED YES NO

JOB INFORMATION

Date CUSTOMER
JOB/WO NUMBER
JOBSITE ADDRESS
NEAR INTERSECTION
CIRCUIT/VOLTAGE MAX T (TOV 1.5-3.5)
MAD (PHASE TO PHASE)
INDUCED VOLTAGE YES NO
TEMPORARY GROUNDS YES NO CONDITION OK POOR
POLE/STRUCTURE CONDITION OK POOR
ENVIRONMENTAL CONDITIONS

ENERGIZED WORK YES NO
RUBBER INSULATING EQUIPMENT INSPECTED & TESTED YES NO
EFFECTIVE COVER IN PLACE YES NO
EQUIP GROUNDED OR BARRICADED YES NO
TOOLS INSPECTED BEFORE USE YES NO

TRENCHING/EXCAVATION YES NO
COMPETENT PERSON
SOIL TYPE A B C
ACCESS/EGRESS YES NO NA
PROTECTIVE SYST YES NO NA
LOCATE #/EXPIR.

TRAFFIC CONTROL REQUIRED YES NO
MUTCD TRAFFIC PLAN REQ. YES NO
SIGNS/CONES YES
FLAGGER(S) NEEDED YES

DE-ENERGIZED WORK YES NO
SWITCHING & TAGGING COMPLETE YES NO
LINES TESTED YES NO
EQUIP GROUNDED YES NO
EQUIP BARRICADED YES NO
GROUNDS INSPECTED YES NO
EPZ IN USE YES NO

DAILY EQUIPMENT INSPECTIONS
DVIR PRE/POST INSPECTION YES
AERIAL LIFT INSPECTION YES
CRANE INSPECTION YES NO
CRANE BASKET TRIAL YES NO

SWITCHING ORDER DETAILS
TIME

NOTES, JOB SKETCH, ADDITIONAL INFORMATION

TASK HAZARD ANALYSIS (briefly describe work task)

TASK	RAC	HAZARDS	CONTROLS

SAMPLE

(Pre/Post Job Briefing & Hazard Analysis, Continued)

CREWMEMBERS

PRINT NAME	SIGNATURE	ROLE/RESPONSIBILITY	POST BRIEF INITALS

QUAL. CRANE OPR. QUAL. RIGGER/SIGNL QUAL. OBSERVER

VISITORS

PRINT NAME	SIGNATURE

POST JOB BRIEF INFORMATION

WERE THERE ANY ACCIDENTS OR INJURIES TO REPORT TO ... ES ... SION NOTIFIED?

IF YES, LIST

WERE THERE ... NEAR MISSES O... CHES TO R... ES ... ED? YES NO

SAMPLE

HO... CATION

... Host ... wo... day ... any unanticipated hazardous conditions not mentioned by the Host.

WERE THERE ANY ... HA... CONDI... SENTED BY THE WORK PERFORMED? YES NO

... S, LIST

WE... AZARDOUS CONDITIONS NOT MENTIONED BY THE HOST (CLIENT) ENCOUNTERED? YES NO

IF YES, LIST

WHO FROM THE HOST (CLIENT) DID YOU NOTIFY REGARDING THE HAZARDS? NAME

DATE

TIME

NOTIFICATION BY

HOW WAS NOTIFICATION GIVEN? EMAIL WRITTEN DOC PHONE FACE-TO-FACE

NOTES, JOB SKETCH, ADDITIONAL INFORMATION

Hazard Control

There are three (3) distinct work methods utilized in energized overhead distribution and transmission work. Each of the three (3) work methods involves unique hazards, and each work method provides a means for controlling potential electrical hazards while performing that work method. The work methods provide three (3) different methods of controlling the potential exposure to the employee, therefore the work rules should not be interchanged among the different work methods.

They are:

- Rubber glove work method
- Live-line tool work method
- Live-line barehand work method

Rubber Glove Work Method

Purpose

This section provides information and guidance in the safe work practices and the proper selection, testing, and use of insulating rubber gloves, sleeves, and insulating protective equipment when work is performed on or near parts energized at 600 V through 34.5 kV phase-to-phase.

The safe work practices contained herein are the minimum requirements for working on or near exposed energized parts. The ultimate goal—safety—depends on the management system, professionalism, and judgment of all concerned, as well as following established work practices.

Effectiveness

Existing governmental codes, statutes, rules, and orders, as well as contract specifications and utility or customer safety requirements or conditions, should be considered a part of this practice. When any conflict exists between this policy and any of the above sources, the policy that provides greater protection to employees should prevail. Where such conflicts are found, they should be documented in writing. The resulting safe work practice or method to be used should be documented in writing, approved by management, and communicated to all affected employees before the start of work.

Emergency Conditions

In case of emergency involving hazard to life, management, a supervisor, or employee in charge of any work may modify or suspend such portion of this safe work practice as may be considered temporarily necessary to permit proper handling of the specific emergency.

Responsibilities

The supervisor or employee in charge of the work should be responsible and accountable for performing a job hazard analysis or JTSA before starting the work. The analysis should include, but is not limited to, identifying the work that is to be done and methods by which it will be performed and the employees involved and their responsibilities. The analysis should also include the identification of any existing or potential work site conditions or potential hazards and the methods or means by which the existing or potential hazards will be eliminated or controlled. The analysis should be documented in writing, using the JTSA form, and communicated to all affected employees at a safety training session, before the start of work.

Employees share with management, supervisors, and the employee in charge of the work the responsibility for safety. Employees are responsible for their own safety, the safety of their fellow workers, and the public. Employees should become familiar with this safe work practice and use all the devices that are provided for their protection.

Conditions Not Covered

Although each employee is primarily responsible for his or her own safety, in all instances where conditions are not covered in this safe work practice or the job is not completely understood by the employee, the employee should obtain specific instructions from the supervisor or employee in charge before proceeding with the work.

General Rules

1. Before conducting any work on energized lines or equipment, make a request to the system operator to see if the work can be performed de-energized.
2. All circuits and equipment should be considered energized until de-energized, tested, and properly grounded using approved work methods and equipment.
3. Only qualified, authorized employees (and apprentices trained for that task and under the qualified person's direct observation and control) may work on or with exposed energized parts.
4. Only qualified, authorized employees (and apprentices trained for that task and under the qualified employee's direct observation and control) may work in areas where they might come into direct contact with unguarded, uninsulated energized parts or equipment operating at 50 V or more.
5. Except as provided in General Rule #2, at least two qualified employees should be present while performing the installation, removal, or repair of:
   - De-energized parts, if an employee is exposed to contact with other parts energized at more than 600 V.
   - Equipment, such a transformers, capacitors, and regulators.

> The preceding requirement of two qualified employees does not apply to the following operations.

6. The preceding requirement of two qualified employees does not apply to the following operations.
   - Routine switching of circuits, if conditions at the site allow the work to be done safely
   - Work performed with live-line tools (hot sticks), if the employee can position so that he or she is not within reach of, or otherwise exposed to, contact with energized parts
   - Emergency repairs to the extent necessary to eliminate hazards and safeguard the public
7. The qualified employee should specify which lines and equipment may be worked and what work is to be done.
8. The qualified employee should closely supervise the work and keep employees advised as to their personal safety and the handling of tools and equipment.
9. Employees should protect his or her climbing or working space at all times with approved protective equipment such as rubber blankets, line hose, line guards, protectors, and so on.

Minimum Approach Distances—Rubber Glove Work Methods

When using Rubber Gloving work methods, insulated rubber gloves (with leather protectors) rated for the applicable circuit voltage shall be required whenever any part of an employee's body and/or any conductive object under the employee's control comes within the minimum approach distances found in Table 8-3.

Insulating Rubber Gloves

A pair of approved rubber insulating gloves, leather protectors, and bag should be assigned to each qualified worker who might be required to work on or be exposed to energized parts.

Rubber insulating gloves should be manufactured to the ANSI/ASTM D 120 specifications described in Table 8-9.

Table 8-9. ANSI/ASTM D 120 Glove Specifications

Glove Color	Class	Maximum Use Voltage (AC rms Volts)
Red	0	1,000
White	1	7,500
Yellow	2	17,000
Green	3	26,500
Orange	4	36,000

In addition to the requirements of the “General Rules” and “Minimum Approach Distances—Rubber Gloving” sections of this chapter, insulating rubber gloves, with leather protectors, shall also be worn when employees are:

- Working on ungrounded circuits, conductors, or electrical equipment rated at 35 kV (phase-to-phase) or less that are subject to back feed or induced voltage.
- Working within the reach of another person in an exposed primary area.
- Operating manually controlled air break switches.
- Opening and closing manually operated oil circuit breakers.
- Setting poles, pulling in wires, or handling other conducting materials near conductors, equipment, or circuits that are, or might become, energized.
- Working on or near exposed parts (open wire secondaries, exposed telephone, fire alarm circuits, and so on) that might become energized, unless such parts are tested for voltage and properly grounded.
- Removing lead or plastic sheaths from existing cables or splices, or when opening or cutting cables (until positive tests at the work location prove the conductors to be de-energized).
- Digging or probing in proximity of an energized cable.
- Working on or near series street lighting circuits even though they are disconnected from the source of power.

The following guidelines should be observed when rubber gloves are used:

- Each day, before work is begun where rubber gloves are required, each glove should be visually inspected and air tested by the employee using the gloves. Defective gloves shall be removed from service and tagged.
- Rubber gloves shall be dielectrically tested at a minimum of every six months or more often if field conditions warrant or other policies and/or local regulations require it.
- Properly sized (cuff length) leather protectors should be used at all times with rubber gloves.
- Rubber gloves should be stored, cuff down, in approved bags in a fully extended position. Rubber gloves should not be folded.
- Rubber glove bags should either be hung up or placed in a special compartment. They should not be placed where other tools or equipment can damage the gloves, or where they are exposed to direct sunlight.

- No items are permitted to be placed in the rubber glove bag along with the rubber gloves and leather protectors.
- Leather protectors should be worn over rubber gloves to keep from damaging the insulating properties of the PPE. Do not use leather glove protectors for any other work. Rubber glove protectors should not be worn as work gloves.

Insulating Rubber Sleeves

- Rubber sleeves, rated for the circuit voltage, shall be worn whenever the employee's arms or shoulders might be exposed to contact with energized parts.
- When rubber sleeves are required, they shall be put on before the employee's arms and/or shoulders come within 5 ft (1.52 m) of any exposed energized parts.
- Each day, before work is begun, where rubber sleeves are required, each sleeve shall be visually inspected by the employee using the sleeves. Defective sleeves shall be removed from service and tagged.
- Rubber sleeves shall be electrically tested at a minimum annually or more often if field conditions warrant or other policies and/or local regulations require it.
- Rubber sleeves should be stored properly. Rubber sleeves should be either hung up or stored in approved bags. Rubber sleeves should be placed in a special compartment where they cannot be damaged by other tools or equipment, or are exposed to direct sunlight.

Use and Care of Rubber Goods and Cover-Up

- Energized parts within 5 ft (1.52 m), measured in all directions, except that part of the conductor or equipment being worked on, should be covered with insulating cover-up materials.
- All open leads and wires should be properly grounded or covered with insulating protective equipment when it is necessary to work around or climb through them. This includes open secondaries, open communication wires, and fire alarm and pilot wires.
- When placing protective equipment on or near energized parts, the employee should use insulating rubber gloves, with leather protectors and rubber sleeves, or use approved insulated live-line tools.
- When covering conductors energized at 5,000 V or more, the employee should be positioned on an insulated platform, insulated ladder, in an aerial basket or use approved insulated live-line tools to install protective equipment.
- Cover-up equipment should be installed from a safe position and wherever possible, from a position below the energized part to be covered. Cover the part nearest the employee first and work away from the employee's position. In removing cover-up materials, start with the piece farthest away and work back to the closest.
- Rubber goods can be damaged by many chemicals, especially petroleum-based products such as oils, gasoline, hydraulic fluid, inhibitors, hand creams, paste, and salves. If contact is made with these or other petroleum-based products, the contaminant should be wiped off immediately. Rubber goods should be cleaned with a mild soap (no chlorine). After washing, rinse thoroughly with clear water and air dry. If any signs of physical damage or chemical deterioration are found, the rubber goods shall be removed from service and tagged.
- Rubber goods can be damaged by sunlight and heat and should be stored in proper containers when not in use.

Live-Line Work—Rubber Gloving

- Where present and allowed by the local utility, the automatic reclosing feature of the circuit-interrupting device should be made inoperative (non-automatic) and tagged.

- Only tools and equipment approved by the Company should be used in live-line rubber gloving work.
- A careful check should be made to see that the condition of the structure and lines at the point of work is such that the job can be performed safely. In addition, the adjacent spans and structures should be carefully checked for defects in conductors, tie wires, insulators, and other equipment.
- Extreme caution should be exercised when working on energized lines in inclement weather.
- While live-line work is in progress, no other work of any nature should be performed on the same pole or structure.
- Employees doing work on energized lines and/or equipment should devote their individual attention to the work at hand.
- All protective equipment should be installed from a level below the conductor or equipment. The removal of protective equipment should be done with equal care in reverse order.
- Employees working on energized lines and equipment should position themselves below the work whenever possible.
- When two or more employees are working, whether on a pole or out of the same aerial lift, they should not work on different phases or items at different potentials at the same time. Work should only take place on one phase at a time.
- When it is necessary to lay an energized conductor on a conductive part, both the conductor and conductive part should be covered with approved insulating equipment and the crossarm or pole should be covered with an approved guard.
- A system neutral should not be opened until the proposed opening has first been properly jumpered.

Live-Line Tool Work Method

- Rubber gloves do not need to be worn when using live-line tools except when making or breaking a circuit or during inclement weather or when required by system operator or local regulations.
- Rubber sleeves do not need to be worn when using live-line tools except when the employee's upper arm or shoulder are within 5 feet (1.52m) of any energized part when working at distribution voltages.
- When it is necessary to perform live-line tool work on lines that are energized, such work shall be performed by qualified personnel.
- The employee in charge of the live-line tool work should specify which lines may be worked and what work is to be done.
- The employee in charge of the live-line tool work should closely supervise the work and keep employees advised as to their personal safety and handling of the live-line tools.
- Live-line tools should be carefully inspected for defects before they are used. They should be wiped down with a silicone impregnated cloth before use. If a defect or contamination that could adversely affect the insulating qualities or mechanical integrity of the live-line tool is found, the tool should be repaired and refinished or permanently removed from service. If no such defect or contamination is found, the live-line tool should be cleaned according to manufacturer specifications. The proper minimum approach distance between the employee and the energized conductor shall be maintained.
- Four foot (4') grip-all (shotgun) sticks should not be used for overhead distribution and transmission work.
- Only live-line tools approved by the Company can be used in live-line maintenance work.
- Four foot (4') grip-all (shotgun) sticks should not be used for overhead distribution and transmission work.
- A careful check should be made of the condition of the structure and lines at work site to ensure that the job can be performed safely. In addition, the adjacent spans and structures should be carefully checked for defects in conductors, tie wires, insulators, and other equipment.
- Under no condition will an employee depend on another employee to hold a live conductor clear of him or her.
- All live-line tools should be visually inspected before use each day. Tools to be used should be wiped clean, and if any hazardous defects are found, the tool should be removed from service and tagged.
- Where present, the automatic reclosing feature of the circuit interrupting devices shall be made inoperative (non-automatic) and tagged.
- Employees should be instructed and trained in the live-line tool (hot stick) technique and the safe work practices pertinent thereto before being permitted to use the technique on energized circuits.
- Chain hoists, chains, metal slings, or cables should not be used in rigging between the pole and an energized circuit unless it is isolated or an insulating link is used.
- The live-line tool method can be used on energized circuits 69 kV and above requiring uninterrupted service. Careful planning by trained personnel following safe work procedures is required.
- A Caution tag should be installed on the equipment connected to the circuit before performing hot-line work according to the system operator's switching and tagging procedures.

- If it becomes necessary to deviate from the original plan, all work should stop and all changes should be discussed with all crewmembers.
- Live-line tools should be stored and transported in special containers or trailers to adequately protect them from damage.
- All live-line tools, when not in use, should be kept in canvas bags or waterproof boxes provided for that purpose, and such containers should be stored in a dry and, if possible, warm location.
- Live-line tools should never be laid down directly on the ground or against sharp objects. Special tool holders or tarpaulins should be used for this purpose.
- The tools should be properly stored and never placed on the ground.
- Crewmembers should avoid unnecessary conversation during live-line tool work.
- Live-line tool work should be performed on one conductor at a time.
- Safe working loads of live-line tools should be adhered to per the recommendations of the live-line tool (hot stick) manufacturer contained in the operations manual. Employees should exercise extreme caution when raising or moving conductors above the level of the conductors on the adjacent structures.
- Before each use, live-line tools should be closely inspected and cleaned. Tools should be electrically tested by qualified personnel according to the recommendations of the manufacturer and regulatory requirements. Live-line tools (hot sticks) should be electrically tested at a minimum of every two (2) years.
- Live-line tools should be secured to eliminate the possibility of the stick falling and striking employees or equipment below.
- The absolute limit of approach distances described in Table 8-8 should be maintained from an energized conductor, by any worker and his or her tools or equipment, if there is a difference of potential.
- The limits of approach should not be encroached upon except during live-line bare-hand work or when performing rubber glove methods.
- When performing live-line tool work methods on live electrical lines and/or apparatus, the minimum approach distances apply for all persons, tools, equipment, and materials being handled. This includes poles, towers, cross arms, and/or conductors.

Minimum Approach Distances—Live-Line Tool Work Methods

When working on energized parts using Live-Line Tool work methods, no employee should approach or take any conductive object closer to exposed energized parts than the established minimum approach distances. (Refer to section on Minimum Approach Distances for more information.)

Live-Line Barehand Work Method

- A written job procedure should be composed before any barehand work can be undertaken. The written job procedure should establish the minimum approach distances for the work. (Refer to section on Minimum Approach Distances for more information). This detailed work procedure should be approved by the Barehand Foreman or Supervisor on site and fully reviewed by all in attendance. The crew involved in the work should conduct a documented pre-job planning meeting, before the start of the work and then at least once every day at the beginning of the workday, until the barehand work has been completed.
- Written procedures should not be changed while work is in progress. If due to unforeseen circumstances a minor change is required, the job should be halted, and only after consultation with the whole crew, ensuring that everyone fully understands the required change, may work proceed. If a substantial change is contemplated, the supervisor or foreman should be consulted and approve of such change.
- Before work begins, the crew should ascertain:
  - Nominal voltage rating of the circuit on which the work is to be performed.
  - Minimum approach distances to ground of the lines and other energized parts on which work is to be performed;
  - Voltage limitations of the equipment to be used.
- Employees should be trained, qualified, and certified by Quanta Energized Services in barehand techniques and procedures. Employees in training are allowed to work under the direct supervision of a qualified instructor, who has been trained and certified in live line barehand techniques. The Quanta Energized Services barehand training program is competency based, consisting of a minimum of 120 hours combined classroom and on the job training. Barehand-qualified linemen are required to complete an annual review of the standards and competence in order to maintain their certification.
- The minimum barehand crew should consist of three barehand-certified linemen. One barehand-certified lineman will be in charge. When working from an aerial lift, there should be two barehand-certified linemen in the bucket. In addition, a qualified, designated employee should be positioned on the ground to observe and help maintain safe work practices. To provide direct supervision of barehand operations, the supervisor should be trained, qualified, and certified by Quanta Energized Services to perform live barehand work.
- Live-line barehand work should not be performed during adverse weather conditions (such as thunderstorms, high winds, or ice storms).
- A Live-Line Permit (recloser blocking) shall be in effect when work involving barehand techniques is performed. Use of air gaps for conductor and ground clearance requires approval of Quanta Energized Services.
- Only tools and equipment intended for live-line barehand work shall be used, and such tools and equipment should be kept clean and dry, inspected before each use, and removed from service and tested at least every two years.
- Before the boom is elevated, the outriggers on the aerial truck should be positioned on suitable outrigger pads and adjusted to level to stabilize the vehicle. The vehicle frame should be grounded with a 4/0 copper ground cable attached to an effective source of ground. When equipment grounding is impractical or when it poses a hazard to employees, equipment, or the general public, the equipment should be barricaded and considered as energized.

- Before moving the aerial device into the working position, all controls, (upper and lower) should be checked to ensure that they are in proper working condition. Aerial lifts to be used for live-line barehand work should have dual controls (upper and lower). The upper controls should be located within easy reach of the employee in the basket. If a two-man basket lift is used, access to the controls should be within easy reach from either basket. The lower set of controls should be located near the base of the boom and should provide override operation of equipment at any time. Lower level lift controls should not be operated unless permission has been obtained from the employee in the basket (except in an emergency).
- Boom leakage tests should be made before starting work each day and the boom should be monitored for leakage when linemen are aloft and bonded to the circuit, or whenever conditions change, such as when the weather changes or the work involves voltages higher than the initial test voltage. In such cases, further testing of boom leakage should be conducted. Aerial baskets used for live barehand work should be subjected to an arm current test. This test consists of placing the basket in contact with an energized voltage equal to the voltage of the circuit to be worked on. The bucket should be in contact for a minimum of three minutes and the leakage current shall not exceed 1 microampere per kilovolt of nominal phase-to-ground voltage (see Table 8-10). Work operations should be suspended immediately upon any indication of a malfunction in the equipment.
- Aerial lifts utilized in bare hand work will be fully barricaded at all times during bare hand operations.
- Complete bare hand suits are required when aerial lifts with baskets in lieu of the fiberglass buckets with metal liner on any transmission voltages are used.

Table 8-10. Maximum Allowable Leakage Currents

Industry standards recommend maximum allowable leakage currents of 1 microampere per kV of Phase to Ground voltage for a 3-minute test.

Phase to Phase Voltage	Phase to Ground Voltage	Max. Allowed Leakage Current
69 kV	39.9 kV	39.9 microamps
115 kV	66.6 kV	66.6 microamps
138 kV	79.8 kV	79.8 microamps
161 kV	93.6 kV	93.6 microamps
230 kV	132.9 kV	132.9 microamps
345 kV	199.4 kV	199.4 microamps
500 kV	289 kV	289 microamps

- Prior to starting work along an insulator string, check each insulator using the approved tester. You are required to have 50% of the insulators in good electrical and mechanical condition before placing live line tools along the string of insulator. The recommended test applies an independent voltage source between 12kV and 15kV DC over each individual suspension insulator. Note, historically the majority of defective insulators show no mechanical symptoms of failure. It has often been found that broken insulators have a greater resistance than their adjacent, non-obvious defective neighbors.

- The minimum approach distances established for the project should be mounted in the basket or its vicinity on a plate of durable nonconductive material so that the table is visible to the operator. When approaching, exiting, or bonding on to an energized circuit, the minimum approach distances should be maintained between all parts of the insulated boom assembly and any grounded parts, included the lower arm or portions of the truck. When positioning the basket alongside an energized bushing or insulator string, the minimum phase-to-ground clearances should be maintained between all parts of the of the basket and the grounded end of the bushing or insulator string. Note, for circuits mounted on wood poles or attached to wooden structures, all wood members should be considered to be at ground potential.
- During barehand contact with live electrical lines and/or apparatus, the limits of approach of all persons, tools, equipment and material they may be handling with respect to objects at ground potential or phase-phase potential should be as specified in the following chart; but in no case less than 3 feet. This includes poles, towers, crossarms, or conductors other than the one on which they are working.
- When the nature of the work requires that minimum clearances be approached, measuring sticks should be used to verify distances.
- Before an employee can contact an energized conductor or apparatus, the conductive basket liner shall be bonded to the energized conductor or apparatus by means of a positive connection that should remain attached to the energized conductor or apparatus until the work is completed.
- When positioning baskets over an energized circuit, clearances should take into account the length of the bonding wand and clamps, should they inadvertently hang free. The wand and clamps at any time cannot hang more than 20 inches from the bottom of the basket.
- When preparing to install a bond to a circuit, approach the conductor within a safe limit. The distance should be far enough away so that inadvertent contact will not be made, yet close enough that the lineman bonding on can easily reach the conductor and, with a positive movement, install the bonding wand. The lineman not responsible for operating the aerial device installs the wand to make initial bond to the circuit. Note, communication between employees is critical; bonding actions should not be initiated unless all employees acknowledge the action will begin. The operator then installs his bonding clamp when in the working position and insures that the bonding clamp remains connected to the circuit by grasping it with his hand. The second bonding clamp is then installed. The bonding wand is removed and work may proceed.
- When moving a short distance and the bonding clamps have to be moved, one lineman shall always retain his bonding clamp to the circuit by grasping it with his hand while the other lineman moves his bonding clamp to the new position.
- When removing a bond from the circuit, the operator of the aerial device retains his bonding clamp to the circuit by grasping it with his hand. The rider lineman installs the wand and removes his bonding clamp. The operator's bonding clamp is removed. Back the aerial device away from the work area and remove the wand from the circuit.
- The use of hand lines between buckets, booms, and the ground is prohibited. A non-conductive hand line may be attached to the hardware on a dead-end or a grip may be used, provided that the tension on the fall line pulls in line with the grip.
- Only non-conductive rope that has been tested electrically to ensure its integrity shall be used for barehand work. Non-conductive rope used as hot rope in barehand work should be stored in approved, appropriately marked containers. Non- conductive rope should be tested daily, or whenever there is any concern as to its dielectric integrity. Non-conductive rope should not be permitted to contact the ground in order to prevent the accumulation of dirt and moisture between the fibers. Approved storage containers and tarps are required in the handling of rope. Ropes used for live-line barehand work may not be used for other purposes.

- No conductive materials over 36 inches (91.44cm) long may be placed in the basket, except for appropriate length jumpers, armor rod and tools.
- The baskets and upper insulated boom should not be used to lift or support weights in excess of its rated capacity. To protect the fiberglass parts, none of the basket parts or upper arm should be used as a fulcrum for prying or lifting. Calculate the conductor weight prior to supporting the conductor in the jib. Ensure that the boom capacity is not exceeded when handling a conductor with the jib. When moving a conductor to a different location, prior to attaching the jib to a conductor, move the boom to the extreme location in which you intend to move the conductor and check the load chart for that position. Make sure the capacity of the boom will not be exceeded at any point.
- When working from an insulated aerial device on a circuit voltage of less than 230Kv, the lineman shall wear a conductive jacket, hood, and gloves as a minimum requirement. Conductive clothing can only be cleaned and maintained with other conductive material.
- When working on voltages above 230KV the lineman shall wear the complete conductive clothing kit.
- When working in a spacer cart, all safety chains will be in working condition and secured. Employees will wear a full-body harness and a shock-absorbing lanyard that is anchored to the cart. Employees should ensure that they maintain their bond and utilize 100% fall protection when entering and exiting the spacer cart.
- A fall arrest device will be utilized when transitioning from a structure to a horizontal or vertical ladder.
- When working from a vertical or horizontal ladder, in the bare hand mode, a complete bare hand suit is required for any transmission voltage.
- Linemen involved in barehand procedures, though not bonded to the line but performing work on the structure, may wear conductive clothing to eliminate the discomforting effects from static discharges.
- Conductive clothing shall be worn on the outside of personal clothing, with the exception of leather protective gloves; when used as part of the barehand kit, they shall be worn over the conductive gloves.
- Safety belts/harnesses with shock absorbing lanyards should be worn at all times. At no time will fall protection equipment be anchored to a conductor.
- Load carrying bypass jumpers should be equivalent to or greater in size/capacity than the conductor being bypassed. Wire brush the conductors and make the connection to the conductor with the required size Ampact connector or equivalent.
- Periodic electrical testing of bucket trucks and insulated equipment for live line barehand work should be performed no less than once every two years. Testing should also be performed when repairs are made to the aerial device or insulated equipment that may impact their insulating capabilities. These repairs could include hydraulic hose repair, hydraulic oil contamination, fiberglass boom or basket repairs.
- All aerial lift equipment that is scheduled for live-line barehand work on circuits should be electrically certified by the most recent edition of ANSI/SIA Standard for the voltage to be worked on.
- No modifications or additions that may affect the stability, mechanical, hydraulic, or electrical integrity and safe operation of live-line equipment without the written authorization of the manufacturer.

Sample 8-2. Live Line Work Procedures

Name ______________________

Live Line Work Procedures

EMERGENCY #: 911
CLOSEST ADDRESS:
TOWN LOCATION:
AED LOCATION:
NEAREST HOSPITAL:

DATE: __________ JOB DESCRIPTION: ______________________________

LINE & VOLTAGE: ______________________________

STRUCTURE #'S / LOCATION: ______________________________

RECLOSING: BLOCKED: __/__/__ at ______ am/pm BY: ______________________

RELEASED: __/__/__ at ______ am/pm BY: ______________________

EQUIPMENT REQUIRED:	TOOLS REQUIRED:

	Truck A	Truck B		Max / Meter Setting
DIELECTRIC BOOM TEST RESULTS:	________ /	________	MICRO-AMPS	____ / ____

PHASE TO GROUND CLEARANCE: __________ PHASE TO PHASE CLEARANCE: __________

SUIT REQUIREMENTS: Truck A: ____Full Suit ____Jacket and Gloves Only
Truck B: ____Full Suit ____Jacket and Gloves Only

HAZARDS (List all):	HAZARD MITIGATION:
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10.

(Live Line Work Procedures, Continued)

WEIGHTS AND FORCES:

MEMBER RESPONSIBILITIES:

Name	Responsibilities	Sign off

(Live Line Work Procedures, Continued)

JOB PROCEDURE: Write a detailed job plan. Include any sketches that will help clarify procedure to crew and supervisor:

9

Electrical Safety (Underground Electrical Workers)

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes for underground electrical workers.

Scope

These guidelines apply to all Operating Unit facilities and project sites that perform work on electric power transmission and distribution lines and equipment.

Definitions

Alive or live (also energized)—Electrically connected to a source of potential difference or electrically charged so as to have potential different from that of the earth or different from that of adjacent conductors or equipment.

Authorized person—One who has the authority to perform specific duties under certain conditions or who is carrying out orders from a responsible authority.

Automatic circuit recloser—A self-controlled device for automatically interrupting and reclosing an alternating-current circuit, with a predetermined sequence of opening and reclosing followed by resetting, hold closed, or lockout.

Barricade—A physical obstruction such as tapes, cones, or A-frame type wood, construction fencing, or metal structures intended to provide a warning about and to limit access to a hazardous area.

Barrier—A physical obstruction that is intended to prevent contact with energized lines or equipment to prevent unauthorized access to a work area.

Bond—The electrical interconnection of conductive parts designed to maintain a common electrical potential.

Bus—A conductor or a group of conductors that serve as a common connection for two or more circuits.

Cable—A conductor with insulation, or a stranded conductor with or without insulation and other coverings (single conductor cable), or a combination of conductors insulated from one another (multiple-conductor cable).

Cable sheath—A conductive protective covering applied to cables.

Circuit—A conductor or system of conductors through which an electric current is intended to flow.

Clearance (between objects)**—**The clear distance between two objects measured surface to surface.

Clearance (for work)—Authorization to perform specified work or permission to enter a restricted area.

Conductor—A material, usually in the form of a wire, cable or bus bar, used for carrying an electrical current.

Contract employer—An employer, other than the host employer, that performs electrical transmission and distribution work.

Covered conductor—A conductor covered with a dielectric having no rated insulating strength or having a rated insulating strength less than the voltage of the circuit in which the conductor is used.

Current-carrying part—A conducting part intended to be connected in an electric circuit to a source of voltage. Non-current parts are those not intended to be so connected.

De-energized—Free from any electrical connection to a source of potential difference and from electric charge; not having a potential that is different from the potential of the earth.

Designated person—See Authorized person.

JTSA—Job Task Safety Analysis or "job briefing" is a meeting held and documented to identify hazards associated with the job, work procedures involved, special precautions, energy source controls, and PPE requirements.

Energized (also alive or live)—Electrically connected to a source of potential difference or electrically charged so as to have a potential different from that of the earth or different from that of adjacent conductors or equipment.

Exposed (not isolated or guarded)—(a) Exposed circuits or lines are in such a position that in the event of failure of supports or insulation, contact with another circuit or line can result. (b) Exposed equipment is an object or device that can be inadvertently touched or approached by any person. It is applied to objects not suitably guarded or situated.

Fall Protection Equipment (FPE)—Any equipment, device or system that prevents an accidental fall from elevations or that mitigates the effect of such fall.

Ground—A conducting connection, whether planned or unplanned, between an electric circuit or equipment and the earth, or to some conducting body that serves in place of the earth.

Grounded—Connected to earth or to some conducting body that serves in place of the earth.

Guarded—Protected by personnel, covered, fenced, or enclosed by means of suitable casings, barriers, rails, screens, mats, platforms, or other suitable devices in accordance with standard barricading techniques designed to prevent dangerous approach or contact by persons or objects.

High wind—A wind of such velocity that one or more of the following hazards would be present:

1. The wind could blow an employee from an elevated location,
2. The wind could cause an employee or equipment that is handling material to lose control of the material, or
3. The wind could expose an employee to other hazards.

High wind is normally considered as winds exceeding 40 miles per hour (64.4 kilometers per hour) or 30 miles per hour (48.3 kilometers per hour) if the work involves material handling unless precautions have been taken to protect employees from the hazardous effects of the wind.

Host employer—An employer that operates or who controls the operating procedures for an electric power generation, transmission, or distribution installation on which a contract employer is performing work.

Insulated—Separated from other conducting surfaces by a dielectric substance or air space, permanently offering a high resistance to the passage of current and to disruptive discharge through the substance or space.

Isolated—Not readily accessible to persons unless special means for access are used.

Personal fall arrest system—A system used to arrest an employee in a fall from a working level.

Primary voltage—Any electrical circuit that normally operates at more than 600 V.

Qualified person—

- A person who is familiar with the construction and/or operation of electrical power generation, transmission, and distribution lines and equipment and who is fully aware of the hazards involved through knowledge, training, and experience; or
- A person who has passed a journeyman's examination for the particular branch of the electrical trade with which he or she is connected; or
- A person who has successfully demonstrated his or her ability and is recognized by management as qualified to perform the duties to which he or she has been assigned.

Shall—When the word "shall" appears in the wording of a guideline, the guideline is to be obeyed as written.

Should—When the word "should" appears in the wording of a guideline, the guideline is to be obeyed as written when it is reasonable and practical to do so.

Statistical sparkover voltage—A transient overvoltage that produces a 97.72 percent probability of sparkover (that is, two standard deviations above the voltage at which there is a 50 percent probability of sparkover).

Statistical withstand voltage—A transient overvoltage level that produces a 0.14 percent probability of sparkover (that is, three standard deviations below the voltage at which there is a 50 percent probability of sparkover).

Switch—A device for opening or for changing the connection of a circuit.

System operator—A qualified person designated to operate the system or its parts.

Tailgate safety training—A short informal discussion of the work to be accomplished and the safety measures to be incorporated. Normally conducted by the supervisor or employee in charge of the work.

Unqualified worker—Employees who have not been trained or authorized by Company management to perform electrical work.

Unsafe conditions—A phrase used to indicate dangerous, hazardous, defective, or unusual conditions that could lead to accidents.

Vault—An enclosure, above or below ground, that personnel may enter and that is used for installing, operating, or maintaining equipment or cables.

Voltage—The effective (root mean square) potential difference between any two conductors or between a conductor and ground. The nominal voltage of a system or circuit is the value assigned to a system or circuit of a given voltage class for the purpose of convenient designation.

Wood Pole Fall Restriction Device—A device that, when properly adjusted and combined with other subcomponents and elements, allows the climber to remain at his or her work position with both hands free and that performs a fall restriction function if the climber loses contact between his or her gaffs and the pole.

Best Practices

The Company participates in an OSHA partnership comprised of electrical transmission and distribution construction contractors, trade associations, unions, and government representatives. The Partnership has developed and should continue to develop Best Practices for safe work practices in the industry. A "Best Practice" is a process or method that, in the judgment of the Partnership members, incorporates the soundest methods for reducing the frequency of incidents and ensuring employee safety.

For information on the Best Practices, see the "Best Practices" section in the Company *Safety, Health, and Environmental Program Manual.*

Training Requirements

Employees shall be trained in, and familiar with, the safety-related work practices, safety procedures, and other safety requirements in this section that pertain to their respective job assignments.

Employees shall also be trained in and familiar with any other safety practices, including applicable emergency procedures, such as pole-top, bucket and manhole rescue, related to their work and necessary for their safety and the safety of their fellow employees.

The degree of training shall be determined by the risk to the employee for the hazard involved.

Employee training is not confined to this section ans can be found throughout this manual in more specific sections. Training may be classroom or on-the-job. The training shall establish employee proficiency in the work practices required. Employment records that indicate that an employee has successfully completed the required training may be used to demonstrate proficiency.

When accepting records of previous training to fulfill the required training requirements, the Company should use an examination or interview to make an initial determination that the employee understands the relevant safety-related work practices before they perform the work. Supervisors should supervise the employee closely until that employee has demonstrated proficiency.

Qualified Employees

Qualified employees shall be trained and competent in:

- The skills and techniques necessary to distinguish exposed live parts from other parts of electrical equipment.
- The skills and techniques necessary to determine the nominal voltage of exposed live parts.
- The skills and techniques necessary to determine the minimum approach distances corresponding to the voltages to which the qualified employee will be exposed and the skills and techniques necessary to maintain those distances.
- The proper use of the special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools for working on or near exposed energized parts of electrical equipment.
- The recognition of electrical hazards to which the employee may be exposed and the skills and techniques necessary to control or avoid those hazards.

Additional Training

An employee shall receive additional training (or retraining) under any of the following conditions:

- If an inspection indicates that the employee is not complying with the safety-related work practices required, or
- If new technology, new types of equipment or changes in work procedures necessitate the need for training, or
- If the employee must use safety-related work practices that are not normally used during the employee's regular job duties.

Information Transfer

Host Employer

Before work begins, the host employer shall inform contract employers of:

- The characteristics of the host employer's installation that are related to the safety of the work to be performed.
- Conditions that are related to the safety of the work to be performed that are known to the host employer.
- Information about the design and operation of the host employer's installation the contract employer needs to make the necessary assessments.
- Any other information about the design and operation of the host employer's installation that is known by the host employer that the contract employer requests and that is related to the protection of the contract employer's employees.

Contract Employer

- The contract employer shall ensure that each of its employees is instructed in the hazardous conditions relevant to the employee's work that the contract employer is aware of as a result of information communicated to the contractor by the host employer.
- Before work begins, the contract employer shall advise the host employer of any unique hazardous conditions presented by their work.
- The contract employer shall advise the host employer of any unanticipated hazardous conditions found during the contract employer's work. The contract employer shall provide this information to the host employer within two working days after discovering the hazardous condition.

> The contract employer and the host employer shall coordinate their work rules and procedures so that each employee is protected.

The transfer of information should be documented. A form has been provided for a means of communicating the requirements of Information Transfer between the host employer, the contract employer and the employees performing the work. See Sample 9-3.

Medical Services

When employees are performing work on, or associated with, exposed lines or equipment energized at 50 volts or more, persons with first-aid and CPR training shall be available as follows:

- For field work involving two or more employees at a work location, at least two trained persons shall be available.
- For fixed work locations such as substations, the number of trained persons shall be sufficient to ensure that each employee exposed to electrical shock can be reached within four (4) minutes by a trained person. However, where the existing number of employees is insufficient to meet this requirement, each employee at the work location shall be a trained employee.

Arc Flash Protection

Assessment

The Company must assess the workplace to identify employees exposed to hazards from flames or from electrical arcs and ensure that employees who face such exposures wear the proper Personal Protective Equipment (PPE) and receive the required protection.

The assessment should consider sources of electrical arcs, including:

- Energized circuit parts not guarded or insulated,
- Switching devices that produce electrical arcs in normal operations,
- Sliding parts that could fault during operation (for example, rack-mounted circuit breakers), and
- Energized electrical equipment that could fail (for example, electric equipment with damaged insulations or with evidence of arcing or overheating)

Identify employees exposed to hazards from flames. Factors to consider include:

- The proximity of employees to open flames, and
- Whether there is a reasonable likelihood that an electric arc or an open flame can ignite flammable material.

The assessment should consider the probability that an electric arc will occur in the work area.

Estimating Incident Heat Energy

The Company must make a reasonable estimate of the heat energy to which an employee would be exposed if an arc occurs. To perform an assessment requires various parameters. Much of the information necessary to perform the estimate must come from the Host Employer. (See the “Information Transfer” section.) The information necessary to perform the estimate includes:

- Fault current
- Expected length of the electric arc
- Clearing time for the fault
- Distance between the employee and the arc

Incident heat energy is measured in cal/cm^2. Fire-retardant (FR) clothing which is arc-rated according to the exposure is required when the estimated incident heat energy exceeds 2.0 cal/cm^2.

Selecting Protective Clothing and Other Protective Equipment

The employee shall wear protective clothing and other protective equipment with an arc rating that is equal to or greater than the estimated incident heat energy that the employee has the potential to be exposed to. Arc-related protective clothing should be capable of preventing second-degree burns to an employee exposed to that incident heat energy from an electric arc. Arc-rated protective equipment may include protection for the employee’s hands, face, and head.

Personal Protective Equipment

Employees working in areas where exposed electrical sources are present and contact is possible will be provided and shall use PPE. The following rules apply to the use and care of PPE:

- PPE shall be used where exposed electrical sources are present and contact is possible.
- PPE should be designed for the work being performed and the environment in which it is used.
- PPE should be visually inspected before each use. If any defect or damage is found, the equipment should be replaced, repaired, or discarded.

- Leather protectors shall be worn over rubber gloves to keep from damaging the insulating properties of the PPE. Do not use leather glove protectors for any other work or without rubber gloves. Rubber glove protectors should not be worn as work gloves.
- Employees shall wear nonconductive ANSI Z-89.1 Type 1, Class E head protection at all times when in the field.
- Employees shall wear approved ANSI Z-87.1 safety glasses at all times when in the field.
- Employees should wear full face (arc-rated face shield) protection whenever there is a danger of electrical arcs, flashes, or flying objects resulting from an electrical explosion.
- Chainsaw chaps shall be worn when operating a chain saw on the ground.
- Rubber insulating equipment shall be inspected for damage before each day's use and immediately following any incident that can reasonably be suspected of causing damage.
- Fall protection equipment (FPE) will be provided and shall be worn when employees are exposed to a fall hazard. Employees will be trained on the proper use and inspection of fall protection equipment.
- Other PPE may be required per the Arc Flash Assessment.

For more information about performing a hazard assessment, see Chapter 29, "Hazard Recognition". For other PPE requirements, see Chapter 25, "Personal Protective Equipment".

Electrical Rubber Goods Inspection Schedule

- The inspection schedule provided in Table 9-1 will be followed, as a minimum, for rubber goods:

Table 9-1. Minimum Inspection Schedule for Electrical Rubber Goods

Type of Equipment	When to Test
Rubber insulating line hose	Upon indication that insulating value is suspect and after repair
Rubber insulating covers	Upon indication that insulating value is suspect and after repair
Rubber insulating blankets	Before first issue and every 12 months thereafter[1], upon indication that the insulating value is suspect, and after repair
Rubber insulating gloves	Before first issue and every 6 months thereafter[1], upon indication that insulating value is suspect, after repair, and after use without protectors
Rubber insulating sleeves	Before first issue and every 12 months thereafter[1], upon indication that insulating value is suspect, and after repair

[1] If the insulating equipment has been electrically tested but not issued for service, the insulating equipment may not be placed into service unless it has been electrically tested within the previous 12 months.

Some operating companies, local bargaining contracts, and customer/client requirements may have a more stringent inspection/testing schedule. The most stringent requirements will take precedence.

Personal Protective Clothing

When employees are exposed to flames or electrical arcs, employees should wear clothing per the following minimum requirements:

- **Shirts—**FR arc-rated long sleeve shirt (minimum of ARC 2 and rated according to the exposure)
- **Jackets or coats**—When worn, FR arc-rated (minimum of ARC 2 and rated according to the exposure)
- **Rainwear**—When worn, FR arc-rated (minimum of ARC 2 and rated according to the exposure)
- **Pants**—FR arc-rated (minimum of ARC 2 and rated according to the exposure)
- **Coveralls—**When worn, FR arc-rated (minimum of ARC 2 and rated according to the exposure)
- **Headgear**—When wearing winter hard hat liners, FR required

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Employees shall wear approved fire-retardant (FR) clothing which is arc-rated according to the exposure to protect their bodies. The outermost garment worn on the body shall be FR. Clothing that is 100% cotton may only be worn underneath the outer FR layer of clothing. All undergarments should be 100% cotton or other natural fibers. Clothing made from the following types of fabric, either alone or in blends,is prohibited: acteate, nylon, polyester, and rayon.

A hazard assessment should be made prior to the start of each job. The assessment should determine to what extent the employee may be exposed to flames or electrical arcs and determine the maximum heat energy that the employee could be potentially exposed to in a fault. The assessment should also determine the parts of the employee’s body that might be exposed to flames or electrical arcs and determine if additional personal protective equipment is required. The result of the hazard assessment may determine that the exposure requires a greater level of arc-rated FR protection.

Protective Equipment And Tools

Employees should use general protective equipment and tools when in the proximity of or when working on exposed energized parts. The following rules apply:

- When working on or near exposed energized parts, qualified employees should use insulated tools or handling equipment suitable for the voltage present and the working environment. In cases where the insulation might be damaged, a protective outer layer should be employed.
- Fuse handling equipment, insulated for the circuit voltage, should be used to remove or install fuses when the terminal is energized.
- Ropes and other hand lines used near exposed energized lines or equipment should be nonconductive and clean.
- Portable electrical equipment should be handled in such a manner that should not cause damage. Do not staple or hang power cords in a way that can cause damage to the outer jacket or insulation.
- Portable electrical equipment should be visually inspected for damage, wear, cracked or split outer jackets or insulation, and other damage before use or before each shift. Any defects, such as cracked or split outer jackets or insulation should be repaired, replaced, or placed out of service.
- Always check the compatibility of cord sets and receptacles for proper use.

- Ground-type cord sets may only be used with ground-type receptacles when used with equipment requiring a ground-type conductor.
- Attachment plugs and receptacles may not be altered or connected in a way that would prevent the proper continuity of the equipment-grounding conductor. Adapters may not be used if they interrupt the continuity of the grounding conductor.
- Only portable electrical equipment that is double insulated or designed for use in areas that are wet or likely to contact conductive liquids may be used.
- Employees who are wet or have wet hands may not plug in, unplug, or otherwise handle portable electrical equipment. PPE should be used when handling portable electrical equipment that is wet or covered with a conductive liquid.
- Locking-type connectors should be properly secured after connection to a power source.
- When band hoists (hot line hoists) are used on energized conductors, an insulating link should be used to increase the integrity of the band hoist and the insulating qualities.

Safety Meetings

Safety meetings are an integral part of a proactive safety management process. There are many types of safety meetings held.

Daily, before the start of work, the crew generally should hold a documented tailgate safety meeting. The meeting should focus on safety issues relevant to the work processes to be performed that day, along with reminders regarding the safe use and inspection of the tools and equipment required for the tasks to be performed that day. The crew should also discuss any near-misses, noncompliance, or other safety issues that were encountered the previous day.

A weekly safety meeting will be held on each jobsite. The purpose is to cover subjects of great importance and relevance to the success of the job. The subjects discussed and attendance will be documented by signing a meeting roster. These meetings supplement and support the safety training provided for all employees. Weekly safety meetings will generally last between 15 and 30 minutes.

The topics may be:

- Pre-chosen and information sent to the field by the Corporate Office and/or Operating Unit.
- Pertinent to the work being performed.
- Tools and equipment being used in the field.
- Work procedures and policies of the client/customer.
- Issues related to the crew’s activities.
- “Special” safety meetings, which may be called when:
  - An incident occurs on a jobsite.
  - Non-compliance was observed.
  - New work practices and/or policies are implemented.
  - New tools and/or equipment are introduced into the work area.
  - Other reasons.

Job Task Safety Analysis

Each day, before the start of each workday, the supervisor/foreman (person in charge) or their designee, should conduct a job briefing or Job Task Safety Analysis (JTSA) with the employees involved (see Chapter 29). The purpose of the JTSA is to identify the hazards associated with the scope of work, determine the safety precautions that will be implemented, and the required PPE by the crew performing the work assignment. The JTSA helps ensure that all members of the crew understand the work assignment and acknowledge that they understand and will follow the safety plan established to complete the work assignment. The JTSA should be documented and signed by all crewmembers. Refer to Sample 9-1. The following are requirements for the JTSA:

- The foreman (person in charge) should assemble the crew at the job site and explain the work to be done, and outline the steps to be followed.
- The foreman (person in charge) and the members of the crew will identify the hazards of the job. The crew should identify appropriate controls to eliminate, mitigate, control, or reduce the accident-producing potential of the hazards.
- If the hazards cannot be eliminated from the jobsite, the JTSA should list how the hazards can be mitigated, controlled, or reduced. This may be done by:
    - Dedicated assignment of work responsibilities.
    - Methods to isolate or control the hazard.
    - Other forms of protection (PPE, training, others) to reduce the hazard to the employees.
- The foreman (person in charge) must ensure that each member of the crew understands all instructions given.
- If the work or operations to be performed during the workday or shift are repetitive and similar, at least one JTSA should be conducted before the start of the first job of each day or shift. An additional JTSA should be completed and a meeting held with the members of the crew if significant changes that might affect the safety of the employees occur during the course of the work. Significant changes include changes in the scope of the work, work assignments, crew structure, crew leadership, environmental conditions or when other hazards (not originally noted) are determined to be present in the workplace.
- The discussion should be in such detail that all employees, by virtue of training and experience, can reasonably be expected to recognize and avoid the hazards involved in the job. A more extensive discussion should be conducted if the work is complicated or particularly hazardous or if the employee cannot be expected to recognize and avoid the hazards involved in the job.
- The foreman (person in charge) is responsible for accounting for all employees after the completion of each job.

Existing characteristics and conditions of electric lines and equipment specific to electrical transmission and distribution industry that need to be determined before work on or near the lines or equipment begins They are:

- The nominal voltages of lines and equipment
- The maximum switching-transient voltages
- The presence of hazardous induced voltages
- The presence of protective grounds and equipment grounding conductors
- The locations of circuits and equipment, including electric supply lines, communication lines, and fire-protective signaling circuits
- The condition of protective grounds and equipment grounding conductors
- The condition of poles

- Environmental conditions relating to safety

Electrical Switching and Tagging

Introduction

When work requires that electrical switching and tagging procedures be performed on transmission or distribution circuits, the utility or other customer/client's program will take precedence over company internal work procedures. All employees should understand the general rules regarding switching and tagging and understand how to obtain a clearance from the system operator. Therefore, the Company should ensure that every employee is trained and understands the procedure that is in place at the work site.

Training

The employer should provide training to ensure that the purpose and function of the energy control program is understood and followed by employees. The knowledge and skills required for the safe application, use, and removal of the energy controls are required by employees. Each employee should receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy insulation, isolation and control.

Switching and Tagging General Practices

- A switch, fuse, tap, or any other device should not be tagged or operated without the specific instructions of the customer's representative (switching supervisor or dispatcher).

NOTE

All switching and tagging shall be performed according to the system operator's switching/tagging procedure. No employee shall perform switching and tagging procedures without authorization by the system owner. Employees performing switching and tagging shall be properly trained.

- The person receiving the orders is responsible for and should personally direct the switching procedures. All switching instructions given by the customer's dispatcher should be documented in writing, and copies should be maintained at the field office. In each case, the Dispatcher's instructions should be read back to the dispatcher to ensure the accuracy of information. Switching orders are not transferable.
- Where equipment or switches are isolated or bypassed for testing, maintenance, or construction and arrangements have been made with the customer's representative, the isolated equipment or switch can be operated.
- The supervisor or person in charge of the work should determine with the customer's switching supervisor or dispatcher the necessary switching and tagging arrangements.
- A supervisor or person in charge should not work under the clearance of another employee or crew. If protection is required for more than one crew working on the same job, the person in charge of each crew should have the circuit or equipment tagged to him or her and should obtain the clearance.
- The clearance request for transmission or distribution circuits should be coordinated according to the customer's clearance procedures.
- All information required on tags should be properly and legibly entered on each tag.
- To release a tag, or give up a clearance, the person for whom the tag or clearance was issued should contact the switching supervisor or dispatcher and release that tag in the following manner:

1. The supervisor or person for whom the tag or clearance was made should identify himself or herself.
2. The supervisor should determine that the person releasing the tag is the person for whom the tag was made.
3. The employee should identify the circuit or equipment upon which he or she has been working.
4. The employee should state that he or she is clear of the circuit or equipment, that grounds have been removed and state its condition so far as his or her work is concerned.

- In the event that it is absolutely necessary to place a piece of equipment in service but the equipment has been tagged to a person who is not available to remove it, the tag may be released by using the following steps:
  - The Company demonstrates that the specific procedure provides equivalent safety to the removal of the device by the authorized employee who applied it;
  - Verification that the authorized employee who applied the device is not available;
  - All reasonable efforts are made to contact the authorized employee to inform that person that the lockout or tagout device has been removed; and
  - Ensure that the authorized employee has the knowledge before they resume work on the system.
- The field office should maintain a file of all switching orders.

De-energizing Lines and Equipment

A designated employee should inform system operator that a particular section of line or equipment is to be de-energized. The designated employee becomes the employee in charge and is responsible for the clearance.

All switches, disconnects, jumpers, taps, and other means through which known sources of electric energy may be supplied to the particular lines and equipment to be de-energized should be opened. Such means should be rendered inoperable, unless its design does not so permit, and tagged to indicate that employees are at work.

Automatically and remotely controlled switches that could cause the opened disconnecting means to close should also be tagged at the point of control. The automatic or remote control feature should be rendered inoperable, unless its design does not so permit.

Tags should prohibit operation of the disconnecting means and should indicate that employees are at work.

After the applicable requirements for de-energizing lines and equipment as stated above have been followed and the employee in charge of the work has been given a clearance by the system operator, the lines and equipment to be worked should be checked for voltage to ensure that they are de-energized and protective grounds should be installed as required.

If two or more independent crews should be working on the same lines or equipment, the crews shall coordinate their activities with a single employee in charge of the clearance for all the crews and follow these requirements as if all of the employees formed a single crew.

To transfer the clearance, the employee in charge (or, if the employee in charge is forced to leave the worksite due to illness or other emergency, the employee's supervisor) should inform the system operator; employees in the crew should be informed of the transfer; and the new employee in charge should be responsible for the clearance.

To release a clearance, the employee in charge shall:

- Notify employees under his or her direction that the clearance is to be released;
- Determine that all employees in the crew are clear of the lines and equipment;
- Determine that all protective grounds installed by the crew have been removed; and

- Report this information to the system operator and release the clearance.

The person releasing a clearance should be the same person that requested the clearance, unless responsibility has been properly transferred.

Tags may not be removed unless the associated clearance has been released.

Only after all protective grounds have been removed, after all crews working on the lines or equipment have released their clearances, after all employees are clear of the lines and equipment, and after all protective tags have been removed from a given point of disconnection, may action be initiated to reenergize the lines or equipment at that point of disconnection. The person in charge should inspect the line to ensure that these requirements have been met.

Minimum Approach Distances

The minimum approach distances for voltages less than 72.5 kilovolts can be found in Table 9-2.

No employee may approach or take any conductive object closer to exposed energized parts than the established minimum approach distance unless:

- The employee is insulated from the energized part (insulating gloves and sleeves);
- The energized part is insulated from the employee and any other conductive object at a different potential;
- The employee is insulated from any other conductive object, as during live-line bare-hand work.

Refer to Table 9-2 for minimum approach distances.

Table 9-2. AC Minimum Approach Distances

Voltage Phase-to-Phase	Distance Phase-to-Ground Exposure		Distance Phase-to-Phase Exposure	
0.751 to 5.0 kV	0.63m	2.07ft	0.63m	2.07ft
5.1 to 15.0 kV	0.65m	2.14ft	0.68m	2.24ft
15.1 to 36.0 kV	0.77m	2.53ft	0.89m	2.92ft
36.1 to 46.0 kV	0.84m	2.76ft	0.98m	3.22ft
46.1 to 72.5 kV	1.00m	3.29ft	1.20m	3.94ft
These minimum approach distances can be used provided the jobsite is at an elevation of 900 meters (3000 feet) or less. If working above 900 meters (3000 feet) above mean sea level, the distances must be calculated using the altitude correction factor.				

For voltages over 72.5 kilovolts, the minimum approach distance can be calculated by determining the maximum anticipated per-unit transient overvoltage, phase to ground, through an engineering analysis or assume a maximum anticipated per-unit transient overvoltage, phase to ground or use the minimum approach distance found in Table 9-3.

Table 9-3. AC Minimum Approach Distances

Voltage Phase-to-Phase	Distance Phase-to-Ground Exposure		Distance Phase-to-Phase Exposure	
72.6 to 121.0 kV	1.13m	3.71ft	1.42m	4.66ft
121.1 to 145.0 kV	1.30m	4.27ft	1.64m	5.38ft
145.1 to 169.0 kV	1.46m	4.79ft	1.94m	6.36ft
169.1 to 242.0 kV	2.01m	6.59ft	3.08m	10.10ft
242.1 to 362.0 kV	3.41m	11.19ft	5.52m	18.11ft
362.1 to 420.0 kV	4.25m	13.94ft	6.81m	22.34ft
420.1 to 550.0 kV	5.07m	16.63ft	8.24m	27.03ft
550.1 to 800.0 kV	6.68m	22.57ft	11.38m	37.34ft
1. These minimum approach distances can be used provided the jobsite is at an elevation of 900 meters (3,000 feet) or less. If working above 900 meters (3,000 feet) above mean sea level, the distances must be calculated using the altitude correction factor. 2. The phase to phase minimum approach distances may be used provided that no insulated tool spans the gap and no large conductive object is in the gap. 3. The clear live-line tool distance shall equal or exceed the values for the indicated voltage ranges.				

When performing electric transmission and distribution work at elevations above 900 meters, the minimum approach distances should be adjusted by the appropriate factor in Table 9-4 for the elevation of the work.

Table 9-4. Altitude Correction Factor

Altitude Above Sea Level (meters)	Factor
0 to 900 m	1.00
901 to 1200 m	1.02
1201 to 1500 m	1.05
1501 to 1800 m	1.08
1801 to 2100 m	1.11
2101 to 2400 m	1.14
2401 to 2700 m	1.17
2701 to 3000 m	1.20
3001 to 3600 m	1.25
3601 to 4200 m	1.30
4201 to 4800 m	1.35
4801 to 5400 m	1.39
5401 to 6000 m	1.44

Instead of using the minimum approach distances contained in Table 9-2 or Table 9-3, a person knowledgable and competent in the field of electric transmission and distribution system design, can perform an engineering analysis and determine the maximum transient overvoltage. When the engineering analysis of the system shows the maximum transient overvoltage is lower and the minimum approach distance can be lowered from the distance shown in Table 9-2 or Table 9-3, the minimum approach distances can be adjusted accordingly. To reduce the distances, we must ensure that any conditions assumed in the analysis, for example, blocking the recloser on a circuit or installing portable protective gaps, are present during energized work. To calculate the minimum approach distances for voltages over 72.5 kV, use Table 9-5.

Table 9-5 AC Live-Line Minimum Approach Distance

For phase to phase system voltages of more than 72.5 kV nominal

MAD= $0.3048(C+a)V_{L-G}TA+M$, where

C= 0.01 for phase to ground exposures that the employer can demonstrate consist only of air across the approach distance (gap),

0.01 for phase to phase exposures if it can be demonstrated that no insulated tool spans the gap and That no large conductive object is in the gap, or

0.11 otherwise

V_{L-G}= phase to phase rms voltage, in kV

T= maximum anticipated per-unit transient overvoltage; for phase to ground exposures, T equals T_{L-G}, the maximum per-unit transient overvoltage, phase to ground, determined by the employer; for phase to phase exposures, T equals $1.35T_{L-G}+0.45$

A= altitude correction factor. See Table 9-4.

M= 0.31 m, the inadvertent movement factor

a= saturation factor, as follows

Phase to Ground Exposures				
$V_{Peak}=T_{L-G}V_{L-G}\sqrt{2}$	635 kV or less	635.1 to 915 kV	915.1 to 1050 kV	More than 1050 kV
a	0	$(V_{Peak}-635)/140{,}000$	$(V_{Peak}-645)/135{,}000$	(VPeak-675)/125,000

Phase to Phase Exposure					
$V_{Peak}=(1.35T_{L-G}+0.45)V_{L-G}\sqrt{2}$	630 kV or less	630.1 to 848 kV	848.1 to 1131 kV	1131.1 to 1485 kV	More than 1485 kV
a	0	$(V_{Peak}-630)/155{,}000$	$(V_{Peak}-633.6)/152{,}207$	$(V_{Peak}-628)/153{,}846$	$(V_{Peak}-350.5)/203{,}666$

Methods of Controlling Possible Transient Overvoltage

There are several means of controlling overvoltages that occur on transmission systems. The operation of circuit breakers or other switching voltages can be modified to reduce switching transient overvoltages. Overvoltages can also be held to an acceptable level by installing surge arrestors or portable protective gaps on the system. The use of switching restrictions can also minimize overvoltages.

Operation of Circuit Breakers

The maximum transient overvoltage that can reach the worksite is often the result of switching on the line on which employees are working. Disabling automatic reclosing during energized line work, so that the line will not be reenergized after being opened for any reason, limits the maximum switching surge overvoltage to the larger of the opening surge or the greatest fault-generated surge, provided that the devices (for example, insertion resistors) are operable and will function to limit the transient overvoltage and that circuit breaker restrikes do not occur. The insertion resistors must properly function to limit the overvoltage level. If the automatic recloser cannot be disabled, other methods of controlling the switching surge may be necessary.

When working on double circuit construction, surges on an adjacent line can cause significant overvoltages. The engineering analysis must account for coupling to adjacent lines.

Surge Arrestors

The use of modern surge arrestors allows a reduction in the basic impulse-insulation levels of much transmission system equipment.

Switching Restrictions

Another form of overvoltage control involves establishing switching restrictions, whereby the employer prohibits the operation of circuit breakers until certain system conditions are present. Switching is restricted by using a tagging system, similar to that used for a permit, except that the common term used for this activity is a "hold-off" or "restriction." These terms indicate that the restriction does not prevent operation, but only modifies the operation during the live-line work activity.

Rubber Gloves/Sleeves For Energized Electrical Work

Purpose

This section provides information and guidance in the safe work practices and the proper selection, testing, and use of insulating rubber gloves, sleeves, and insulating protective equipment when work is performed on or near parts energized at 600 V through 34.5 kV phase-to-phase.

The safe work practices contained herein are the minimum requirements for working on or near exposed energized parts. The ultimate goal—safety—depends on the management system, professionalism, and judgment of all concerned, as well as following established work practices.

Effectiveness

Existing governmental codes, statutes, rules, and orders, as well as contract specifications, utility, or customer safety requirements or conditions, should be considered a part of this practice. When any conflict exists between this policy and any of the above sources, the policy that provides greater protection to employees should prevail. Where such conflicts are found, they should be documented in writing. The resulting safe work practice or method to be used should be documented in writing, approved by management, and communicated to all affected employees before the start of work.

Emergency Conditions

In case of emergency involving hazard to life, management, a supervisor, or employee in charge of any work may modify or suspend such portion of this safe work practice as may be considered temporarily necessary to permit proper handling of the specific emergency.

Responsibilities

The supervisor or employee in charge of the work should be responsible and accountable for performing a job hazard analysis or JTSA before starting the work. The analysis should include, but is not limited to, identifying the work that is to be done and methods by which it should be performed and the employees involved and their responsibilities. The analysis should also include the identification of any existing or potential worksite conditions or potential hazards and the methods or means by which the existing or potential hazards should be eliminated or controlled. The analysis should be documented in writing, using the JTSA form, and communicated to all affected employees at a safety training session, before the start of work.

Employees share with management, supervisors, and the employee in charge of the work the responsibility for safety. Employees are responsible for their own safety, the safety of their fellow workers, and the public. Employees should become familiar with this safe work practice and use all the devices that are provided for their protection.

Conditions Not Covered

Although each employee is primarily responsible for his or her own safety, in all instances where conditions are not covered in this safe work practice or the job is not completely understood by the employee, the employee should obtain specific instructions from the supervisor or employee in charge before proceeding with the work.

General Rules

1. Before conducting any work on energized lines or equipment, make a request to the system operator to see if the work can be performed de-energized.
2. All circuits and equipment should be considered energized until de-energized, tested, and grounded using approved work methods and equipment.
3. Only qualified, authorized employees (and apprentices trained for that task and under the qualified person’s direct observation and control) may work on or with exposed energized parts.
4. Only qualified, authorized employees (and apprentices trained for that task and under the qualified employee’s direct observation and control) may work in areas where they might come into direct contact with unguarded, uninsulated energized parts or equipment operating at 50 V or more.
5. Except as provided in General Rule #2, at least two qualified employees should be present while performing the installation, removal, or repair of:
   - ❑ De-energized parts if an employee is exposed to contact with other parts energized at more than 600 V.
   - ❑ Equipment, such a transformers, capacitors, and regulators.

The preceding requirement of two qualified employees does not apply to the following operations.

6. The preceding requirement of two qualified employees does not apply to the following operations:
   - ❑ Routine switching of circuits if conditions at the site allow the work to be done safely
   - ❑ Work performed with live-line tools (hot sticks) if the employee can position so that he or she is not within reach of, or otherwise exposed to, contact with energized parts
   - ❑ Emergency repairs to the extent necessary to eliminate hazards and safeguard the public
7. The qualified employee should specify which lines and equipment may be worked and what work is to be done.
8. The qualified employee should closely supervise the work and keep employees advised as to their personal safety and the handling of tools and equipment.
9. Employees should protect his or her climbing or working space at all times with approved protective equipment such as rubber blankets, line hose, line guards, protectors, and so on.

Minimum Approach Distances—Rubber Gloving

When using Rubber Gloving work methods, insulated rubber gloves (with leather protectors) rated for the applicable circuit voltage shall be required whenever an employee's body and/or any conductive object under the employee's control comes within the minimum approach distances found in Table 9-2.

Minimum Approach Distances—Live-Line Tools

When working on energized parts using Live-Line Tool work methods, no employee should approach or take any conductive object closer to exposed energized parts than set forth in Table 9-2 or Table 9-3 unless:

- The employee is insulated from the energized part. Insulating gloves or insulating gloves (with leather protectors) and sleeves are considered insulation of the employee.
- The energized part is insulated or isolated from the employee and from any other conductive object at a different potential.

Insulating Rubber Gloves

A pair of approved rubber insulating gloves, leather protectors, and bag should be assigned to each qualified worker who might be required to work on or be exposed to energized parts.

Rubber insulating gloves should be manufactured to the ANSI/ASTM D 120 specifications described in Table 9-6.

Table 9-6 ANSI/ASTM D 120 Glove Specifications

Glove Color	Class	Maximum Use Voltage (AC rms Volts)
Red	0	1,000
White	1	7,500
Yellow	2	17,000
Green	3	26,500
Orange	4	36,000

In addition to the requirements of the "General Rules" and "Minimum Approach Distances—Rubber Gloving" sections of " For Energized Electrical Work," insulating rubber gloves, with leather protectors, shall also be worn when employees are:

- Working on ungrounded circuits, conductors, or electrical equipment rated at 35 kV (phase-to-phase) or less that are subject to back feed or induced voltage.
- Working within the reach of another person in an exposed primary area.
- Operating manually controlled air break switches.
- Opening and closing manually operated oil circuit breakers.
- Setting poles, pulling in wires, or handling other conducting materials near conductors, equipment, or circuits that are or might become energized.
- Working on or near exposed parts (open wire secondaries, exposed telephone, fire alarm circuits, and so on) that might become energized, unless such parts are tested for voltage and adequately grounded.
- Removing lead or plastic sheaths from existing cables or splices or when opening or cutting cables (until positive tests at the work location prove the conductors to be de-energized).
- Digging or probing in proximity of an energized cable.
- Working on or near series street lighting circuits even though they are disconnected from the source of power.
- Opening or closing underground cabinets of breakers, switches or capacitor banks.

The following guidelines should be observed when rubber gloves are used:

- Each day, before work is begun where rubber gloves are required, each glove should be visually inspected and air tested by the employee using the gloves. Defective gloves shall be removed from service and tagged.
- Rubber gloves shall be dielectrically tested at a minimum of every six months or more often if field conditions warrant or other policies and/or local regulations require it.
- Rubber gloves should be stored, cuff down, in approved bags in a fully extended position. Rubber gloves should not be folded.
- Rubber glove bags should either be hung up or placed in a special compartment. They should not be placed where other tools or equipment can damage the gloves.
- No items are permitted to be placed in the rubber glove bag along with the rubber gloves and leather protectors.
- Leather protectors should be worn over rubber gloves to keep from damaging the insulating properties of the PPE. Do not use leather glove protectors for any other work. Rubber glove protectors should not be worn as work gloves.

Insulating Rubber Sleeves

- Rubber sleeves, rated for the circuit voltage, shall be worn whenever the employee's arms or shoulders might be exposed to contact with energized parts.
- When rubber sleeves are required, they shall be put on before the employee's arms or shoulders come within 5 ft (1.52 m) of any exposed energized parts.

NOTE

Rubber insulating sleeves are required when installing and/or removing an insulating cover on any energized parts. After all exposed energized parts are thoroughly covered, rubber insulating sleeves are not required until the employee begins the process to remove the cover.

- Each day, before work is begun, where rubber sleeves are required, each sleeve shall be visually inspected by the employee using the sleeves. Defective sleeves shall be removed from service and tagged.
- Rubber sleeves should be electrically tested at a minimum annually or more often if field conditions warrant or other policies and/or local regulations require it.
- Rubber sleeves should be stored properly. Rubber sleeves should be either hung up or stored in approved bags. Rubber sleeves should be placed in a special compartment where they cannot be damaged by other tools or equipment.

Use and Care of Rubber Goods and Cover-Up

- Energized parts within 5 ft (1.52 m), measured in all directions, except that part of the conductor or equipment being worked on, should be covered with insulating cover-up materials.
- All open leads and wire should be properly grounded or covered with insulating protective equipment when it is necessary to work around or climb through them. (This includes open secondaries, open communication wires, and fire alarm and pilot wires.)
- When placing protective equipment on or near energized parts, the employee should use insulating rubber gloves, with leather protectors, or use approved insulated live-line tools.
- When covering primary conductors, employees should be positioned on an insulated platform or in an aerial basket, unless hot line tools are used to install cover-up equipment.

- Cover-up equipment should be installed from a safe position and wherever possible, from a position below the energized part to be covered. Cover the part nearest the employee first and work away from the employee's position. In removing cover-up materials, start with the piece farthest away and work back to the closest.
- Rubber goods can be damaged by many chemicals, especially petroleum-based products such as oils, gasoline, hydraulic fluid, inhibitors, hand creams, paste, and salves. If contact is made with these or other petroleum-based products, the contaminant should be wiped off immediately. Rubber goods should be cleaned with a mild soap (no chlorine). After washing, rinse thoroughly with clear water and air dry. If any signs of physical damage or chemical deterioration are found, the rubber goods shall be removed from service and tagged.
- Rubber goods can be damaged by sunlight and heat and should be stored in proper containers when not in use.

Live-Line Work—Rubber Gloving

- Where present, the automatic reclosing feature of the first source side of the circuit interrupting devices should be made inoperative (nonautomatic) and tagged.
- Only tools and equipment approved by the Company should be used in live-line rubber gloving work.
- A careful check should be made to ensure that the condition of the structure and lines at the point of work is such that the job can be performed safely. In addition, the adjacent spans and structures should be carefully checked for defects in conductors, tie wires, insulators, and other equipment.
- Extreme caution should be exercised when working on energized lines in inclement weather.
- While live-line work is in progress, no other work of any nature should be performed on the same pole or structure.
- Employees doing work on energized lines or equipment should devote their individual attention to the work at hand.
- All protective equipment should be installed from a level below the conductor or equipment. The removal of protective equipment should be done with equal care in reverse order.
- Employees working on energized lines and equipment should position themselves below the work whenever possible.
- When two or more employees are working, whether on a pole or out of a bucket, they should not work on different phases or items at different potentials at the same time. Work should only take place on one phase at a time.
- When it is necessary to lay an energized conductor on a conductive part, both the conductor and conductive part should be covered with approved insulating equipment and the crossarm or pole should be covered with an approved guard.
- A system neutral should not be opened until the proposed opening has first been jumpered or bypassed.

Live-Line Work—Live-Line Tool Method (Hot Sticks)

- Rubber gloves need not be worn when using live-line tools except when making or breaking a circuit or during inclement weather or when required by system operator or local regulations.
- Rubber sleeves need not be worn when using live-line tools except when the employee's upper arm or shoulder are within 5 feet (1.52) of any energized part when working at distribution voltages.
- Only live-line tools approved by the Company should be used in live-line maintenance work.

- A careful check should be made to see that the condition of the structure and lines at the point of work is such that the job can be performed safely. In addition, the adjacent spans and structures should be carefully checked for defects in conductors, tie wires, insulators, and other equipment.
- Under no condition should an employee depend on another employee to hold a live conductor clear of them.
- When moving heavy conductors, blocks should be used on the live-line tool so that they can be moved slowly and carefully.
- While live-line work is in progress, no other work of any nature should be performed on the same pole or structure.
- Live-line tools should be stored and transported in special containers or trailers to adequately protect them from damage.
- All live-line tools, when not in use, should be kept in canvas bags or waterproof boxes provided for that purpose, and such containers should be stored in a dry and, if possible, warm location.
- Live-line tools should never be laid directly on the ground or against sharp objects. Special tool holders or tarpaulins should be used for this purpose.
- All live-line tools should be visually inspected before use each day. Tools to be used should be wiped clean, and if any hazardous defects are found, the tool should be removed from service and tagged.
- Where present the automatic reclosing feature of the circuit interrupting devices shall be made inoperative (non-automatic) and tagged.
- Before each use, live-line tools should be closely inspected and cleaned. Tools should be electrically tested by qualified personnel according to the recommendations of the manufacturer and regulatory requirements. Live-line tools (hot sticks) should be electrically tested at a minimum of every two (2) years.

Rescue Operations

General

- Rescue and resuscitation techniques should be reviewed and practiced at least once a year.
- Each jobsite should have a documented emergency action plan. This plan should identify medical facilities for emergency and non-emergency situations, jobsite location, directions to medical facilities, and emergency contacts.
- Determine, prior to the start of each job, that a means of communication is available for contacting and summoning emergency help. Remember that cell phones do not work in all remote areas.
- Radio calls for emergency medical assistance in ***life threatening*** situations should be identified with the words, “Mayday, Mayday.” Calls for other emergency situations should be identified with the words, “This is an emergency.” All other radio communication should cease while the emergency is underway.
- When radios are not available, call 911 and report the emergency.
- The supervisor should be notified of emergency situations, and the supervisor should call for emergency assistance as needed. The supervisor should follow Company policy for incident reporting.
- An AED and first aid kit shall be available onsite.

Vault/Manhole Rescue

- When work is being performed in a vault or manhole containing energized equipment, an approved tripod or other type of lifting device should be in place.
- Employees working in a vault or manhole containing energized equipment should wear a full body rescue harness.
- When an employee is in a vault or manhole, another qualified employee with the proper equipment readily available should be stationed at the surface to assist in case of emergency.
- Unless it is known that the atmosphere in a vault is safe, an escape breathing apparatus should be available at the work site for each employee working in the manhole or vault. Employees may not enter an enclosed space while it contains a hazardous atmosphere, unless entry conforms to the Confined Spaces Program.
- An AED and first aid kit shall be available onsite.
- Appropriate first aid/CPR may be administered after the victim has been brought topside.

Work On and Around Underground Electrical Systems

Opening, Guarding, and Entering Underground Structures

Whenever cover is to be removed from a manhole or a vault, or any other obstruction to traffic exists, the following safety precautions should be taken:

- Adequate signs, barricades, lights, flares, flags, and so on should guard all obstructions to traffic. Traffic should be warned in sufficient time that an obstruction exists, through the use of signs, high-level standards, flashing lights, traffic cones, or flagmen.
- Where permissible and practical, the truck should also be placed to guard the work area against oncoming traffic.
- A blowtorch or other open flame should never be used to melt ice around a manhole or vault cover.
- Manhole, vault, and service-box covers should always be removed and replaced by means of approved hooks or hoists.

Entering Underground Structures (Enclosed Spaces)

See Chapter 22, “Confined Space and Vessel Entry Procedures,” for more information on entering enclosed spaces.

- Before a manhole cover is removed, or an unvented vault is completely opened, a check should be made to determine if any volatile gas or substance is present at the opening.
- Before an employee enters an enclosed space, such as a manhole or an unvented vault, the area should be promptly protected with a barrier, temporary cover, or other suitable guard.
- When work is to be performed in a manhole or unvented vault:
  - No entry should be permitted unless forced ventilation is used or the atmosphere is found to be safe by testing for oxygen deficiency and the presence of explosive gasses or fumes.
  - If testing or other means detects unsafe conditions, the work area should be ventilated and otherwise made safe before entry.
  - Provisions should be made for an adequate continuous supply of air.
  - The manhole should be inspected for other potential hazards such as water, animals, swollen cables, and so on.

- If, in an emergency, it becomes necessary for an employee to enter a manhole or vault where hazardous gas is present, the employee should use an approved respirator and wear a safety harness with a lifeline attended by another employee stationed at the manhole or vault opening. If the atmosphere is oxygen deficient, a self-contained breathing apparatus (SCBA) should be worn.
- A ladder should be used to access or egress a manhole or vault. Climbing into or out of manholes or vaults by stepping on cables, conduits, pipes, equipment, or hangers is forbidden.
- While work is being performed in manholes, a trained attendant should be available outside of the manhole to render emergency assistance as required.
  - This requirement should not preclude the employee in the immediate vicinity from occasionally entering a manhole to provide assistance other than emergency aid.
  - This requirement does not preclude a qualified employee, working alone, from entering for brief periods of time a manhole where energized cables or equipment are in service for the purpose of inspection, housekeeping, taking readings, or similar work if such work can be performed safely.
- Before any work is done on a cable, all cables should be identified by an approved method. If there is any doubt as to the identification, work should not be started until the cable is checked and identified by the proper authority.
- When working in manholes, unvented vaults, and other underground spaces, rescue equipment should be readily available outside of the opening to enable a rescue attempt. Proper planning should determine what equipment is necessary. Typical rescue equipment includes rescue tripods and an SCBA.
- Employees working in or near underground spaces should be properly trained in the use of the rescue equipment.
- An evaluation should be made before entering any manhole/vault and performing any work when it contains conductors and/or equipment energized at primary voltages above 600 volts.
- The first step in the evaluation process is to perform a heat scan on the cables before vault entry. The heat scan should show problem areas in the cables. Do not enter any manhole/vault where a heat scan detects problems in the cables.
- If the heat scan does not detect any problem areas in the cables, then the manhole/vault can be entered only to perform a further evaluation. This evaluation should be documented. (See Sample 9-2) This evaluation should be made by a team consisting of a minimum of two journeyman. The main purpose of the evaluation is to help ensure the safety of the craft personnel by detecting and mitigating possible hazards prior to work being performed in manholes/vaults that contain energized conductors or equipment.
- Once the evaluation is completed, and a job briefing is held with all affected employees, then the job can begin.
- All confined space entry procedures should be followed when entering any manhole/vault. (See Chapter 22) A Competent Person should monitor the work on a daily basis.

Work on Energized Cables

- All underground cables and apparatus carrying current at voltages above 600 V should be de-energized before work is done on the conductor or before the cables are cut or spliced.
- Before any work is done on an energized cable or other cables, all grounded equipment with which contact can be made while working on the energized cable should be covered with rubber insulating blankets or approved insulating shields. (Cables with nonmetallic sheaths and those with an insulating jacket over the metallic sheath do not need to be covered.) When working on or around unstable or questionable conductors, a blast blanket should be used as an added precaution. Heat sensing guns should be used to detect unstable conductors.

- Because of the characteristics of a low voltage network system, when work is performed on cables or apparatus carrying less than 600 V, employees should take extra precautions in the use of necessary rubber protective equipment, in observing adequate clearances, and in using proper tools to prevent short circuits.
- Employees should wear rubber gloves with leather protectors and stand on rubber mats while cutting and removing sheathing or sleeves and while testing energized cables.
- After removing a section of lead sheath or sleeve on an energized cable, the lead on each side of the opening should be covered with insulating tape for a distance of at least 9 inches (22.86 cm).

Cable Cutting Safety Procedure

The following procedure is designed to minimize employee risk/exposure while cutting, removing, or relocating any type of energized insulated cable located in tray, aerial and conduit installations, and direct buried. The following steps are required to ensure that the cable being worked on is correct and not energized. This procedure applies to any insulated cable that has been previously energized. It does not apply to new insulated cable in new construction where the cables have not been connected to an energy source.

- When multiple cables are present in the work area, identify the cable to be worked by electrical means, unless it is obvious by reason of distinctive appearance or location or by other readily apparent means of identification.
  - After the cable has been located, identify the cable with a distinguishing mark. All involved employees shall be made aware of that identifying mark.
- The person who will be cutting the cable must perform an independent verification from termination point to termination point.
- After the cable has been identified by the person planning to make the cut, the cable must be marked separately and independently of the original distinguishing mark. All involved employees must be made aware of that identifying mark.
- When possible, have a representative of the customer/client verify that the proper cable has been identified.
- Wear appropriate PPE for the task of cutting the cable. PPE may include rubber gloves, rubber sleeves, safety glasses, face shield, and fire retardant clothing.
- Never cut more than one single cable at a time; never cut multiple cables.
- The lead person, foreman, or supervisor must be present when cutting the cable.

Moving Cables

- Prior to moving any energized cable, the cable should be inspected for abnormalities.
- When a cable is identified that could have one or more abnormalities that could lead to an impending fault:
  - ☐ The cable shall be de-energized before employees may work in the manhole or vault; or
  - ☐ When service load conditions and a lack of feasible alternatives require the cable remain energized, employees shall be protected from the possible effects of a failure using shields or other devices that are capable of containing the adverse effects of a fault.
- When performing work on buried cables or on a cable in a manhole or vault, maintain metallic sheath continuity or the cable sheath shall be treated as energized.
- Cables operating at voltages above 15,000 V should not be repositioned or moved under any circumstances.

- All cables up to 15,000 V may be repositioned or moved at the discretion of the supervisor or qualified person. These cables should not, however, be moved where such movement requires changing bends.
- All energized cables should be handled with rubber gloves with leather protectors, except when applying sealing materials.

Pulling Cables

- Employees should not handle pull-wires or pulling-lines within reaching distance of blocks, sheaves, winch drums, and take-up reels.
- Pull-wires, steel pulling-lines, or metal rodding should not be pushed through manholes or vaults where energized equipment is present unless another employee is stationed at the other end of the run.
- Employees should not remain in a manhole or vault during pulling operations.

Heating Materials

- Metals and insulating compounds should be heated in a manner that prevents hazards to the employees working in manholes or vaults and to vehicular or pedestrian traffic.
- Gloves should be worn while heating or working with hot insulating compounds.
- Furnaces and tanks containing a liquefied petroleum gas, such as butane, should not be placed in a manhole or vault.
- Cold solder scraps or dippers should never be placed in a hot solder pot until the chill and any moisture has been removed from the scraps or dipper.
- Heating pots for solder, oil, or other compounds should be safely positioned so that the contents cannot enter the vault or manhole in the event of a spillage.
- Lighted furnaces or blowtorches should not be left unattended.
- Torches or furnaces should be kept a safe distance from flammable materials.

Work on De-energized Cables

- When cables and apparatus are taken out of service to be worked on, the procedures for de-energizing and obtaining clearances should be followed.
- Before making an opening in or removing a part of a sheath or sleeve of a cable, the line should be grounded at the first possible grounding point on each side of the work location.
- Before a cable is cut, a short section of the cable shielding should be removed and a test should be made with approved testing devices to determine whether the cable is de-energized. If no indication of a live cable is obtained, the employee may proceed with the work.
- When opening a joint or splice in a high-tension cable, install a jumper across the open joint. The sleeve of the joint should be cut completely around near the wipes and then cut lengthwise and removed from the joint. The employee should not try to remove the compound until tests indicate that the cable is not live. The employee should test each conductor with approved testing devices. If no indication of a live cable is obtained, the employee should then remove the compound.
- If shielding tape is encountered, it should be removed and another test made over each conductor with approved testing devices. If no indication of a live cable is obtained, the employee should cut through the joint until the saw or blade touches one of the conductors. Before cutting further, a test should be made on the blade of the saw or cutting tool.

- When cutting or opening joints on low-tension cables, the same procedures for high-tension cables should be followed, except in testing. To determine whether the conductor is energized, the insulation should be cut away to the conductor and tests made with an approved tester. On multiple conductor cables, only one conductor should be cut into at a time, and tests should be made on at least two conductors before proceeding with the work.

Underground Residential Distribution

General

Before an underground residential distribution (URD) transformer enclosure is opened, all unauthorized persons including guests, visitors, and the general public should be required to leave the immediate work area and remain clear of all hazards involved in the work.

When underground equipment is being located, short sections of scrap cable could be mistaken for the position of permanent conductors; therefore, all scrap cable, regardless of length, is to be removed from the jobsite.

Opening and Closing Circuits

- Company switching procedures, including hold carding and tagging practices, should be followed when sectionalizing URD systems.
- When a URD circuit has been opened, the route of the circuit should be patrolled for obvious hazards before the circuit is closed.
- Any URD primary circuit should be de-energized by opening one or more load-break devices. De-energizing should be done with a load break elbow connector, load break fuse cutout at the riser pole, load break tool, or other approved load break device.
- Eye (safety glasses) and face (arc-rated face shield) protection should be worn when primary switching operations are performed.
- Long-sleeved, FR shirts should be worn when primary switching operations are performed.
- An approved switching tool, rubber gloves, and rubber sleeves should be used when switches (including secondary breakers) in an energized circuit are opened or closed.

NOTE: The Company requires the use of rubber gloves and rubber sleeves, and safety glasses and arc-rated face shields when opening a transformer.

Grounding

- All URD cables and equipment, including services, that have been energized or could become energized from any source, should be considered as “energized” until the equipment is proven to be de-energized and has been grounded.
- Before doing work on de-energized primary circuits or equipment:
  - A visible open break should be provided.
  - A voltage test should be made.
  - The equipment should be grounded.
- When work is to be done on equipment or cables of an underground system, precautions should be taken to prevent back feed. The precautions should include the grounding of secondary conductors.

- De-energized cables to be worked on should be grounded at a point as close to the work as possible.
- All underground cables and apparatus carrying current at voltages above 600 V should be de-energized and grounded before cables are cut into or spliced. The minimum size ground for URD work is 1/0 copper.
- All conductors of a circuit should be de-energized when work is to be performed on any of them.

Rubber Protective Gear

- Rubber gloves and rubber sleeves shall be put on before any URD compartment or enclosure (including service pedestals) is opened and kept on until the compartment or enclosure is closed and locked or until all equipment is properly grounded.
- Rubber gloves should be worn when removing animals, vines, weeds, grass, or vegetation of any kind from an energized URD installation whether the equipment is open or closed.
- Rubber gloves and sleeves should be worn when moving, repositioning, handling, or protecting energized primary cables.
- Rubber gloves should be worn when working on energized secondaries and services.
- Rubber gloves should be worn when working on or contacting a neutral.

Work on Energized Equipment

- When work is performed on cables or apparatus carrying less than 600 V, employees should use necessary rubber protective equipment, observe adequate clearances, and use proper tools to prevent short circuits.
- When energized pad-mounted transformers are unlocked and opened, an employee should directly attend them. These transformers should be kept closed and locked at all other times.
- A primary or secondary neutral on any energized circuit should not be opened under any circumstances.
- Elbow connectors provide flexibility in switching and system sectionalizing. However, only those connectors designed and approved for load break may be used to connect or disconnect an energized circuit.
- Only tools with insulated handles should be used for making energized secondary connections or when work is performed within energized service pedestals, pad-mounted compartments, or submersible transformer enclosures.
- Only one energized secondary or service conductor should be worked on at any one time, and protective devices should be used to insulate or isolate the conductor from all others.
- Before any attempt is made to replace a damaged or blown cable limiter, the customer's service should be checked for faults by the use of an ohmmeter or a voltmeter.
- Employees working on any energized URD cable or apparatus should wear appropriate fire retardant (FR) arc-rated protective clothing.

Excavations

See Chapter 23, "Trenching and Excavation," for additional information.

- No employee should enter any trench or excavation until a Competent Person has inspected the trench and/or excavation and determined that it is safe to enter.
- Mechanical excavating equipment should be used only in areas where there is no known danger of contacting or damaging buried facilities.

- Before excavating in any area where buried facilities are suspected, such facilities should be identified and located through a one-call (Call Before You Dig or Dig Safe) underground locating service in the area or by contacting the owners of the facilities.
- It is recommended that pictures of locate marks be taken before digging.
- Excavating done in close proximity to buried facilities should be done by hand digging.
- If electric cables are damaged, the following steps should be taken:
  - If the damaged cable belongs to a power company other than the customer for whom the work is being done, the company should be notified immediately.
  - The area should be barricaded and the public kept out until hazardous conditions can be eliminated.
- If gas lines are damaged, the following steps should be taken:
  - Call 911 immediately; it is a Federal Law.
  - The gas company should be notified immediately.
  - The hole should be left open to allow the gas to dissipate into the atmosphere.
  - All possible sources of igniting the gas should be removed or eliminated.
  - Residents in the immediate area should be warned when necessary, and the public should be kept out of the immediate area.
- Where water lines are damaged, the water company should be notified immediately.
- If communications cables are damaged, the communication company should be notified immediately.
- Where trenches are left open, warning devices, barriers, barricades, or guardrails should be placed to adequately protect the public and employees.
- At the end of each day's work, as much of the trench as practical should be closed. No more of the trench should be open at one time than is necessary.
- Rubber insulating gloves with leather protectors should be worn when using any equipment or tools to excavate, expose, or handle secondary cables. Gloves should also be used when digging with approved hand tools to expose primary cables.
- In excavations that employees might be required to enter, excavated or other material should be effectively stored and retained at least 2 ft (0.61 m) or more from the edge of the excavation.
- When employees are required to be in trenches that are 4 ft (1.22 m) or deeper, an adequate means of entry and exit, such as a ladder or steps, should be provided and located so as to require no more than 25 ft (7.62 m) of lateral travel.
- Trenches 5 ft (1.52) or deeper should be shored, sloped, or otherwise supported to protect employees working within them.
- Trenching machines that are parked or operating on streets or highways should be protected by proper warning devices.
- When it is necessary to leave excavating equipment unattended, the blade, bucket, or scoop should be lowered to the ground and the ignition system locked.

Verifying Utility Locations and Potholing

Prior to starting any digging operations, local One Call locator services must be contacted within established or customary local response times, advised of the proposed work, and asked to establish the location of the utility underground installations before the work begins

The following guidelines should be followed to ensure safety during any work operations where underground utilities might be encountered:

- The location of all identified utilities should be verified using nondestructive methods of excavation.
- If any risk to the utility from the work activity is present, a “window” should be excavated at or near the utility to visually monitor the potentially hazardous situation.
- Exposed existing utilities should be adequately protected and supported.
- When crossing or running parallel to existing utilities within 3 ft (0.91 m), the utilities should be visually confirmed by exposing the buried utility at appropriate intervals.
- Because of a high risk and hazard potential, a competent person should visually confirm the location of gas lines, electrical utilities, fiber, and communication lines within the immediate vicinity of the work taking place.
- Contract documents and state and local regulations should be checked to determine responsibility for verifying locations of unmarked utilities.
- When utilizing high-pressure water for verifying utility locations, the proper PPE should include long-sleeved arm protection, di-electric shoes/boots or overshoes, safety glasses and face shield, and appropriately rated rubber insulating gloves.

As a general guide to identifying utilities, the standard surface marking colors are shown in Table 9-7.

Table 9-7. Surface Marking Colors

Color	Utility
Red	Electric power, including street lighting
Yellow	Gas, oil, steam, and petroleum
Blue	Water and irrigation
Green	Sewer and storm drains
Orange	Fiber optic, telephone, and cable TV
Pink	Temporary survey markings
White	Proposed construction area or work limits
Purple	Reclaimed water

Sample 9-1. Job Task Safety Analysis—Power

Job Task Safety Analysis - Power

Company Name:	**Date:**	**Time:**	**Job #:**
Location:		**City:**	**State:**
Describe job task:			
Competent Person Trenching / Excavation:			**Soil Classification:**
Person responsible for First Aid / CPR:			
Name and Location of Emergency Medical Facility:			
Location of AED:			**Emergency Contact Number: 911**

PPE Required (Yes / N/A)
- Hardhat
- Safety Glasses/Goggles
- Hearing Protection
- Leather Gloves
- Dielectric Overshoes
- Face Shield
- Welding Hood
- Chemical Gloves
- Dielectric Gloves
- Protective Sleeves
- Air Test (Electrical PPE)
- Class 2 Reflective Vest
- Class 3 Reflective Vest
- Respirators

Fall Protection
- "Buck Squeeze"
- Full Body Harness/Lanyard
- Climbing Belt
- Qualified Climber
- 100 % Fall Protection-Tower
- Warning Line
- Safety Monitor
- Barricaded/Control Zone
- Falling Object Protection
- Daily Inspections

Aerial Lifts
- Qualified Operator
- Wheels Chocked
- Grounded & Barricad[illegible]
- Warning Labels
- Controls Labeled
- Lower Controls [illegible]ional

Ladders
- Daily Inspection[illegible]
- Warn./Usage La[illegible]
- 3 Feet Above Lan[illegible]
- Ladder Secured

Confined Space (Yes / N/A)
- Competent Person
- Permitted/Non-Permitted
- Calibrated Monitor
- Continuous Monitoring
- Hole Watch
- Man Hole Guard
- Forced Ventilation
- Rescue Equipment
- Resc. Team/Serv. Identified
- Hot Work Permit
- Warning Signs
- Written Program on Hand
- Contractors Notified
- Confined Space Log Book

Excavations
- Competent Person
- Utilities Located
- Integrity of Adj. Structures
- Soil Classification
- Location of Spoil Bank
- Overhead Load Protection
- Water in Trench
- Ladders/Ramps (Circle 1)
- Ladders Secured
- Sloping/Benching
- [illegible] System
- [illegible]d Data
- [illegible]ere Tested
- [illegible]odic Insp[illegible]
- [illegible]ystem
- [illegible]/Rescue [illegible]
- [illegible]og
- [illegible]itati[illegible]
- [illegible]d as [illegible]e)
- [illegible]ps
- [illegible]e
- Hand W[illegible]ion

Traffic Control (Yes / N/A)
- Traffic Control Plan
- Right/Left Lane Closed
- Sign - Flagman Ahead
- Sign - Construction Ahead
- Arrow Board
- Message Board
- Traffic Control Zone
- Advance Warning Area
- Transition Area
- Buffer Space
- Work Area
- Termination Area
- Barricades/Cones
- Stop/Slow Paddles

Cranes/Digger Derricks
- Qualified Operator
- Annual Inspection
- Daily Inspections
- Fire Extingui[illegible]
- Quali[illegible]
- O[illegible]
- Pr[illegible] Load
- W[illegible]k
- W[illegible] Signa[illegible]
- L[illegible]
- R[illegible] Inspect[illegible]
- Q[illegible]
- C[illegible]nals Posted

Med[illegible]
- T[illegible]PR/FA Employee
- Fi[illegible] Kit
- Bl[illegible]e Pathogen Kit

Adm[illegible]ative Issues
- OSHA Poster
- MSDS Manual
- Written Safety Program
- Permits
- Daily AED Check

Electrical (Yes / N/A)
- Daily Inspection of Tools/Cords
- GFCI/Assured Grounding
- Energized Work Permit
- Survey of Daily Conditions
- Operating Voltage ________
- Elevated Structures Inspected
- Minimum Safe Distances
- Energized/Deenergized
- Arc-rated Face Shield
- FR Clothing
- Grounds Tested
- Equal Potential Zone
- Live Line Tools Tested
- Blan[illegible]
- [illegible]oser"
- [illegible]rounded
- [illegible] for "Dead"

[illegible]ut/Tagout
- [illegible]on
- [illegible]dure
- [illegible]ow Tester
- [illegible]age Tested

[illegible]ylinders
- [illegible]red [illegible]
- [illegible]lace
- [illegible] From Fuels
- [illegible]ers Properly Labeled
- Secured to Prevent Falling
- Inspections/Certificates
- Stored Away From Heat
- Proper Ventilation
- Warning Signs

Clearance Issued (Yes / N/A)
#: ____________
Time: ____________
By: ____________

Work assign[illegible] res[illegible] above shall be outlined below

____

____

____

All employees must print and sign their names below

Printed Name	Signature	Printed Name	Signature
1.		6.	
2.		7.	
3.		8.	
4.		9.	
5.		10.	

Foreman Signature ______________________ **Safety Rep. Signature** ______________________

NOTE: Additional Job Briefing will be required when scope of work changes and/or conditions change

1. Have all overhead lines (parallel, crossings, etc) been located and have proper precautions been identified?
2. Have all employees received training and are qualified to perform the tasks to which they have been assigned?
3. List injuries, incidents, first aid and near miss cases that occur at the job site during the course of the day:

Sample 9-2. Evaluation for Safe Entry Into Manholes/Vaults Containing Energized Cables

Evaluation for Safe Entry Into Manholes/Vaults Containing Energized Cables

An evaluation shall be made and documented prior to entering manholes that contain energized cables or equipment. The evaluation shall be made by a team of three, consisting of the Foreman, General Foreman, journeyman craftsman and/or competent person. The purpose of the evaluation is detecting and mitigating possible hazards prior to work being performed in spaces that contain energized conductors or equipment.

1. What was the age of the cables?
2. What type(s) of cables were used?
3. What type(s) of termination?
4. What type(s) of slice?
5. What amp load [illegible]n the cab[illegible]
6. What is t[illegible]nfi[illegible]on of [illegible]ca[illegible]
7. [illegible]n w[illegible]e perfor[illegible] without moving the stepping on the cables?
8. Are bending radiuses of the cables proper?
9. What is the voltage rating of the cables?
10. What is the voltage of the energized circuits?

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(Evaluation for Safe Entry Into Manholes/Vaults Containing Energized Cables, Continued)

11. Can re-closing be turned off?

12. What are the dimensions of the confined spaces?

13. Will the vault conditions require specialized retrieval equipment?

14. Will the vault entry opening accommodate rescue equipment and atmospheric ventilation equipment without impeding access and egress?

15. Does the vault configuration present problems with rescue or retrie[illegible]erations?

16. Have any hot spots been [illegible]ected [illegible]trac[illegible]

17. A[illegible]er poss[illegible]h[illegible]d[illegible]c[illegible]ir q[illegible] access-egress, [illegible]g or moving energized c[illegible]?

18. [illegible]era[illegible]ri[illegible]able failures?

19. Can possible hazards be mitigated for safe entry into the confined space?

20. If yes, explain the elimination, control or PPE to be used.

Evaluation Team Members

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(Evaluation for Safe Entry Into Manholes/Vaults Containing Energized Cables, Continued)

Job Briefing Conducted with Employees:

Date: ________________________ Time: ________________________

Competent Person: ____

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Sample 9-3. Pre/Post Job Briefing & Hazard Analysis

PRE/POST JOB BRIEFING & HAZARD ANALYSIS

EMERGENCY INFORMATION

HOSPITAL/ADDRESS
FOREMAN PHONE
SUPERVISOR PHONE
SAFETY COORD. PHONE
ALT PERSON IN CHARGE
AED LOCATION
AED INSPECTED YES NO NA
FA/CPR/AED TRAINED YES NO

JOB INFORMATION

Date CUSTOMER
JOB/WO NUMBER
JOBSITE ADDRESS
NEAR INTERSECTION
CIRCUIT/VOLTAGE MAX T (TOV 1.5-3.5)
MAD (PHASE TO PHASE)
INDUCED VOLTAGE YES NO
TEMPORARY GROUNDS YES NO CONDITION OK POOR
POLE/STRUCTURE CONDITION OK POOR
ENVIRONMENTAL CONDITIONS

ENERGIZED WORK YES NO
RUBBER INSULATING EQUIPMENT INSPECTED & TESTED YES NO
EFFECTIVE COVER IN PLACE YES NO
EQUIP GROUNDED OR BARRICADED YES NO
TOOLS INSPECTED BEFORE USE YES NO

TRENCHING/EXCAVATION YES NO
COMPETENT PERSON
SOIL TYPE A B C
ACCESS/EGRESS YES NO NA
PROTECTIVE SYST YES NO NA
LOCATE #/EXPIR.

TRAFFIC CONTROL REQUIRED YES NO
MUTCD TRAFFIC PLAN REQ. NA
SIGN... NO
FL... S) NEEDED NO

DE-ENERGIZED WORK YES NO
SWITCHING & TAGGING COMPLETE YES NO
LINES TESTED YES NO
EQUIP GROUNDED YES NO
EQUIP BARRICADED YES NO
GROUNDS INSPECTED NO
EPZ IN USE NO

DAILY EQUIPMENT INSP... ONS
DVIR PRE/POST IN... NO NA
AE... T INSP... NO NA
...SPECTI... NO NA
...SKET ... NA

...REQUIRED
HARD HAT ...R GLOVES
SAFETY GLASSES ...UBBER SLEEVES
FALL PROT. ...I-ELEC BOOTS
WORK GLOVES ...R CLOTH...
CHAINSAW CHAP... ...D
OTHER

SWITCH... ETAILS
A... TAKEN

NOTES, JOB SKETCH, ADDITIONAL INFORMATION

TASK HAZARD ANALYSIS
(Briefly describe work task)

TASK	RAC	HAZARDS	CONTROLS

SAMPLE

(Pre/Post Job Briefing & Hazard Analysis, Continued)

CREWMEMBERS

PRINT NAME	SIGNATURE	ROLE/RESPONSIBILITY	POST BRIEF INITIALS

QUAL. CRANE OPR. QUAL. RIGGER/SIGNL QUAL. OBSERVER

VISITORS

PRINT NAME	SIGNATURE

POST JOB BRIEF INFORMATION

WERE THE... CIDENTS OR I... EPORT TO... S SU... ? YES NO

W... ERE ANY NEAR MISSES ... OD... S TO RE... S SUPERVISION NOTIFIED? YES NO

HOST (C... ENT) NO... TIO...

... Ho... ent) within (2) working days of any unanticipated hazardous conditions not mentioned by the Host.

WE... IQUE HAZARDOUS CONDITIONS PRESENTED BY THE WORK PERFORMED? YES NO

IF YES, LIST

WERE THERE ANY HAZARDOUS CONDITIONS NOT MENTIONED BY THE HOST (CLIENT) ENCOUNTERED? YES NO

IF YES, LIST

WHO FROM THE HOST (CLIENT) DID YOU NOTIFY REGARDING THE HAZARDS? NAME

DATE

TIME

NOTIFICATION BY

HOW WAS NOTIFICATION GIVEN? EMAIL WRITTEN DOC PHONE FACE-TO-FACE

NOTES, JOB SKETCH, ADDITIONAL INFORMATION

10

Electrical Safety (Substation Workers)

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes for substation electrical workers.

Scope

These guidelines apply to all Operating Unit facilities and project sites that perform work on electric power transmission and distribution lines and equipment.

Definitions

Alive or live (also energized)—Electrically connected to a source of potential difference or electrically charged so as to have potential different from that of the earth or different from that of adjacent conductors or equipment.

Authorized person—One who has the authority to perform specific duties under certain conditions or who is carrying out orders from a responsible authority.

Automatic circuit recloser—A self-controlled device for automatically interrupting and reclosing an alternating-current circuit, with a predetermined sequence of opening and reclosing followed by resetting, hold closed, or lockout.

Barricade—A physical obstruction such as tapes, cones, or A-frame type wood, construction fencing, or metal structures intended to provide a warning about and to limit access to a hazardous area.

Barrier—A physical obstruction that is intended to prevent contact with energized lines or equipment to prevent unauthorized access to a work area.

Bond—The electrical interconnection of conductive parts designed to maintain a common electrical potential.

Bus—A conductor or a group of conductors that serve as a common connection for two or more circuits.

Cable—A conductor with insulation, or a stranded conductor with or without insulation and other coverings (single conductor cable), or a combination of conductors insulated from one another (multiple-conductor cable).

Cable sheath—A conductive protective covering applied to cables.

Circuit—A conductor or system of conductors through which an electric current is intended to flow.

Clearance (between objects)**—**The clear distance between two objects measured surface to surface.

Clearance (for work)**—**Authorization to perform specified work or permission to enter a restricted area.

Conductor—A material, usually in the form of a wire, cable, or bus bar, used for carrying an electrical current.

Contract employer—An employer, other than the host employer, that performs electrical transmission and distribution work.

Covered conductor—A conductor covered with a dielectric having no rated insulating strength or having a rated insulating strength less than the voltage of the circuit in which the conductor is used.

Current-carrying part—A conducting part intended to be connected in an electric circuit to a source of voltage. Non-current parts are those not intended to be so connected.

De-energized—Free from any electrical connection to a source of potential difference and from electric charge; not having a potential that is different from the potential of the earth.

Designated person—See Authorized person.

JTSA—Job Task Safety Analysis or "job briefing" is a meeting held and documented to identify hazards associated with the job, work procedures involved, special precautions, energy source controls, and PPE requirements.

Energized (also alive or live)—Electrically connected to a source of potential difference or electrically charged so as to have a potential different from that of the earth or different from that of adjacent conductors or equipment.

Exposed (not isolated or guarded)—(a) Exposed circuits or lines are in such a position that in the event of failure of supports or insulation, contact with another circuit or line can result. (b) Exposed equipment is an object or device that can be inadvertently touched or approached by any person. It is applied to objects not suitably guarded or situated.

Fall Protection Equipment (FPE) – Any equipment, device or system that prevents an accidental fall from elevations or that mitigates the effect of such fall.

Ground—A conducting connection, whether planned or unplanned, between an electric circuit or equipment and the earth, or to some conducting body that serves in place of the earth.

Grounded—Connected to earth or to some conducting body that serves in place of the earth.

Guarded—Protected by personnel, covered, fenced, or enclosed by means of suitable casings, barriers, rails, screens, mats, platforms, or other suitable devices in accordance with standard barricading techniques designed to prevent dangerous approach or contact by persons or objects.

High wind—A wind of such velocity that one or more of the following hazards would be present:

1. The wind could blow an employee from an elevated location,
2. The wind could cause an employee or equipment that is handling material to lose control of the material, or
3. The wind could expose an employee to other hazards.

High wind is normally considered as winds exceeding 40 miles per hour (64.4 kilometers per hour) or 30 miles per hour (48.3 kilometers per hour) if the work involves material handling unless precautions have been taken to protect employees from the hazardous effects of the wind.

Host employer—An employer who operates or controls the operating procedures for an electric power generation, transmission, or distribution installation on which a contract employer is performing work.

Insulated—Separated from other conducting surfaces by a dielectric substance or air space, permanently offering a high resistance to the passage of current and to disruptive discharge through the substance or space.

Isolated—Not readily accessible to persons unless special means for access are used.

Personal fall arrest system—A system used to arrest an employee in a fall from a working level.

Primary voltage—Any electrical circuit that normally operates at more than 600 V.

Qualified person—

- A person who is familiar with the construction and/or operation of electrical power generation, transmission, and distribution lines and equipment and who is fully aware of the hazards involved through knowledge, training, and experience; or
- A person who has passed a journeyman's examination for the particular branch of the electrical trade with which he or she is connected; or
- A person who has successfully demonstrated his or her ability and is recognized by management as qualified to perform the duties to which he or she has been assigned.

Shall—When the word "shall" appears in the wording of a guideline, the guideline is to be obeyed as written.

Should—When the word "should" appears in the wording of a guideline, the guideline is to be obeyed as written when it is reasonable and practical to do so.

Statistical sparkover voltage—A transient overvoltage that produces a 97.72 percent probability of sparkover (that is, two standard deviations above the voltage at which there is a 50 percent probability of sparkover).

Statistical withstand voltage—A transient overvoltage level that produces a 0.14 percent probability of sparkover (that is, three standard deviations below the voltage at which there is a 50 percent probability of sparkover).

Switch—A device for opening or for changing the connection of a circuit.

System operator—A qualified person designated to operate the system or its parts.

Tailgate safety training—A short informal discussion of the work to be accomplished and the safety measures to be incorporated. Normally conducted by the supervisor or employee in charge of the work.

Unqualified worker—Employees who have not been trained or authorized by Company management to perform electrical work.

Unsafe conditions—A phrase used to indicate dangerous, hazardous, defective, or unusual conditions that could lead to accidents.

Vault—An enclosure, above or below ground, that personnel may enter and that is used for installing, operating, or maintaining equipment or cable.

Voltage—The effective (root mean square) potential difference between any two conductors or between a conductor and ground. The nominal voltage of a system or circuit is the value assigned to a system or circuit of a given voltage class for the purpose of convenient designation.

Wood Pole Fall Restriction Device – A device that, when properly adjusted and combined with other subcomponents and elements, allows the climber to remain at his or her work position with both hands free and that performs a fall restriction function if the climber loses contact between his or her gaffs and the pole.

Best Practices

The Company participates in an OSHA partnership comprised of electrical transmission and distribution construction contractors, trade associations, unions, and government representatives. The Partnership has developed and should continue to develop Best Practices for safe work practices in the industry. A "Best Practice" is a process or method that, in the judgment of the Partnership members, incorporates the soundest methods for reducing the frequency of incidents and ensuring employee safety.

For information on the Best Practices, see the "Best Practices" section in the Company *Safety, Health, and Environmental Program Manual.*

Training Requirements

Employees shall be trained in, and familiar with, the safety-related work practices, safety procedures, and other safety requirements in this section that pertain to their respective job assignments.

Employees shall also be trained in and familiar with any other safety practices, including applicable emergency procedures, such as pole-top, bucket, and manhole rescue, related to their work and necessary for their safety and the safety of their fellow employees.

The degree of training shall be determined by the risk to the employee for the hazard involved.

Employee training is not confined to this section ans can be found throughout this manual in more specific sections. Training may be classroom or on-the-job. The training shall establish employee proficiency in the work practices required. Employment records that indicate that an employee has successfully completed the required training may be used to demonstrate proficiency.

When accepting records of previous training to fulfill the required training requirements, the Company should use an examination or interview to make an initial determination that the employee understands the relevant safety-related work practices before they perform the work. Supervisors should supervise the employee closely until that employee has demonstrated proficiency.

Qualified Employees

Qualified employees shall be trained and competent in:

- The skills and techniques necessary to distinguish exposed live parts from other parts of electrical equipment.
- The skills and techniques necessary to determine the nominal voltage of exposed live parts.
- The skills and techniques necessary to determine the minimum approach distances corresponding to the voltages to which the qualified employee will be exposed and the skills and techniques necessary to maintain those distances.
- The proper use of the special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools for working on or near exposed energized parts of electrical equipment.
- The recognition of electrical hazards to which the employee may be exposed and the skills and techniques necessary to control or avoid those hazards.

Additional Training

An employee shall receive additional training (or retraining) under any of the following conditions:

- If an inspection indicates that the employee is not complying with the safety-related work practices required, or
- If new technology, new types of equipment, or changes in work procedures necessitate the need for training, or
- If the employee must use safety-related work practices that are not normally used during the employee's regular job duties.

Information Transfer

Host Employer

Before work begins, the host employer shall inform contract employers of:

- The characteristics of the host employer's installation that are related to the safety of the work to be performed.
- Conditions that are related to the safety of the work to be performed that are known to the host employer.
- Information about the design and operation of the host employer's installation the contract employer needs to make the necessary assessments.
- Any other information about the design and operation of the host employer's installation that is known by the host employer that the contract employer requests and that is related to the protection of the contract employer's employees.

Contract Employer

- The contract employer shall ensure that each of its employees is instructed in the hazardous conditions relevant to the employee's work that the contract employer is aware of as a result of information communicated to the contractor by the host employer.
- Before work begins, the contract employer shall advise the host employer of any unique hazardous conditions presented by their work.
- The contract employer shall advise the host employer of any unanticipated hazardous conditions found during the contract employer's work. The contract employer shall provide this information to the host employer within two working days after discovering the hazardous condition.

The contract employer and the host employer shall coordinate their work rules and procedures so that each employee is protected.

The transfer of information should be documented. A form has been provided for a means of communicating the requirements of Information Transfer between the host employer, the contract employer, and the employees performing the work. See Sample 10-2.

Medical Services

When employees are performing work on, or associated with, exposed lines or equipment energized at 50 volts or more, persons with first-aid and CPR training shall be available as follows:

- For field work involving two or more employees at a work location, at least two trained persons shall be available.
- For fixed work locations such as substations, the number of trained persons shall be sufficient to ensure that each employee exposed to electrical shock can be reached within four (4) minutes by a trained person. However, where the existing number of employees is insufficient to meet this requirement, each employee at the work location shall be a trained employee.

Arc Flash Protection

Assessment

The Company must assess the workplace to identify employees exposed to hazards from flames or from electrical arcs and ensure that employees who face such exposures wear the proper Personal Protective Equipment (PPE) and receive the required protection.

The assessment should consider sources of electrical arcs, including:

- Energized circuit parts not guarded or insulated,
- Switching devices that produce electrical arcs in normal operations,
- Sliding parts that could fault during operation (for example, rack-mounted circuit breakers), and
- Energized electrical equipment that could fail (for example, electric equipment with damaged insulations or with evidence of arcing or overheating)

Identify employees exposed to hazards from flames. Factors to consider include:

- The proximity of employees to open flames, and
- Whether there is a reasonable likelihood that an electric arc or an open flame can ignite flammable material.

The assessment should consider the probability that an electric arc will occur in the work area.

Estimating Incident Heat Energy

The Company must make a reasonable estimate of the heat energy to which an employee would be exposed if an arc occurs. To perform an assessment requires various parameters. Much of the information necessary to perform the estimate must come from the Host Employer. (See the “Information Transfer” section.) The information necessary to perform the estimate includes:

- Fault current
- Expected length of the electric arc
- Clearing time for the fault
- Distance between the employee and the arc

Incident heat energy is measured in cal/cm^2. Fire-retardant (FR) clothing which is arc-rated according to the exposure is required when the estimated incident heat energy exceeds 2.0 cal/cm^2.

Selecting Protective Clothing and Other Protective Equipment

The employee shall wear protective clothing and other protective equipment with an arc rating that is equal to or greater than the estimated incident heat energy that the employee has the potential to be exposed to. Arc-related protective clothing should be capable of preventing second-degree burns to an employee exposed to that incident heat energy from an electric arc. Arc-rated protective equipment may include protection for the employee’s hands, face, and head.

Personal Protective Equipment

Employees working in areas where exposed electrical sources are present and contact is possible will be provided and shall use PPE. The following rules apply to the use and care of PPE:

- PPE shall be used where exposed electrical sources are present and contact is possible.
- PPE should be designed for the work being performed and the environment in which it is used.

- PPE should be visually inspected before each use. If any defect or damage is found, the equipment should be replaced, repaired, or discarded.
- Leather protectors shall be worn over rubber gloves to keep from damaging the insulating properties of the PPE. Do not use leather glove protectors for any other work or without rubber gloves. Rubber glove protectors should not be worn as work gloves.
- Employees shall wear nonconductive ANSI Z-89.1 Type 1, Class E head protection at all times when in the field.
- Employees shall wear approved ANSI Z-87.1 safety glasses at all times when in the field.
- Employees should wear full face (arc-rated face shield) protection whenever there is a danger of electrical arcs, flashes, or flying objects resulting from an electrical explosion.
- Chainsaw chaps shall be worn when operating a chain saw on the ground.
- Rubber insulating equipment shall be inspected for damage before each day's use and immediately following any incident that can reasonably be suspected of causing damage.
- Fall protection equipment (FPE) will be provided and shall be worn when employees are exposed to a fall hazard. Employees will be trained on the proper use and inspection of fall protection equipment.
- Other PPE may be required per the Arc Flash Assessment.

For more information about performing a hazard assessment, see Chapter 29, “Hazard Recognition.” For other PPE requirements, see Chapter 25, “Personal Protective Equipment.”

Electrical Rubber Goods Inspection Schedule

- The inspection schedule provided in Table 10-1 will be followed, as a minimum, for rubber goods:

Table 10-1. Minimum Inspection Schedule for Electrical Rubber Goods

Type of Equipment	When to Test
Rubber insulating line hose	Upon indication that insulating value is suspect and after repair
Rubber insulating covers	Upon indication that insulating value is suspect and after repair
Rubber insulating blankets	Before first issue and every 12 months thereafter[1], upon indication that the insulating value is suspect, and after repair
Rubber insulating gloves	Before first issue and every 6 months thereafter[1], upon indication that insulating value is suspect, after repair, and after use without protectors
Rubber insulating sleeves	Before first issue and every 12 months thereafter[1], upon indication that insulating value is suspect, and after repair
[1] If the insulating equipment has been electrically tested but not issued for service, the insulating equipment may not be placed into service unless it has been electrically tested within the previous 12 months.	

Some operating companies, local bargaining contracts, and customer/client requirements may have a more stringent inspection/testing schedule. The most stringent requirements will take precedence.

Personal Protective Clothing

When employees are exposed to flames or electrical arcs, employees should wear clothing per the following minimum requirements:

- **Shirts**—FR arc-rated long sleeve shirt (minimum of ARC 2 and rated according to the exposure)
- **Jackets or coats**—When worn, FR arc-rated (minimum of ARC 2 and rated according to the exposure)
- **Rainwear**—When worn, FR arc-rated (minimum of ARC 2 and rated according to the exposure)
- **Pants**—FR arc-rated (minimum of ARC 2 and rated according to the exposure)
- **Coveralls**—When worn, FR arc-rated (minimum of ARC 2 and rated according to the exposure)
- **Headgear**—When wearing winter hard hat liners, FR required

Employees shall wear approved fire-retardant (FR) clothing which is arc-rated according to the exposure to protect their bodies. The outermost garment worn on the body shall be FR. Clothing that is 100% cotton may only be worn underneath the outer FR layer of clothing. All undergarments should be 100% cotton or other natural fibers. Clothing made from the following types of fabric, either alone or in blends,is prohibited: acteate, nylon, polyester, and rayon.

A hazard assessment should be made prior to the start of each job. The assessment should determine to what extent the employee may be exposed to flames or electrical arcs and determine the maximum heat energy that the employee could be potentially exposed to in a fault. The assessment should also determine the parts of the employee's body that might be exposed to flames or electrical arcs and determine if additional personal protective equipment is required. The result of the hazard assessment may determine that the exposure requires a greater level of arc-rated FR protection.

Protective Equipment and Tools

Employees should use general protective equipment and tools when in the proximity of or when working on exposed energized parts. Electrical equipment is defined as cord or plug-type electrical devices and includes the use of flexible or extension cords. Examples of portable electrical equipment include powered hand tools, powered bench tools, fans, and radios. The following rules apply:

- When working on or near exposed energized parts, qualified employees should use insulated tools or handling equipment suitable for the voltage present and working environment. In cases where the insulation might be damaged, a protective outer layer should be employed.
- Fuse handling equipment, insulated for the circuit voltage, should be used to remove or install fuses when the terminal is energized.
- Ropes and other hand lines used near exposed energized lines or equipment should be nonconductive and clean.

- Portable electrical equipment must be handled in such a manner that will not cause damage. Do not staple or hang power cords in a way that can cause damage to the outer jacket or insulation.
- Portable electrical equipment should be visually inspected for damage, wear, cracked or split outer jackets or insulation, and other damage, before use or before each shift. Any defects, such as cracked or split outer jackets or insulation, should be repaired, replaced, or placed out of service.
- Always check the compatibility of cord sets and receptacles for proper use.
- Ground-type cord sets may only be used with ground-type receptacles when used with equipment requiring a ground-type conductor.
- Attachment plugs and receptacles may not be altered or connected in a way that would prevent the proper continuity of the equipment-grounding conductor. Adapters may not be used if they interrupt the continuity of the grounding conductor.
- Only portable electrical equipment that is double insulated or designed for use in areas that are wet or likely to contact conductive liquids may be used.
- PPE should be used when handling portable electrical equipment that is wet or covered with a conductive liquid.
- Locking-type connectors should be properly secured after connection to a power source.
- When band hoists (hot line hoists) are used on energized conductors, an insulating link should also be used to increase the integrity of the band hoist and the insulating qualities.

Safety Meetings

Safety meetings are an integral part of a proactive safety management process. There are many types of safety meetings held.

Daily, before the start of work, the crew generally should hold a documented tailgate safety meeting. The meeting should focus on safety issues relevant to the work processes to be performed that day, along with reminders regarding the safe use and inspection of the tools and equipment required for the tasks to be performed that day. The crew should also discuss any near-misses, noncompliance, or other safety issues that were encountered the previous day.

A weekly safety meeting will be held on each jobsite. The purpose is to cover subjects of great importance and relevance to the success of the job. The subjects discussed and attendance will be documented by signing a meeting roster. These meetings supplement and support the safety training provided for all employees. Weekly safety meetings will generally last between 15 and 30 minutes.

The topics may be:

- Pre-chosen and information sent to the field by the Corporate Office and/or Operating Unit.
- Pertinent to the work being performed.
- Tools and equipment being used in the field.
- Work procedures and policies of the client/customer.
- Issues related to the crew’s activities.
- “Special” safety meetings, which may be called when:
  - An incident occurs on a jobsite.
  - Non-compliance was observed.
  - New work practices and/or policies are implemented.
  - New tools and/or equipment are introduced into the work area.
  - Other reasons.

Job Task Safety Analysis

Each day, before the start of each workday, the supervisor/foreman (person in charge) or their designee, should conduct a job briefing or Job Task Safety Analysis (JTSA) with the employees involved (see Chapter 29). The purpose of the JTSA is to identify the hazards associated with the scope of work, determine the safety precautions that will be implemented, and the required PPE by the crew performing the work assignment. The JTSA helps ensure that all members of the crew understand the work assignment and acknowledge that they understand and will follow the safety plan established to complete the work assignment. The JTSA should be documented and signed by all crewmembers. Refer to Sample 10-1. The following are requirements for the JTSA:

- The foreman (person in charge) should assemble the crew at the job site and explain the work to be done, and outline the steps to be followed.
- The foreman (person in charge) and the members of the crew will identify the hazards of the job. The crew should identify appropriate controls to eliminate, mitigate, control, or reduce the accident-producing potential of the hazards.
- If the hazards cannot be eliminated from the jobsite, the JTSA should list how the hazards can be mitigated, controlled, or reduced. This may be done by:
  - Dedicated assignment of work responsibilities.
  - Methods to isolate or control the hazard.
  - Other forms of protection (PPE, training, others) to reduce the hazard to the employees.
- The foreman (person in charge) must ensure that each member of the crew understands all instructions given.
- If the work or operations to be performed during the workday or shift are repetitive and similar, at least one JTSA should be conducted before the start of the first job of each day or shift. An additional JTSA should be completed and a meeting held with the members of the crew if significant changes that might affect the safety of the employees occur during the course of the work. Significant changes include changes in the scope of the work, work assignments, crew structure, crew leadership, environmental conditions or when other hazards (not originally noted) are determined to be present in the workplace.
- The discussion should be in such detail that all employees, by virtue of training and experience, can reasonably be expected to recognize and avoid the hazards involved in the job. A more extensive discussion should be conducted if the work is complicated or particularly hazardous or if the employee cannot be expected to recognize and avoid the hazards involved in the job.
- The foreman (person in charge) is responsible for accounting for all employees after the completion of each job.

Existing characteristics and conditions of electric lines and equipment specific to electrical transmission and distribution industry that need to be determined before work on or near the lines or equipment begins. They are:

- The nominal voltages of lines and equipment
- The maximum switching-transient voltages
- The presence of hazardous induced voltages
- The presence of protective grounds and equipment grounding conductors
- The locations of circuits and equipment, including electric supply lines, communication lines, and fire-protective signaling circuits
- The condition of protective grounds and equipment grounding conductors
- The condition of poles

- Environmental conditions relating to safety

Electrical Switching and Tagging

Introduction

When work requires that electrical switching and tagging procedures be performed on transmission or distribution circuits, the utility or other customer/client's program will take precedence over company internal work procedures. All employees should understand the general rules regarding switching and tagging and understand how to obtain a clearance from the system operator. Therefore, the Company should ensure that every employee is trained and understands the procedure that is in place at the work site.

Training

The employer should provide training to ensure that the purpose and function of the energy control program is understood and followed by employees. The knowledge and skills required for the safe application, use, and removal of the energy controls are required by employees. Each employee should receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy insulation, isolation and control.

Switching and Tagging General Practices

- A switch, fuse, tap, or any other device should not be tagged or operated without the specific instructions of the customer's representative (switching supervisor or dispatcher).

> NOTE: All switching and tagging shall be performed according to the system operator's switching/tagging procedure. No employee shall perform switching and tagging procedures without authorization by the system owner. Employees performing switching and tagging shall be properly trained.

- The person receiving the orders is responsible for and should personally direct the switching procedures. All switching instructions given by the customer's dispatcher should be documented in writing, and copies should be maintained at the field office. In each case, the Dispatcher's instructions should be read back to the dispatcher to ensure the accuracy of information. Switching orders are not transferable.
- Where equipment or switches are isolated or bypassed for testing, maintenance, or construction and arrangements have been made with the customer's representative, the isolated equipment or switch can be operated.
- The supervisor or person in charge of the work should determine with the customer's switching supervisor or dispatcher the necessary switching and tagging arrangements.
- A supervisor or person in charge should not work under the clearance of another employee or crew. If protection is required for more than one crew working on the same job, the person in charge of each crew should have the circuit or equipment tagged to him or her, and should obtain clearance.
- The clearance request for transmission or distribution circuits should be coordinated according to the customer's clearance procedures.
- All information required on tags should be properly and legibly entered on each tag.
- To release a tag, or give up clearance, the person for whom the tag or clearance was issued should contact the switching supervisor or dispatcher and release that tag in the following manner:

1. The supervisor or person for whom the tag or clearance was made should identify himself or herself.
2. The supervisor should determine that the person releasing the tag is the person for whom the tag was made.
3. The employee should identify the circuit or equipment upon which he or she has been working.
4. The employee should state that he or she is clear of the circuit or equipment, that grounds have been removed and state its condition so far as his or her work is concerned.

- In the event that it is absolutely necessary to place a piece of equipment in service but the equipment has been tagged to a person who is not available to remove it, the tag may be released by using the following steps:
  - The Company demonstrates that the specific procedure provides equivalent safety to the removal of the device by the authorized employee who applied it;
  - Verification that the authorized employee who applied the device is not available;
  - All reasonable efforts are made to contact the authorized employee to inform that person that the lockout or tagout device has been removed; and
  - Ensure that the authorized employee has the knowledge before they resume work on the system.
- The field office should maintain a file of all switching orders.

De-energizing Lines and Equipment

A designated employee should inform system operator that a particular section of line or equipment is to be de-energized. The designated employee becomes the employee in charge and is responsible for the clearance.

All switches, disconnects, jumpers, taps, and other means through which known sources of electric energy may be supplied to the particular lines and equipment to be de-energized should be opened. Such means should be rendered inoperable, unless its design does not so permit, and tagged to indicate that employees are at work.

Automatically and remotely controlled switches that could cause the opened disconnecting means to close should also be tagged at the point of control. The automatic or remote control feature should be rendered inoperable, unless its design does not so permit.

Tags should prohibit operation of the disconnecting means and should indicate that employees are at work.

After the applicable requirements for de-energizing lines and equipment as stated above have been followed and the employee in charge of the work has been given a clearance by the system operator, the lines and equipment to be worked should be checked for voltage to ensure that they are de-energized and protective grounds should be installed as required.

If two or more independent crews will be working on the same lines or equipment, the crews shall coordinate their activities with a single employee in charge of the clearance for all the crews and follow these requirements as if all of the employees formed a single crew.

To transfer the clearance, the employee in charge (or, if the employee in charge is forced to leave the worksite due to illness or other emergency, the employee's supervisor) should inform the system operator; employees in the crew should be informed of the transfer; and the new employee in charge should be responsible for the clearance.

To release a clearance, the employee in charge shall:

- Notify employees under his or her direction that the clearance is to be released;
- Determine that all employees in the crew are clear of the lines and equipment;
- Determine that all protective grounds installed by the crew have been removed; and

- Report this information to the system operator and release the clearance.

The person releasing a clearance should be the same person that requested the clearance, unless responsibility has been properly transferred.

Tags may not be removed unless the associated clearance has been released.

Only after all protective grounds have been removed, after all crews working on the lines or equipment have released their clearances, after all employees are clear of the lines and equipment, and after all protective tags have been removed from a given point of disconnection, may action be initiated to reenergize the lines or equipment at that point of disconnection. The person in charge should inspect the line to ensure that these requirements have been met.

Minimum Approach Distances

The minimum approach distances for voltages less than 72.5 kilovolts can be found in Table 10-2.

No employee may approach or take any conductive object closer to exposed energized parts than the established minimum approach distance unless:

- The employee is insulated from the energized part (insulating gloves and sleeves);
- The energized part is insulated from the employee and any other conductive object at a different potential;
- The employee is insulated from any other conductive object, as during live-line bare-hand work.

Refer to Table 10-2 for minimum approach distances.

Table 10-2. AC Minimum Approach Distances

Voltage Phase-to-Phase	Distance Phase-to-Ground Exposure		Distance Phase-to-Phase Exposure	
0.751 to 5.0 kV	0.63m	2.07ft	0.63m	2.07ft
5.1 to 15.0 kV	0.65m	2.14ft	0.68m	2.24ft
15.1 to 36.0 kV	0.77m	2.53ft	0.89m	2.92ft
36.1 to 46.0 kV	0.84m	2.76ft	0.98m	3.22ft
46.1 to 72.5 kV	1.00m	3.29ft	1.20m	3.94ft
These minimum approach distances can be used provided the jobsite is at an elevation of 900 meters (3,000 feet) or less. If working above 900 meters (3,000 feet) above mean sea level, the distances must be calculated using the altitude correction factor.				

For voltages over 72.5 kilovolts, the minimum approach distance can be calculated by determining the maximum anticipated per-unit transient overvoltage, phase to ground, through an engineering analysis or assume a maximum anticipated per-unit transient overvoltage, phase to ground or use the minimum approach distance found in Table 10-3.

Table 10-3. AC Minimum Approach Distances

Voltage Phase-to-Phase	Distance Phase-to-Ground Exposure		Distance Phase-to-Phase Exposure	
72.6 to 121.0 kV	1.13m	3.71ft	1.42m	4.66ft
121.1 to 145.0 kV	1.30m	4.27ft	1.64m	5.38ft
145.1 to 169.0 kV	1.46m	4.79ft	1.94m	6.36ft
169.1 to 242.0 kV	2.01m	6.59ft	3.08m	10.10ft
242.1 to 362.0 kV	3.41m	11.19ft	5.52m	18.11ft
362.1 to 420.0 kV	4.25m	13.94ft	6.81m	22.34ft
420.1 to 550.0 kV	5.07m	16.63ft	8.24m	27.03ft
550.1 to 800.0 kV	6.68m	22.57ft	11.38m	37.34ft
1. These minimum approach distances can be used provided the jobsite is at an elevation of 900 meters (3,000 feet) or less. If working above 900 meters (3,000 feet) above mean sea level, the distances must be calculated using the altitude correction factor. 2. The phase to phase minimum approach distances may be used provided that no insulated tool spans the gap and no large conductive object is in the gap. 3. The clear live-line tool distance shall equal or exceed the values for the indicated voltage ranges.				

When performing electric transmission and distribution work at elevations above 900 meters, the minimum approach distances should be adjusted by the appropriate factor in Table 10-4 for the elevation of the work.

Table 10-4. Altitude Correction Factor

Altitude Above Sea Level (meters)	Factor
0 to 900 m	1.00
901 to 1200 m	1.02
1201 to 1500 m	1.05
1501 to 1800 m	1.08
1801 to 2100 m	1.11
2101 to 2400 m	1.14
2401 to 2700 m	1.17
2701 to 3000 m	1.20
3001 to 3600 m	1.25
3601 to 4200 m	1.30
4201 to 4800 m	1.35
4801 to 5400 m	1.39
5401 to 6000 m	1.44

Instead of using the minimum approach distances contained in Table 10-2 or Table 10-3, a person knowledgable and competent in the field of electric transmission and distribution system design, can perform an engineering analysis and determine the maximum transient overvoltage. When the engineering analysis of the system shows the maximum transient overvoltage is lower and the minimum approach distance can be lowered from the distance shown in Table 10-2 or Table 10-3, the minimum approach distances can be adjusted accordingly. To reduce the distances, we must ensure that any conditions assumed in the analysis, for example, blocking the recloser on a circuit or installing portable protective gaps, are present during energized work. To calculate the minimum approach distances for voltages over 72.5 kV, use Table 10-5.

Table 10-5 AC Live-Line Minimum Approach Distance

For phase to phase system voltages of more than 72.5 kV nominal

MAD= $0.3048(C+a)V_{L-G}TA+M$, where

C= 0.01 for phase to ground exposures that the employer can demonstrate consist only of air across the approach distance (gap),

0.01 for phase to phase exposures if it can be demonstrated that no insulated tool spans the gap and That no large conductive object is in the gap, or

0.11 otherwise

V_{L-G}= phase to phase rms voltage, in kV

T= maximum anticipated per-unit transient overvoltage; for phase to ground exposures, T equals T_{L-G}, the maximum per-unit transient overvoltage, phase to ground, determined by the employer; for phase to phase exposures, T equals $1.35T_{L-G}+0.45$

A= altitude correction factor. See Table 10-4.

M= 0.31 m, the inadvertent movement factor

a= saturation factor, as follows

Phase to Ground Exposures				
$V_{Peak}=T_{L-G}V_{L-G}\sqrt{2}$	635 kV or less	635.1 to 915 kV	915.1 to 1050 kV	More than 1050 kV
a	0	$(V_{Peak}-635)/140{,}000$	$(V_{Peak}-645)/135{,}000$	(VPeak-675)/125,000

Phase to Phase Exposure					
$V_{Peak}=(1.35T_{L-G}+0.45)V_{L-G}\sqrt{2}$	630 kV or less	630.1 to 848 kV	848.1 to 1131 kV	1131.1 to 1485 kV	More than 1485 kV
a	0	$(V_{Peak}-630)/155{,}000$	$(V_{Peak}-633.6)/152{,}207$	$(V_{Peak}-628)/153{,}846$	$(V_{Peak}-350.5)/203{,}666$

Methods of Controlling Possible Transient Overvoltage

There are several means of controlling overvoltages that occur on transmission systems. The operation of circuit breakers or other switching voltages can be modified to reduce switching transient overvoltages. Overvoltages can also be held to an acceptable level by installing surge arrestors or portable protective gaps on the system. The use of switching restrictions can also minimize overvoltages.

Operation of Circuit Breakers

The maximum transient overvoltage that can reach the worksite is often the result of switching on the line on which employees are working. Disabling automatic reclosing during energized line work, so that the line will not be reenergized after being opened for any reason, limits the maximum switching surge overvoltage to the larger of the opening surge or the greatest fault-generated surge, provided that the devices (for example, insertion resistors) are operable and will function to limit the transient overvoltage and that circuit breaker restrikes do not occur. The insertion resistors must properly function to limit the overvoltage level. If the automatic recloser cannot be disabled, other methods of controlling the switching surge may be necessary.

When working on double circuit construction, surges on an adjacent line can cause significant overvoltages. The engineering analysis must account for coupling to adjacent lines.

Surge Arrestors

The use of modern surge arrestors allows a reduction in the basic impulse-insulation levels of much transmission system equipment.

Switching Restrictions

Another form of overvoltage control involves establishing switching restrictions, whereby the employer prohibits the operation of circuit breakers until certain system conditions are present. Switching is restricted by using a tagging system, similar to that used for a permit, except that the common term used for this activity is a "hold-off" or "restriction." These terms indicate that the restriction does not prevent operation, but only modifies the operation during the live-line work activity.

Rubber Gloves/Sleeves for Energized Electrical Work

Purpose

This section provides information and guidance in the safe work practices and the proper selection, testing, and use of insulating rubber gloves, sleeves, and insulating protective equipment when work is performed on or near parts energized at 600 V through 34.5 kV phase-to-phase.

The safe work practices contained herein are the minimum requirements for working on or near exposed energized parts. The ultimate goal—safety—depends on the management system, professionalism, and judgment of all concerned, as well as following established work practices.

Effectiveness

Existing governmental codes, statutes, rules, and orders, as well as contract specifications, utility, or customer safety requirements or conditions, should be considered a part of this practice. When any conflict exists between this policy and any of the above sources, the policy that provides greater protection to employees should prevail. Where such conflicts are found, they should be documented in writing. The resulting safe work practice or method to be used should be documented in writing, approved by management, and communicated to all affected employees before the start of work.

Emergency Conditions

In case of emergency involving hazard to life, management, a supervisor, or employee in charge of any work may modify or suspend such portion of this safe work practice as may be considered temporarily necessary to permit proper handling of the specific emergency.

Responsibilities

The supervisor or employee in charge of the work should be responsible and accountable for performing a job hazard analysis or JTSA before starting the work. The analysis should include, but is not limited to, identifying the work that is to be done and methods by which it will be performed, the employees involved, and their responsibilities. The analysis should also include the identification of any existing or potential work site conditions or potential hazards and the methods or means by which the existing or potential hazards will be eliminated or controlled. The analysis should be documented in writing, using the JTSA form and communicated to all affected employees at a safety training session, before the start of work.

Employees share with management, supervisors, and the employee in charge of the work the responsibility for safety. Employees are responsible for their own safety, the safety of their fellow workers, and the public. Employees should become familiar with this safe work practice and use all the devices that are provided for their protection.

Conditions Not Covered

Although each employee is primarily responsible for his or her own safety, in all instances where conditions are not covered in this safe work practice or the job is not completely understood by the employee, the employee should obtain specific instructions from the supervisor or employee in charge before proceeding with the work.

General Rules

1. Before conducting any work on energized lines or equipment, make a request to the system operator to see if the work can be performed de-energized.
2. All circuits and equipment should be considered energized until de-energized, tested, and grounded using approved work methods and equipment.
3. Only qualified, authorized employees (and apprentices trained for that task and under the qualified person's direct observation and control) may work on or with exposed energized parts.
4. Only qualified, authorized employees (and apprentices trained for that task and under the qualified employee's direct observation and control) may work in areas where they might come into direct contact with unguarded, uninsulated energized parts or equipment operating at 50 V or more.
5. Except as provided in General Rule #2, at least two qualified employees should be present while performing installation, removal, or repair of:
   - ❑ De-energized parts, if an employee is exposed to contact with other parts energized at more than 600 V.
   - ❑ Equipment such a transformers, capacitors, and regulators.

NOTE: The above requirement of two qualified employees does not apply to the following operations.

6. The preceding requirement of two qualified employees does not apply to the following operations:
   - ❑ Routine switching of circuits, if conditions at the site allow the work to be done safely
   - ❑ Work performed with live-line tools (hot sticks), if the employee can position so that he or she is not within reach of, or otherwise exposed to, contact with energized parts
   - ❑ Emergency repairs to the extent necessary to eliminate hazards and safeguard the public
7. The qualified employee should specify which lines and equipment may be worked and what work is to be done.
8. The qualified employee should closely supervise the work and keep employees advised as to their personal safety and the handling of tools and equipment.
9. Employees should protect his or her climbing or working space at all times with approved protective equipment such as rubber blankets, line hose, line guards, protectors, and so on.

Minimum Approach Distances—Rubber Gloving

When using Rubber Gloving work methods, insulated rubber gloves (with leather protectors) rated for the applicable circuit voltage shall be required whenever an employee's body and/or any conductive object under the employee's control comes within the minimum approach distances found in Table 10-2 or Table 10-3.

Minimum Approach Distances—Live-Line Tools

When working on energized parts using Live-Line Tools work methods, no employee should approach or take any conductive object closer to exposed energized parts than set forth in Table 10-2 or Table 10-3 unless:

- The employee is insulated from the energized part. Insulating gloves or insulating gloves (with leather protectors) and sleeves are considered insulation of the employee.
- The energized part is insulated or isolated from the employee and from any other conductive object at a different potential.

Insulating Rubber Gloves

A pair of approved, rubber insulating gloves, leather protectors, and bag should be assigned to each qualified worker who might be required to work on or be exposed to energized parts.

Rubber insulating rubber gloves should be manufactured to the ANSI/ASTM D 120 specifications described in Table 10-6.

Table 10-6. ANSI/ASTM D 120 Glove Specifications

Glove Color	Class	Maximum Use Voltage (AC rms Volts)
Red	0	1,000
White	1	7,500
Yellow	2	17,000
Green	3	26,500
Orange	4	36,000

In addition to the requirements of the "General Rules" and "Minimum Approach Distances—Rubber Gloving" sections of "For Energized Electrical Work," insulating rubber gloves, with leather protectors, shall also be worn when employees are:

- Working on ungrounded circuits, conductors, or electrical equipment rated at 35 kV (phase-to-phase) or less that are subject to back feed or induced voltage.
- Working within the reach of another person in an exposed primary area.
- Operating manually controlled air break switches.
- Opening and closing manually operated oil circuit breakers.
- Setting poles, pulling in wires, or handling other conducting materials near conductors, equipment, or circuits that are or may become energized.
- Working on or near exposed parts (open wire secondaries, exposed telephone, fire alarm circuits, and so on) that can become energized, unless such parts are tested for voltage and adequately grounded.
- Removing lead or plastic sheaths from existing cables or splices or when opening or cutting cables (until positive tests at the work location prove the conductors to be de-energized).
- Digging or probing in proximity of an energized cable.
- Working on or near series street lighting circuits even though they are disconnected from the source of power.

The following guidelines should be observed when rubber gloves are used:

- Each day, before work is begun where rubber gloves are required, each glove should be visually inspected and air tested by the employee using the gloves. Defective gloves shall be removed from service and tagged.
- Rubber gloves shall be dielectrically tested at a minimum of every six months or more often if field conditions warrant or other policies and/or local regulations require it.
- Rubber gloves should be stored, cuff down, in approved bags in a fully extended position. Rubber gloves should not be folded.
- Rubber glove bags should either be hung up or placed in a special compartment. They should not be placed where other tools or equipment can damage the gloves.
- No items are permitted to be placed in the rubber glove bag along with the rubber gloves and leather protectors.
- Leather protectors should not be worn over rubber gloves to keep from damaging the insulating properties of the PPE. Do not use leather glove protectors for any other work. Rubber glove protectors should not be worn as work gloves.

Insulating Rubber Sleeves

- Rubber sleeves, rated for the circuit voltage, shall be worn whenever the employee's arms or shoulders might be exposed to contact with energized parts.
- When rubber sleeves are required, they shall be put on before the employee's arms or shoulders come within 5 ft (1.52 m) of any exposed energized parts.

Rubber insulating sleeves are required when installing and/or removing an insulating cover on any energized parts. After all exposed energized parts are thoroughly covered, rubber insulating sleeves are not required until the employee begins the process to remove the cover.

- Each day, before work is begun, where rubber sleeves are required, each sleeve shall be visually inspected by the employee using the sleeves. Defective sleeves shall not be removed from service and tagged.
- Rubber sleeves should be electrically tested at a minimum annually or more often if field conditions warrant or other policies and/or local regulations require it.
- Rubber sleeves should be stored properly. Rubber sleeves should be either hung up or stored in approved bags. Rubber sleeves should be placed in a special compartment where they cannot be damaged by other tools or equipment.

Use and Care of Rubber Goods and Cover-Up

- Energized parts within 5 ft (1.52 m), measured in all directions, except that part of the conductor or equipment being worked on, should be covered with insulating cover-up materials.
- All open leads and wire should be properly grounded or covered with insulating protective equipment when it is necessary to work around or climb through them. (This includes open secondaries, open communication wires, and fire alarm and pilot wires.)
- When placing protective equipment on or near energized parts, the employee should use insulating rubber gloves, with leather protectors, or use approved insulated live-line tools to install protective equipment.

- When covering primary conductors energized at 5,000 V or more, employees should be positioned on an insulated platform, insulated ladder, in an aerial basket, or use approved live-line tools are used to install cover-up equipment.
- Cover-up equipment should be installed from a safe position and wherever possible, from a position below the energized part to be covered. Cover the part nearest the employee first and work away from the employee's position. In removing cover-up materials, start with the piece farthest away and work back to the closest.
- Rubber goods can be damaged by many chemicals, especially petroleum-based products such as oils, gasoline, hydraulic fluid, inhibitors, hand creams, paste, and salves. If contact is made with these or other petroleum-based products, the contaminant should be wiped off immediately. Rubber goods should be cleaned with a mild soap (no chlorine). After washing, rinse thoroughly with clear water and air dry. If any signs of physical damage or chemical deterioration are found, the rubber goods shall be removed from service and tagged.
- Rubber goods can be damaged by sunlight and heat and should be stored in proper containers when not in use.

Live-Line Work—Rubber Gloving

- Where present, the automatic reclosing feature of the first source side of the circuit interrupting devices should be made inoperative (non-automatic) and tagged.
- Only tools and equipment approved by the Company should be used in live-line rubber gloving work.
- A careful check should be made to ensure that the condition of the structure and lines at the point of work is such that the job can be performed safely. In addition, the adjacent spans and structures should be carefully checked for defects in conductors, tie wires, insulators, and other equipment.
- Extreme caution should be exercised when working on energized lines in inclement weather.
- While live-line work is in progress, no other work of any nature should be performed on the same pole or structure.
- Employees doing work on energized lines or equipment should devote their individual attention to the work at hand.
- All protective equipment should be installed from a level below the conductor or equipment. The removal of protective equipment should be done with equal care in reverse order.
- Employees working on energized lines and equipment should position themselves below the work whenever possible.
- When two or more employees are working, whether on a pole or out of a bucket, they should not work on different phases or items at different potentials at the same time. Work should only take place on one phase at a time.
- When it is necessary to lay an energized conductor on a conductive part, both the conductor and conductive part should be covered with approved insulating equipment and the crossarm or pole should be covered with an approved guard.
- A system neutral should not be opened until the proposed opening has first been jumpered or bypassed.

Live-Line Work—Live-Line Tool Method (Hot Sticks)

- Rubber gloves need not be worn when using live-line tools except when making or breaking a circuit or during inclement weather or when required by system operator or local regulations.

- Rubber sleeves need not be worn when using live-line tools except when the employee's upper arm or shoulder are within 5 feet (1.52) of any energized part when working at distribution voltages.
- Only live-line tools approved by the Company should be used in live-line maintenance work.
- A careful check should be made to see that the condition of the structure and lines at the point of work is such that the job can be performed safely. In addition, the adjacent spans and structures should be carefully checked for defects in conductors, tie wires, insulators, and other equipment.
- Under no condition should an employee depend on another employee to hold a live conductor clear of them.
- When moving heavy conductors, blocks should be used on the live-line tool so that they can be moved slowly and carefully.
- While live-line work is in progress, no other work of any nature should be performed on the same pole or structure.
- Live-line tools should be stored and transported in special containers or trailers to adequately protect them from damage.
- All live-line tools, when not in use, should be kept in canvas bags or waterproof boxes provided for that purpose, and such containers should be stored in a dry and, if possible, warm location.
- Live-line tools should never be laid directly on the ground or against sharp objects. Special tool holders or tarpaulins should be used for this purpose.
- All live-line tools should be visually inspected before use each day. Tools to be used should be wiped clean, and if any hazardous defects are found, the tool should be removed from service and tagged.
- Where present the automatic reclosing feature of the circuit interrupting devices shall be made inoperative (non-automatic) and tagged.
- Before each use, live-line tools should be closely inspected and cleaned. Tools should be electrically tested by qualified personnel according to the recommendations of the manufacturer and regulatory requirements. Live-line tools (hot sticks) should be electrically tested at a minimum of every two (2) years.

Work in and Around Substations (Maintenance and Construction)

Access to Substations

- Qualified employees should only enter a substation after receiving proper authorization from the person in charge of the substation.
- Sufficient access and working space shall be provided and maintained around electrical equipment to permit ready and safe operation and maintenance of such equipment.
- Conductive fences around substations shall be grounded. When a substation fence is expanded or a section is removed, fence sections shall be isolated, grounded, or bonded as necessary to protect employees from hazardous differences in electrical potential.
- Upon entering an attended substation, each employee, other than employees regularly working in the substation, shall report their presence to the employee in charge of the substation activities to receive information on special system conditions affecting employee safety.

Barricades and Barriers

- When work is to be done in a de-energized bay adjacent to an energized bay, barricades should be installed to warn against entry into the energized area.
- When an addition is being constructed, barricades should be installed around the existing energized substation until the new construction is completed.
- When employees are positioned on top of structures, transformers, breakers, regulators, or ladders and are within reaching distance of an energized conductor or apparatus, barriers should be used to prevent accidental contact, or approved protective equipment should be used.
- When working in close proximity to energized conductors or equipment, temporary barriers should be installed to protect employees.
- Provide guards around all live parts operating at more than 150 volts to ground without an insulating covering unless the location of the live parts gives sufficient clearance (horizontal, vertical or both) to minimize the possibility of accidental employee contact.
- Maintain guarding of energized parts, except for fuse replacement, within a compartment during operation and maintenance functions to prevent accidental contact with energized parts and to prevent dropped tools or other equipment from contacting energized parts.
- Before guards are removed from energized equipment, install barriers around the work area to prevent employees not working on the equipment from contacting the exposed live parts.

Capacitors

- Before work is begun on a capacitor bank, the bank should be grounded.
- Employees should wait five minutes before shorting out a capacitor to allow the capacitor to drain itself by built-in discharging devices.
- Live-line tools should be used to short out and ground capacitors.
- When capacitors are removed from service, they should be shorted out.

Circuit Breaker Maintenance and Repair

Proper clearance should be obtained to test or make repairs to circuit breakers.

- All parties concerned should be instructed about the work plan that will be followed.
- When switching the breaker out for maintenance, if the circuit breaker control switch is remote from the circuit breaker, the person in charge should place an electrical Danger tag on the control switch.
- A check should be made to determine that all disconnects or air-break switches are in an open position. The blades should rest in the full open position.
- On breakers where the energized side of the disconnects are close to the Oil Circuit Breaker (OCB), Air Circuit Breaker (ACB), Vacuum Breaker (VAC) or Gas Breaker (SF6) bushings, employees should not climb up on top to connect the leads used for test purposes. This work should be done from a ladder below the energized zone.
- When testing an OCB, ACB, VAC or SF6 for the purposes of making a test, the test equipment and the vehicle should be grounded to the substation ground.
- The case of each test transformer should be grounded when in use, provided that such cases are made of metal.
- When an OCB, ACB, VAC or SF6 is being operated electrically or by spring, employees should keep hands clear of the mechanical closing mechanism.
- The secondary side of an energized current transformer should not be opened and grounds installed on external bushings.

- Before entering the tank of an OCB to make repairs or adjustments, the following precautions should be carried out:
  1. All AC control power should be disconnected.
  2. All DC control power should be disconnected.
  3. The main control valve should be off.
  4. The operating mechanism should be in the relaxed position or blocked to prevent movement.
- Only remove or insert draw-out-type circuit breakers in the open position. Render the control circuit breaker inoperable if the design of the equipment permits.

Entry should be in accordance with approved procedures for enclosed or confined spaces. Refer to Chapter 22 for Confined Space Entry Program.

- When employees are working inside the tank, the breaker should not be closed electrically or by spring.
- A ladder of the proper length should be used when climbing up on an OCB or other equipment, so that the ladder does not reach energized conductors.
- After all work has been completed on top of the equipment, a careful check should be made to see that all tools, materials, and grounds have been removed.
- If it becomes necessary to climb on top of an OCB during oil filtering operations, the terminals should be grounded.
- When performing work on or near high-pressure air or gas systems, extreme caution should be exercised.

Fall Protection

- Fall arrest equipment, work positioning equipment, or travel restricting equipment should be used by employees working at elevated locations more than 6 ft (1.83 m) above the ground unless an approved ladder, a work platform, a guardrail system, or a safety net system is in place.
- Personal fall arrest systems should be rigged so that an employee can neither free-fall more than 6 ft (1.83 m) nor contact any lower level.
- Positioning belts should be positioned so that the employee cannot free-fall more than 2 ft (0.61 m).
- If vertical lifelines or droplines are used, no more than one employee may be attached to any one lifeline.
- Snaphooks may not be connected to loops made in webbing-type lanyards.
- Snaphooks may not be connected to each other.
- All snaphooks used for positioning or fall arrest should be of the locking type.

Insulating Equipment

- Insulating equipment should be installed from a safe position and, whenever possible, from a position below the conductor or apparatus to be covered. The line or equipment nearest the employee should be covered first. When removing insulating equipment, the equipment farthest away should be removed first.
- Climbing above exposed and energized conductors or equipment is not permitted.

- When it is necessary to work on or near energized conductors or equipment, sufficient protective equipment should be used to prevent accidental contact with the energized conductor or equipment.
- All open leads and wires should be de-energized and grounded or covered with insulating protective equipment whenever it is necessary to work around or climb through them.
- When covering conductors energized at 5,000 V or more, the employee should be positioned on an insulated platform, insulated ladder, or in an aerial basket, or use approved live-line tools to install protective equipment.
- When not in use, insulating equipment should be shielded from sunlight, heat, ozone, oil, and other harmful agents and protected from physical damage from sharp or rough objects.
- Blankets should not be used on the ground without protecting them from physical damage and moisture by means of a tarp, canvas, or other protective mats.
- Flexible equipment should always be stored in a relaxed position. Blankets, line hose, and hoods should not be stored in folded or strained positions.
- Barriers should be used when working adjacent to energized conductors or equipment that cannot be adequately insulated with cover-up material. When barriers are erected near energized equipment or conductors, they should be constructed of nonconductive materials.
- All protective equipment should be maintained in satisfactory condition. When any protective equipment becomes defective, it should be replaced or sent in for repair.
- Before each use, the person in charge should ensure that the insulating equipment is properly inspected. Damaged or defective equipment should not be used and should be removed from service.
- Approved live-line tools should be used to operate disconnect switches. When switching, employees should keep as far away as practical from the energized equipment.
- Each live-line tool should be wiped clean using a silicone wiping cloth and should be visually inspected for defects before use each day.

Working in an Energized Substation

- When work is to be done in an energized substation, the person in charge should determine:
  - That people who enter are qualified.
  - What equipment is energized.
  - What protective equipment and precautions are necessary for the safety of the employees.
  - The extraordinary caution that should be exercised in the handling of materials and equipment in the vicinity of energized equipment.
- Climbing above exposed energized equipment or conductors is not permitted.
- All equipment should be considered energized at full voltage unless it is de-energized, tested for voltage, isolated from all sources of potential, and grounded. In a substation, special precautions should be taken to guard against hazards of induced voltage.
- No one is permitted to approach or take any conductive object closer than the established minimum approach distances in Table 10-2 or Table 10-3 to exposed energized parts unless: (1) the employee is insulated from the energized part or (2) the energized part is insulated or guarded from the employee.
- Chain jacks should not be used on energized conductors or equipment. When using chain jacks on de-energized conductors or equipment where accidental contact with energized equipment could be made, protective equipment should be used.

- When it is necessary to do any switching in a substation where employees are working, the customer's switching supervisor or dispatcher should notify the persons in the substation holding clearances. The individuals holding clearances should then notify their employees.

Working on Overhead Structures

- Before ladders, scaffolds, steel structures, or other elevated structures are climbed, a thorough inspection should be made to determine if they are safe. When there is doubt, these items should not be climbed until they are made safe by guying, bracing, or other adequate means. Fall protection devices should be used when climbing.
- Employees on the ground should stay clear of the overhead work to avoid being struck by falling objects.
- Tools or materials should not be thrown up to or down from structures or elevated work areas.
- When working on elevated structures, employees should wear a full body harness. When strapping off, employees should observe the hooking of the safety snap into the D-ring.
- No one is permitted under a structure that is being erected or assembled.
- Tag lines should be used to guide and handle steel.

Working in Transformer Tanks and Vessels

- Entry into tanks and vessels should be in compliance with the Company Confined Spaces Program.
- When electrically operated tools are used, a ground fault interrupter should be used with 110-V lights. Lights must be shielded.
- When it is necessary to remove a manhole cover or inspection plate from a transformer, any pressure or vacuum should be relieved before removing any stud or bolt.
- Transformer tanks should be ventilated while employees are working in them. Oxygen levels should be monitored. Employees should not enter any vessel or tank where the oxygen level is below 19.5% or above 23.5 %.
- When pulling a vacuum on a transformer, no one should be on top of the transformer.

Sample 10-1: Job Task Safety Analysis—Power

Job Task Safety Analysis - Power

Company Name:	Date:	Time:	Job #:
Location:		City:	State:
Describe job task:			
Competent Person Trenching / Excavation:		Soil Classification:	
Person responsible for First Aid / CPR:			
Name and Location of Emergency Medical Facility:			
Location of AED:		Emergency Contact Number: 911	

Each item is followed by Yes / N/A check boxes.

PPE Required
- Hardhat
- Safety Glasses/Goggles
- Hearing Protection
- Leather Gloves
- Dielectric Overshoes
- Face Shield
- Welding Hood
- Chemical Gloves
- Dielectric Gloves
- Protective Sleeves
- Air Test (Electrical PPE)
- Class 2 Reflective Vest
- Class 3 Reflective Vest
- Respirators

Fall Protection
- "Buck Squeeze"
- Full Body Harness/Lanyard
- Climbing Belt
- Qualified Climber
- 100 % Fall Protection-Tower
- Warning Line
- Safety Monitor
- Barricaded/Control Zone
- Falling Object Protection
- Daily Inspections

Aerial Lifts
- Qualified Operator
- Wheels Chocked
- Grounded & Barricaded
- Warning Labels
- Controls Labeled
- Lower Controls Ope...

Ladders
- Daily Inspection
- Warn./Usage Labels Af...
- 3 Feet Above Landing
- Ladder Secured

Confined Space
- Competent Person
- Permitted/Non-Permitted
- Calibrated Monitor
- Continous Monitoring
- Hole Watch
- Man Hole Guard
- Forced Ventilation
- Rescue Equipment
- Resc. Team/Serv. Identified
- Hot Work Permit
- Warning Signs
- Written Program on Hand
- Contractors Notified
- Confined Space Log Book

Excavations
- Competent Person
- Utilities Located
- Integrity of Adj. Structures
- Soil Classification
- Location of Spoil Bank
- Overhead Load Protection
- Water in Trench
- Ladders/Ramps (Circle 1)
- Ladders Secured
- Sloping/Benching
- Sh... ...tem
- T... ...ta
- A... ...ested
- D... ...Inspecti...
- ...
- ...ge... ...ue Eq...
- ...Book...

S... ...ion
- ... ...Pota...
- ...
- ...m Restr...
- ...and Wash Station

Traffic Control
- Traffic Control Plan
- Right/Left Lane Closed
- Sign - Flagman Ahead
- Sign - Construction Ahead
- Arrow Board
- Message Board
- Traffic Control Zone
- Advance Warning Area
- Transition Area
- Buffer Space
- Work Area
- Termination Area
- Barricades/Cones
- Stop/Slow Paddles

Cranes/Digger Derricks
- Qualified Operator
- Annual Inspection
- Daily Inspections
- Fire Extinguisher
- Qualified ...
- Outrig...
- ...rotec... ...n Su... ...s
- ...ind ...
- ...arn... ...al/Li...
- ...oad ...
- ...iggin... ...spected
- ...ualif... ...rs
- ...rane ... Posted

...ical
- ...raine... ...FA Employees
- ...irst A...
- ...loodb... ...athogen Kit

...inistrative Issues
- OSHA Poster
- MSDS Manual
- Written Safety Program
- Permits
- Daily AED Check

Electrical
- Daily Inspection of Tools/Cords
- GFCI/Assured Grounding
- Energized Work Permit
- Survey of Daily Conditions
- Operating Voltage ___________
- Elevated Structures Inspected
- Minimum Safe Distances
- Energized/Deenergized
- Arc-rated Face Shield
- FR Clothing
- Grounds Tested
- Equal Potential Zone
- Live Line Tools Tested
- Blankets Te...
- ...
- ...ued
- ..."Dead"

Lo... ...agout
- ...
- ...
- ...w Tester
- ...e Tested

G... ...ders
- ...
- ...
- ...From Fuels
- ...ainers Properly Labeled
- Secured to Prevent Falling
- Inspections/Certificates
- Stored Away From Heat
- Proper Ventilation
- Warning Signs

Clearance Issued (Yes / N/A)

#: ___________

Time: ___________

By: ___________

Work assignmen... ...essed above shall be outlined below

All employees must print and sign their names below

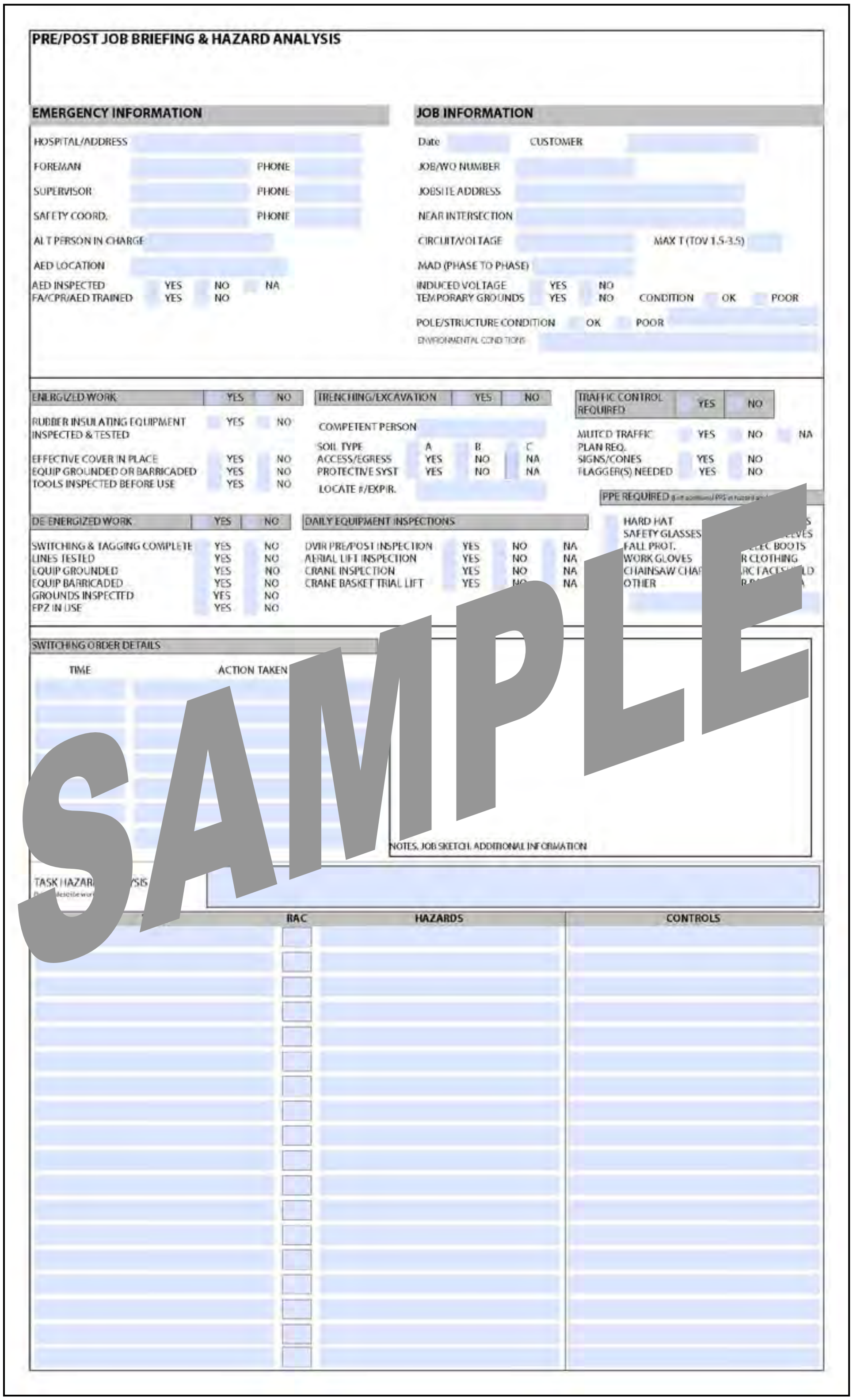
Printed Name	Signature	Printed Name	Signature
1.		6.	
2.		7.	
3.		8.	
4.		9.	
5.		10.	

Foreman Signature ______________________ **Safety Rep. Signature** ______________________

NOTE: Additional Job Briefing will be required when scope of work changes and/or conditions change

1. Have all overhead lines (parallel, crossings, etc) been located and have proper precautions been identified?
2. Have all employees received training and are qualified to perform the tasks to which they have been assigned?
3. List injuries, incidents, first aid and near miss cases that occur at the job site during the course of the day:

Sample 10-2: Pre/Post Job Briefing & Hazard Analysis



PRE/POST JOB BRIEFING & HAZARD ANALYSIS

EMERGENCY INFORMATION

HOSPITAL/ADDRESS
FOREMAN PHONE
SUPERVISOR PHONE
SAFETY COORD. PHONE
ALT PERSON IN CHARGE
AED LOCATION
AED INSPECTED YES NO NA
FA/CPR/AED TRAINED YES NO

JOB INFORMATION

Date CUSTOMER
JOB/WO NUMBER
JOBSITE ADDRESS
NEAR INTERSECTION
CIRCUIT/VOLTAGE MAX T (TOV 1.5-3.5)
MAD (PHASE TO PHASE)
INDUCED VOLTAGE YES NO
TEMPORARY GROUNDS YES NO CONDITION OK POOR
POLE/STRUCTURE CONDITION OK POOR
ENVIRONMENTAL CONDITIONS

ENERGIZED WORK YES NO
RUBBER INSULATING EQUIPMENT INSPECTED & TESTED YES NO
EFFECTIVE COVER IN PLACE YES NO
EQUIP GROUNDED OR BARRICADED YES NO
TOOLS INSPECTED BEFORE USE YES NO

TRENCHING/EXCAVATION YES NO
COMPETENT PERSON
SOIL TYPE A B C
ACCESS/EGRESS YES NO NA
PROTECTIVE SYST YES NO NA
LOCATE #/EXPIR.

TRAFFIC CONTROL REQUIRED YES NO
MUTCD TRAFFIC PLAN REQ. YES NO NA
SIGNS/CONES YES NO
FLAGGER(S) NEEDED YES NO

DE ENERGIZED WORK YES NO
SWITCHING & TAGGING COMPLETE YES NO
LINES TESTED YES NO
EQUIP GROUNDED YES NO
EQUIP BARRICADED YES NO
GROUNDS INSPECTED YES NO
EPZ IN USE YES NO

DAILY EQUIPMENT INSPECTIONS
DVIR PRE/POST INSPECTION YES NO NA
AERIAL LIFT INSPECTION YES NO NA
CRANE INSPECTION YES NO NA
CRANE BASKET TRIAL LIFT YES NO NA

PPE REQUIRED
HARD HAT
SAFETY GLASSES
FALL PROT.
WORK GLOVES
CHAINSAW CHAP
OTHER
ELEC BOOTS
R CLOTHING
RC FACESHIELD

SWITCHING ORDER DETAILS
TIME ACTION TAKEN

NOTES, JOB SKETCH, ADDITIONAL INFORMATION

TASK HAZARD ANALYSIS

	RAC	HAZARDS	CONTROLS

SAMPLE

(Pre/Post Job Briefing & Hazard Analysis, Continued)

CREWMEMBERS

PRINT NAME	SIGNATURE	ROLE/RESPONSIBILITY	POST BRIEF INITIALS

QUAL. CRANE OPR. QUAL. RIGGER/SIGNL QUAL. OBSERVER

VISITORS

PRINT NAME	SIGNATURE

SAMPLE

POST JOB ... MATION

WE... DENTS OR ... ORT TOD... SUPERVISION NOTIFIED? YES NO

...ES, LIS...

W... MISSE... O RE... YES NO SUPERVISION NOTIFIED? YES NO

HO... ATIO...

...y the Host (Client) within (2) working days of any unanticipated hazardous conditions not mentioned by the Host.

WERE THERE ANY UNIQUE HAZARDOUS CONDITIONS PRESENTED BY THE WORK PERFORMED? YES NO

IF YES, LIST

WERE THERE ANY HAZARDOUS CONDITIONS NOT MENTIONED BY THE HOST (CLIENT) ENCOUNTERED? YES NO

IF YES, LIST

WHO FROM THE HOST (CLIENT) DID YOU NOTIFY REGARDING THE HAZARDS? NAME

DATE

TIME

NOTIFICATION BY

HOW WAS NOTIFICATION GIVEN? EMAIL WRITTEN DOC PHONE FACE-TO-FACE

NOTES, JOB SKETCH, ADDITIONAL INFORMATION

11

Equal Potential Grounding and Bonding Work Zone Safety

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites. The work that is done by crews can be dynamic and involve varying conditions and hazards that may not be fully captured in this written policy. While these guidelines provide a set of best practices based on company and industry experience, qualified crew members are responsible for selecting the most appropriate means and methods, in compliance with applicable law, and providing at least as much protection as these guidelines, for safeguarding themselves and their co-workers from hazardous differences in electrical potential or other electrical hazards.

Definitions

Accessible Voltage Drop – Voltage difference between any two points accessible to workers at the work site.

Alive or live (also energized)—Electrically connected to a source of potential difference or electrically charged so as to have potential different from that of the earth or different from that of adjacent conductors or equipment.

Authorized person—One who has the authority to perform specific duties under certain conditions or who is carrying out orders from a responsible authority.

Automatic circuit recloser—A self-controlled device for automatically interrupting and reclosing an alternating-current circuit, with a predetermined sequence of opening and reclosing followed by resetting, hold closed, or lockout.

Barricade—A physical obstruction such as tapes, cones, or A-frame type wood or metal structures intended to provide a warning about and to limit access to a hazardous area.

Barrier—A physical obstruction that is intended to prevent contact with equipment or live parts or to prevent unauthorized access to a work area.

Bonded—The mechanical interconnection of conductive parts to maintain a common electrical potential.

Body Resistance—Determined from the ratio of voltage applied to current flowing in a body, neglecting capacitive and inductive effects, the value impeding the current flow through the common body resulting from contact with an energized line.

Bracket grounding—A grounding method where temporary ground sets are installed on each side of the work taking place, with the purpose of tripping out the system should a fault occur on the line.

Bundle—One phase of a circuit consisting of more than one conductor. Each conductor of the phase is referred to as a subconductor.

Bus—A conductor or a group of conductors that serve as a common connection for two or more circuits.

Cable—A conductor with insulation, or a stranded conductor with or without insulation and other coverings (single conductor cable), or a combination of conductors insulated from one another (multiple-conductor cable).

Cable isolation—Isolating cable from accidental energization by disconnecting the cable and its concentric neutral from all ground sources, including other concentric neutrals, grounding cables, and ground loops. Jacketed cable can be considered isolated if bare concentric neutral ends of the cable are isolated from all ground sources.

Cable sheath—A conductive protective covering applied to cables.

Circuit—A conductor or system of conductors through which an electric current is intended to flow.

Clamp—A device used in making a temporary connection between the grounding cable and the ground bus or grounding electrode and between the grounding cable and the transmission or distribution facility that is being grounded.

Clearance—Authorization to perform specified work or permission to enter a restricted area by the proper controlling authority.

Conductor—A wire or combination of wires suitable for carrying an electrical current.

De-energized—Free from any electrical connection to a source of potential difference and from electric charge; not having a potential different from that of earth.

Energized—Electrically connected to a source of potential difference or electrical charges so as to have a potential different from that of ground.

Equal Potential Work Zone—A work zone where all equipment is interconnected by jumpers, grounds, ground rods and/or grids that will provide acceptable potential differences between all parts of the work zone in case of accidental energization.

Exposed (not isolated or guarded)—(a) Exposed circuits or lines are in such a position that in the event of failure of supports or insulation, contact with another circuit or line can result. (b) Exposed equipment is an object or device that can be inadvertently touched or approached by any person. It is applied to objects not suitably guarded or situated.

Fall Protection Equipment (FPE)—Any equipment, device, or system that prevents an accidental fall from elevations or that mitigates the effect of such fall.

Fault Current—A current that flows from one conductor to ground or to another conductor causing an abnormal condition.

Fuzzing (Buzzing)—A method used to test the presence of voltage on a conductor by holding a metallic object near the conductor and listening for a crackling or buzzing noise. This method is considered unreliable and shall not be used. Use only approved testing equipment to check for presence of voltage on a conductor.

Ground—Earth or a conductive body of relatively large extent that serves in place of earth. Ground normally refers to zero volts (V), or no voltage, for electrical circuits. Under fault conditions, the ground potential may increase to a level above zero volts near an intentional or accidental connection of an electrical circuit to ground.

Grounded—A means of connecting an electrical circuit or electrical equipment to ground (see Ground) whether intentional or accidental.

Grounded equipment—When a utility vehicle is connected to an approved ground source in the following priority:

1. System neutral
2. Grounded structure (steel tower leg, grounded tower footing)
3. Pole ground attached to a system neutral or static wire
4. Temporary driven ground rod

> Results of tests by the industry have shown that temporary driven ground rods provide little or no protection to workers. Ground rods may be used only when no other ground source is available. Utility vehicles grounded to ground rods must be considered energized and treated as such.

Grounding—An intentional connection of an electrical circuit or apparatus to ground for the protection and safety of personnel and equipment.

Grounding cluster bracket—A bracket that attaches around a pole or structure that when used in conjunction with protective grounds brings the pole or structure at or near the same potential as the phases and neutral.

Grounding elbow—A 200-A load break elbow body (normally orange in color) with a copper ground cable connected to a grounding clamp, used to ground distribution bushing of transformers, junction boxes, and cables.

Ground set—A system of ground clamps and covered cables suitable for carrying fault current.

High wind—A wind of such velocity that one or more of the following hazards would be present:

1. The wind could blow an employee from an elevated location,
2. The wind could cause an employee or equipment that is handling material to lose control of the material, or
3. The wind could expose an employee to other hazards.

High wind is normally considered as winds exceeding 40 miles per hour (64.4 kilometers per hour) or 30 miles per hour (48.3 kilometers per hour) if the work involves material handling unless precautions have been taken to protect employees from the hazardous effects of the wind.

Induced current—Current impressed on a conductive object due to its proximity to an energized conductor and the means to allow that current to travel by means of magnetic fields.

Insulated—Separated from other conducting surfaces by a dielectric material (including air space) offering a high resistance to the passage of current.

Isolated—Physically separated, electrically and mechanically, from all sources of electrical energy. Such separation may not eliminate the effects of electromagnetic induction.

Insulated aerial manlifts—Mechanical equipment employing insulated booms, tested for the voltage involved, that are used to position workers in an elevated position.

Jumper— (1) A permanent section of the circuit phase conductor(s) connecting to a dead-ended circuit phase to a second dead-ended circuit phase or to equipment so that continuity is maintained; (2) A temporary conductor placed across the clear space between the ends of two conductors or metal pulling lines; (3) A conductive tool used to maintain electrical continuity across equipment, or a conductor that shall be opened mechanically to enable various operations of live-line work to be performed.

Neutral bonding jumper—A jumper installed on the concentric neutral bridging a location on the cable that is to be cut. The neutral bonding jumper ensures that the concentric neutral (common neutral) is not opened.

One Shot (R-Switch)—Removing the reclosing capabilities of protective devices such as circuit breakers. When this is done, the line cannot re-energize itself after a fault.

Overhead Ground Wire (OHGW)—Multiple grounded wire or wires placed above phase conductors for the purpose of intercepting lightning strikes in order to protect the phase conductors from the direct strikes.

Personal fall arrest system—A system used to arrest an employee in a fall from a working level.

Personal grounds—A cluster bar installed on the pole or structure below the work position and a grounding jumper installed between the system neutral or ground, the cluster bar, and the phase being worked on.

Personal protective grounding (equal potential zone)—Temporary protective grounding equipment placed at such locations and arranged to prevent employees from being exposed to hazardous differences in electrical potential.

Primary voltage—Any electrical circuit that normally operates at more than 600 V.

Pulling Line—A synthetic fiber rope, wire rope, or existing conductor being removed, used to pull the new conductor.

Qualified person—

- A person who is familiar with the construction and/or operation of electrical power generation, transmission, and distribution lines and equipment and who is fully aware of the hazards involved through knowledge, training, and experience; or
- A person who has passed a journeyman's examination for the particular branch of the electrical trade with which he or she is connected; or
- A person who has successfully demonstrated his or her ability and is recognized by management as qualified to perform the duties to which he or she has been assigned.

Recloser—Automatic reclosing or re-energizing capability of a circuit.

Running ground (Traveling ground) —A portable device that connects a moving conductor or wire rope, or both, to an electrical ground. These devices are normally placed on the conductor or wire rope adjacent to the pulling and tensioning equipment.

Shock—A condition that could cause physiological harm resulting in fibrillation, respiratory tetanus, muscle contraction, annoyance, alarm, or aversion.

Static charge—Any electrical charge at rest (such as a capacitor). A static charge can impress a voltage on an isolated electrical line due to various environmental conditions such as wind, fog, and lightning.

Statistical sparkover voltage—A transient overvoltage that produces a 97.72 percent probability of sparkover (that is, two standard deviations above the voltage at which there is a 50 percent probability of sparkover).

Statistical withstand voltage—A transient overvoltage level that produces a 0.14 percent probability of sparkover (that is, three standard deviations below the voltage at which there is a 50 percent probability of sparkover).

Step potential—The difference between two points on the earth's surface separated by a distance of one pace in the direction of maximum potential gradient. Under fault conditions, this potential difference could be dangerous when current flows through the earth, upon which a worker is standing.

Stringing – The pulling of pilot lines, pulling lines, and conductors over travelers supported on structures of overhead lines.

System grounds—The process of placing a set of grounds on each side of the work taking place, with the purpose of tripping the system should a fault occur on the line.

Switching overvoltage—A transient wave of overvoltage in an electrical circuit caused by a switching operation. When an overvoltage condition occurs, a momentary voltage surge could be induced in a circuit adjacent and parallel to the switched circuit in excess of the voltage associated with the circuit and under normal conditions.

Temporary protective grounding equipment—A system of ground clamps, ferrules, cluster bars, and cables designed to cause to operate system protective devices and for carrying fault current.

Utility vehicles—Mechanical equipment including uninsulated manlifts, diggers or derricks, boom trucks, or pulling and tensioning equipment used in stringing conductors, cable pulling equipment, and so on.

Voltage—The effective (root mean square) potential difference between any two conductors or between a conductor and ground. The nominal voltage of a system or circuit is the value assigned to a system or circuit of a given voltage class for the purpose of convenient designation.

Wood Pole Fall Restriction Device—A device that, when properly adjusted and combined with other subcomponents and elements, allows the climber to remain at his or her work position with both hands free and that performs a fall restriction function if the climber loses contact between his or her gaffs and the pole.

Working grounds—Temporary protective grounding equipment installed between the phase conductors and system neutral or ground.

General Grounding Rules

If the line or equipment is not de-energized, tested and grounded properly, it cannot be considered de-energized.

- Only qualified and authorized employees are permitted to install grounds on any previously energized lines or equipment.
- The lines or equipment to be worked on must be de-energized, tested for voltage using an approved test device, grounded, and short circuited.

Unless an installed ground is visibly present on the line, employees shall test lines and equipment and verify the absence of nominal voltage before installing any ground on those lines and equipment.

- Employees must maintain the minimum approach distance from all ungrounded parts that may be of a different electrical potential as stated in Table 11-1 or Table 11-2. Where necessary, an insulated measuring device may be used to determine that this minimum distance is being maintained.
- All lines or equipment must be tested for dead by using a voltage indicator rated for the anticipated voltage. The voltage tester, regardless of the type, must be verified to be operational before and after the line or equipment is tested.
- Before installing grounds, the surface of the material to which the grounding clamp is to be attached must be cleaned by use of a wire brush attached to an approved insulated live-line tool (hot stick), or other suitable means. In the case of previously energized parts, minimum approach distances must be maintained until the part is effectively grounded.
- Only approved protective grounding devices shall be used in accordance with approved grounding procedures.

- Temporary protective grounding equipment must be visually inspected each day before use. This inspection must include visually checking grounding jumpers for broken or loose fittings and chafed or cut insulation. The grounding clamp jaws must be clean, and the cable ferrules must be tightened each day. The grounding clamp jaws must be wire brushed with inhibitor before each use. If any damage is found, the equipment must be replaced.
- Grounds must be tested annually; a sticker must be placed on the ground showing the last test date.
- Grounds shall only be installed and removed with an approved live-line tool where there is a difference in potential.
- Four foot (4') grip-all (shotgun) sticks should not be used for overhead distribution and transmission work.
- Before grounds are attached, the circuit must be de-energized, tagged, and tested for voltage. Protective grounds must not be removed until the work has been completed and all persons and equipment involved are at a safe (minimum approach) distance from the equipment.
- At no time during installation or removal of protective grounds shall the employee rely on the insulation of the ground for any dielectric value.
- When electrical testing requires that circuits or equipment be ungrounded, any protective grounds shall be removed using an insulated live-line tool. Grounds must be replaced after the test.
- Conductors must be grounded in this order:
    1. The grounding cables shall be connected to a suitable ground.
    2. The nearest phase conductor shall be grounded.
    3. The remaining conductors shall be grounded.
- Employees must stand as far from the conductor as possible. When removing the grounding cable, the employee shall reverse the order being used and ensure that his or her body does not come in contact with conductors that are grounded. The clamp from the ground source will always be removed last.
- Guy wire must not be used for ground sources. In the absence of a reliable ground source such as a system neutral, a pole bond (#2 AWG copper minimum), or an overhead shield wire, it may be necessary to install a driven ground rod at the base of the structure and run a copper grounding conductor from the ground rod to the equipment to be grounded. Special precautions, such as barricading, must be taken to protect the public and to ensure that the ground clamp is not removed from the ground rod.
- When grounding bundled conductors, each conductor in the bundle must be grounded.
- Rubber gloves must be worn when opening and closing ground bars on overhead and underground circuits.

Hazards of Induced Voltage

Induced voltage on a conductor can be a dangerous condition. Any line conductor has the potential for induced voltage. These potentially hazardous conditions are caused by various effects such as:

- Electromagnetic induction—Induced voltage on a conductor from adjacent energized lines.
- Electrostatic induction—Induced voltage caused by wind action flowing across conductors.
- Lightning—Lightning striking a conductor will cause the charge to flow great distances over the conductor before it dissipates.

To offset these potentially hazardous conditions, proper grounding must be in place. Proper grounding may include system grounds, personal protective grounds, or combinations that must be determined when conducting the Job Task Safety Analysis (JTSA) prior to the start of the job.

Minimum Approach Distances

The minimum approach distances for voltages less than 72.5 kilovolts can be found in Table 11-1.

No employee may approach or take any conductive object closer to exposed energized parts than the established minimum approach distance unless:

- The employee is insulated from the energized part (insulating gloves and sleeves);
- The energized part is insulated from the employee and any other conductive object at a different potential;
- The employee is insulated from any other conductive object, as during live-line bare-hand work.

Refer to Table 11-1 for minimum approach distances.

Table 11-1. AC Minimum Approach Distances

Voltage Phase-to-Phase	Distance Phase-to-Ground Exposure		Distance Phase-to-Phase Exposure	
0.751 to 5.0 kV	0.63m	2.07ft	0.63m	2.07ft
5.1 to 15.0 kV	0.65m	2.14ft	0.68m	2.24ft
15.1 to 36.0 kV	0.77m	2.53ft	0.89m	2.92ft
36.1 to 46.0 kV	0.84m	2.76ft	0.98m	3.22ft
46.1 to 72.5 kV	1.00m	3.29ft	1.20m	3.94ft
These minimum approach distances can be used provided the jobsite is at an elevation of 900 meters (3,000 feet) or less. If working above 900 meters (3,000 feet) above mean sea level, the distances must be calculated using the altitude correction factor.				

For voltages over 72.5 kilovolts, the minimum approach distance can be calculated by determining the maximum anticipated per-unit transient overvoltage, phase to ground, through an engineering analysis or assume a maximum anticipated per-unit transient overvoltage, phase to ground or use the minimum approach distance found in Table 11-2.

Table 11-2. AC Minimum Approach Distances

Voltage Phase-to-Phase	Distance Phase-to-Ground Exposure		Distance Phase-to-Phase Exposure	
72.6 to 121.0 kV	1.13m	3.71ft	1.42m	4.66ft
121.1 to 145.0 kV	1.30m	4.27ft	1.64m	5.38ft
145.1 to 169.0 kV	1.46m	4.79ft	1.94m	6.36ft
169.1 to 242.0 kV	2.01m	6.59ft	3.08m	10.10ft
242.1 to 362.0 kV	3.41m	11.19ft	5.52m	18.11ft
362.1 to 420.0 kV	4.25m	13.94ft	6.81m	22.34ft
420.1 to 550.0 kV	5.07m	16.63ft	8.24m	27.03ft
550.1 to 800.0 kV	6.68m	22.57ft	11.38m	37.34ft
1. These minimum approach distances can be used provided the jobsite is at an elevation of 900 meters (3,000 feet) or less. If working above 900 meters (3,000 feet) above mean sea level, the distances must be calculated using the altitude correction factor. 2. The phase to phase minimum approach distances may be used provided that no insulated tool spans the gap and no large conductive object is in the gap. 3. The clear live-line tool distance shall equal or exceed the values for the indicated voltage ranges.				

When performing electric transmission and distribution work at elevations above 900 meters, the minimum approach distances should be adjusted by the appropriate factor in Table 11-3 for the elevation of the work.

Table 11-3 Altitude Correction Factor

Altitude Above Sea Level (meters)	Factor
0 to 900 m	1.00
901 to 1200 m	1.02
1201 to 1500 m	1.05
1501 to 1800 m	1.08
1801 to 2100 m	1.11
2101 to 2400 m	1.14
2401 to 2700 m	1.17
2701 to 3000 m	1.20
3001 to 3600 m	1.25
3601 to 4200 m	1.30
4201 to 4800 m	1.35
4801 to 5400 m	1.39
5401 to 6000 m	1.44

Instead of using the minimum approach distances contained in Table 11-1 or Table 11-2, a person knowledgable and competent in the field of electric transmission and distribution system design can perform an engineering analysis and determine the maximum transient overvoltage. When the engineering analysis of the system shows the maximum transient overvoltage is lower and the minimum approach distance can be lowered from the distance shown in Table 11-1 or Table 11-2, the minimum approach distances can be adjusted accordingly. To reduce the distances, we must ensure that any conditions assumed in the analysis, for example, blocking the recloser on a circuit or installing portable protective gaps, are present during energized work. To calculate the minimum approach distances for voltages over 72.5 kV, use Table 11-4.

Table 11-4 AC Live-Line Minimum Approach Distance

For phase to phase system voltages of more than 72.5 kV nominal

MAD= $0.3048(C+a)V_{L-G}TA+M$, where

C= 0.01 for phase to ground exposures that the employer can demonstrate consist only of air across the approach distance (gap),

0.01 for phase to phase exposures if it can be demonstrated that no insulated tool spans the gap and That no large conductive object is in the gap, or

0.11 otherwise

V_{L-G}= phase to phase rms voltage, in kV

T= maximum anticipated per-unit transient overvoltage; for phase to ground exposures, T equals T_{L-G}, the maximum per-unit transient overvoltage, phase to ground, determined by the employer; for phase to phase exposures, T equals $1.35T_{L-G}+0.45$

A= altitude correction factor. See Table 11-3.

M= 0.31 m, the inadvertent movement factor

a= saturation factor, as follows

Phase to Ground Exposures					
$V_{Peak}=T_{L-G}V_{L-G}\sqrt{2}$	635 kV or less	635.1 to 915 kV	915.1 to 1050 kV	More than 1050 kV	
a	0	$(V_{Peak}-635)/140{,}000$	$(V_{Peak}-645)/135{,}000$	(VPeak-675)/125,000	
Phase to Phase Exposure					
$V_{Peak}=(1.35T_{L-G}+0.45)V_{L-G}\sqrt{2}$	630 kV or less	630.1 to 848 kV	848.1 to 1131 kV	1131.1 to 1485 kV	More than 1485 kV
a	0	$(V_{Peak}-630)/155{,}000$	$(V_{Peak}-633.6)/152{,}207$	$(V_{Peak}-628)/153{,}846$	$(V_{Peak}-350.5)/203{,}666$

Methods of Controlling Possible Transient Overvoltage

There are several means of controlling overvoltages that occur on transmission systems. The operation of circuit breakers or other switching voltages can be modified to reduce switching transient overvoltages. Overvoltages can also be held to an acceptable level by installing surge arrestors or portable protective gaps on the system. The use of switching restrictions can also minimize overvoltages.

Operation of Circuit Breakers

The maximum transient overvoltage that can reach the worksite is often the result of switching on the line on which employees are working. Disabling automatic reclosing during energized line work so that the line will not be reenergized after being opened for any reason limits the maximum switching surge overvoltage to the larger of the opening surge or the greatest fault-generated surge, provided that the devices (for example, insertion resistors) are operable and will function to limit the transient overvoltage and that circuit breaker restrikes do not occur. The insertion resistors must properly function to limit the overvoltage level. If the automatic recloser cannot be disabled, other methods of controlling the switching surge may be necessary.

When working on double circuit construction, surges on an adjacent line can cause significant overvoltages. The engineering analysis must account for coupling to adjacent lines.

Surge Arrestors

The use of modern surge arrestors allows a reduction in the basic impulse-insulation levels of much transmission system equipment.

Switching Restrictions

Another form of overvoltage control involves establishing switching restrictions, whereby the employer prohibits the operation of circuit breakers until certain system conditions are present. Switching is restricted by using a tagging system, similar to that used for a permit, except that the common term used for this activity is a "hold-off" or "restriction". These terms indicate that the restriction does not prevent operation, but only modifies the operation during the live-line work activity.

Personal Protective Grounding of Transmission Lines and Devices

General Requirements

- When a conductor or device that is energized or may be energized at over 50 V is removed from service for operation, maintenance, or construction, it must be considered energized until it is identified, isolated, tested, and grounded as specified in this section.
- Lines and devices must be de-energized, tested and grounded only after proper clearances have been issued.
- To make the work area safer around overhead transmission systems, create an equal potential zone by using temporary protective grounding equipment. Workers are best protected when personal protective grounding is installed as close as practical to the work site.
- A tailgate safety meeting must be held and documented with all workers involved before beginning any job to discuss the potential hazards. When the work includes the grounding of lines and devices, the development of the equal potential zone must be discussed and understood by everyone involved with the work.
- When grounding is impractical or more hazardous than working on the lines or devices without grounds, the grounds may be omitted, provided that all work is done as if the line or device is energized. The minimum approach distances specified in Table 11-1 or Table 11-2 must be maintained.
- If phase conductors have been moved from their normal position and are lying or hanging near the ground, working grounds must be installed as close to the work site as possible. Workers in contact with the conductors must stand on conductive mats connected to the conductors or work out of approved insulated manlifts. If the phase conductors are broken, personal protective grounds must be installed on both sides of the work location and ground mats, or approved insulated manlifts must be used.
- When work is done out of an approved insulated aerial manlift, the lines and devices must be grounded using personal protective grounds. If work is done out of an uninsulated aerial manlift, the lines and devices must be grounded using personal protective grounds, and the manlift work platform must be connected to the conductors with an approved grounding jumper. See “Personal Protective Grounding of Utility Vehicles and Equipment” for proper grounding of utility vehicles.

Only approved temporary protective grounding equipment may be used.

- Protective grounding equipment shall be capable of conducting the maximum fault current that could flow at the point of grounding for the time necessary to clear the fault. The minimum size ground for transmission work is 4/0 copper. In some cases, more than one set of grounding jumpers may be required. This will be determined after obtaining fault currents on each line being worked from the client/customer and completion of Table 11-5. IEEE Standard 1048 requires that the current capacity of a grounding cable be reduced by 20% when using parallel jumpers. When this is completed and the sizing of grounding jumpers is determined, all affected employees must be made aware of these requirements.

- Temporary protective grounding equipment must be visually inspected each day before use. This inspection must include visually checking grounding jumpers for broken or loose fittings and chafed or cut insulation. The grounding clamp jaws must be clean, and the cable ferrules must be tightened each day. The grounding clamp jaws must be wire brushed with inhibitor before each use. If any damage is found, the equipment must be replaced. Grounds must be tested annually; a sticker must be placed on the ground showing the last test date.
- Personal protective grounds should be installed as short, straight, and direct as practical. Grounds should be installed so that the grounding conductor does not contact the pole, steel structure, arm, hardware, or equipment.
- Grounding jumpers can make violent whipping actions when energized with fault currents exceeding 15,000 A. When system fault currents exceed 15,000 A, jumpers must be installed so that they will not injure workers if energized.
- The ground-end clamp of the grounding cable must be connected first and removed last. The conductor end of the ground must be connected and disconnected by using approved live-line tools.
- No part of the personal protective grounding jumpers shall be contacted when being installed or removed. Workers must not contact any portion of the personal protective grounds after the grounds are in place.
- Under normal operating conditions, employees shall not contact or make attempt to get on/off any piece of equipment that has the potential to become energized.
- Workers on the ground can be exposed to step and touch potentials if the utility vehicle contacts energized lines and/or devices. Workers can be exposed even when all types of protective grounding procedures are used. Ground personnel must stay a minimum of 10 ft (3.01 m) away from the utility vehicle, structure being worked on and any driven ground rod.
- There are two acceptable methods of making contact with a utility vehicle, structure or driven ground rod while it has the potential to become energized. They are:
  - The employee is wearing rubber insulating gloves and rubber insulating over shoes that are rated for the voltage of the potential exposure.
  - The employee is standing on a conductive mat that is electrically bonded to that equipment. When accessing the conductive mat, employees must first step from the earth to an insulated platform before stepping onto the conductive mat. Egress from the conductive mat shall be done in reverse order.
- In an emergency condition, employees may get on/off a piece of equipment to operate the lower controls to perform a bucket rescue provided that one of the above personal protective measures is taken.
- Personal protective grounds must not be removed until all employees are clear of the lines or devices. Grounds must be removed from the phase conductors by using approved live-line tools, with the last connection removed at the ground location.
- Personal protective grounds may be removed temporarily during testing. However, insulating equipment, rubber gloves, and hot-line tools must be used to isolate all workers from the lines and devices.

NOTE

All grounds must be installed and removed with live-line tools and with proper PPE.

- Use Table 11-5 to list transmission system fault current capacities. Certain voltages may require two (parallel) grounds per each phase. This table must be completed with input provided by the system operator on each transmission system worked by the Company. List all voltages of the lines on the transmission system and the fault current for each voltage. The fault current on some voltages may require more than one ground. Voltages that require two grounds must be identified. Employees must be made aware of these requirements.

Table 11- 5. Transmission System Fault Current Capacities

Voltage Phase-to-Phase	Maximum Three-phase Fault Current, Amps	Clearing Time, Seconds	Back-up Clearing Time, Seconds	Required Cable Size
69,000				
138,000				
230,000				
287,000				
345,000				
500,000				

Installing Personal Protective Grounds at the Work Location

The grounding method described in the following procedure provides an equal potential zone at the work site:

1. Obtain a clearance.
2. Identify and isolate the line. Obtain a visible opening on the source (and load side if possible) of the line or device.
3. Use an approved voltage detector to test the line or device to ensure that it is de-energized. "Fuzzing" the line is not an accepted method of testing.
4. Clean the ground connection point (steel tower leg, static wire, and structure) using a wire brush and inhibitor. Clean the phase conductors using inhibitor and a wire brush that is attached to an insulated tool where the location ground clamps are to be installed.
5. Install a personal ground on the structure to be worked. If the structure is:
   - Wood with a static wire, install a cluster bar around the poles, below the working position, and jumper to the static wire. Connect working grounds to the cluster bar.
   - Wood with only a pole ground, install a cluster bar around the poles, below the working position, and jumper to the pole ground. Connect working grounds to the cluster bar.
   - Wood with no static or pole ground, install a cluster bar around the poles, below the working position, and jumper to a temporary ground rod installed 20 ft (6.10 m) from the structure. Connect working grounds to the cluster bar.
   - Lattice steel, install a tower clamp on the steel below the working position and jumper the working grounds to the tower clamp.
   - Tubular steel, install a grounding bolt at a location specified by the manufacturer of the structure and jumper the working grounds to the grounding bolt.
6. Install personal protective grounds from the ground point (cluster bar, grounding bolt, or tower grounding clamp) to the closest phase conductor by using approved live-line tools. Jumper to other phases from the ground point together, working from the nearest to the farthest away.

Results of tests by the industry have shown that temporary driven ground rods may provide little or no protection to workers. Ground rods must be used only when no other ground source is available. Utility vehicles grounded to ground rods must be barricaded and considered energized and treated as such.

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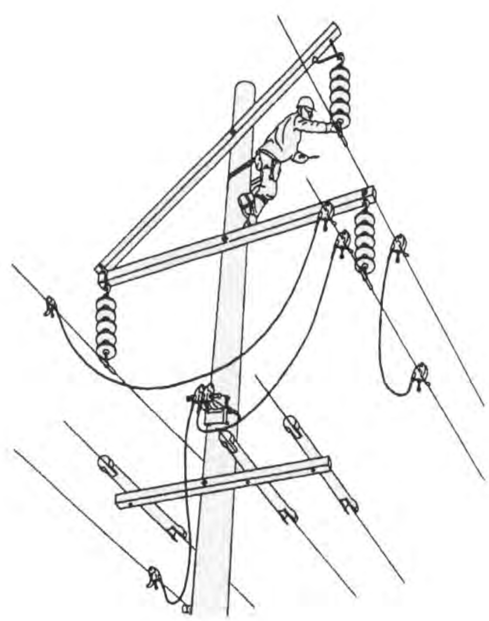
7. Remove personal protective grounds in the reverse order after the work is completed.

Personal Protective Grounding of Overhead Transmission Lines With Distribution Underbuild

Follow these steps to apply personal protective grounds to transmission lines with distribution underbuild (shown in Figure 11-1):

1. Obtain a clearance, in accordance with local practices.
2. Identify and isolate the line. Obtain visible openings on the source side (and the load side, if possible) of the line or equipment.
3. Use a voltage detector to ensure that the line or equipment is de-energized.
4. Make the grounding connections in the following order:
    a. Install a cluster bar on the pole just below the work area.
    b. Install a ground jumper from the system neutral to the cluster bar. If necessary, install barriers to prevent the grounding jumpers from contacting energized conductors.
    c. Jumper from the cluster bar to the closest phase conductor.
    d. Jumper the other phases together, working from the nearest to the farthest away. It is important to bond the phases together so that protective devices will operate.
5. Remove the grounds in the reverse order.

Figure 11-1. Single Point Overhead Transmission Line Grounding With Distribution Underbuild

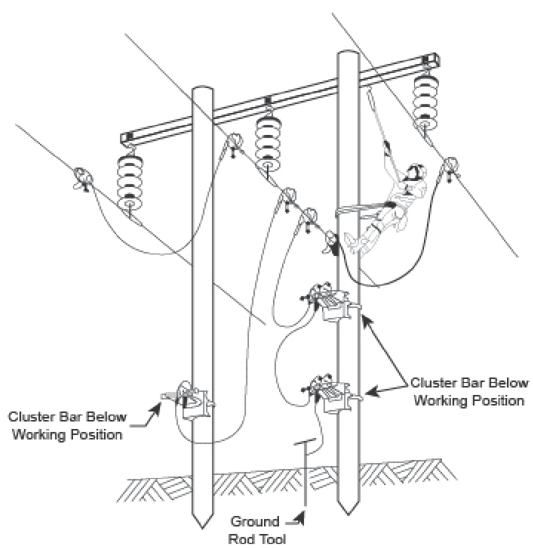


Personal Protective Grounding of Overhead Transmission Lines Without Distribution Underbuild

Follow these steps to apply personal protective grounds to transmission lines without distribution underbuild (shown in Figure 11-2):

1. Obtain a clearance, in accordance with local practices.
2. Identify and isolate the line. Obtain visible openings on the source side (and on the load side, if possible) of the line or equipment.
3. Use a voltage detector to ensure that the line or equipment is de-energized.
4. Make the grounding connections in the following order:
    a. Install a temporary ground rod (ground rod tool) a minimum of 20 ft (7.62 m) from the working position of workers on the ground. Surround the ground rod with safety cones to remind workers of the hazard.
    b. Install a cluster bar on the pole approximately 5 ft (1.52 m) above the ground.
    c. Clamp one end of the proper length jumper to the ground rod and the other end to the cluster bar.
    d. Install cluster bars on the poles nearest the lowest conductor.
    e. Install the proper length grounding jumper from the lower cluster bar to the upper cluster bar.
    f. Jumper from the upper cluster bars to the closest phase conductor. Jumper to the other phases using the remaining jumpers. It is important to bond the phases together so that the protective devices operate properly.
5. Remove the grounds in the reverse order.

Figure 11-2. Single Point Overhead Transmission Line Grounding Without Distribution Underbuild

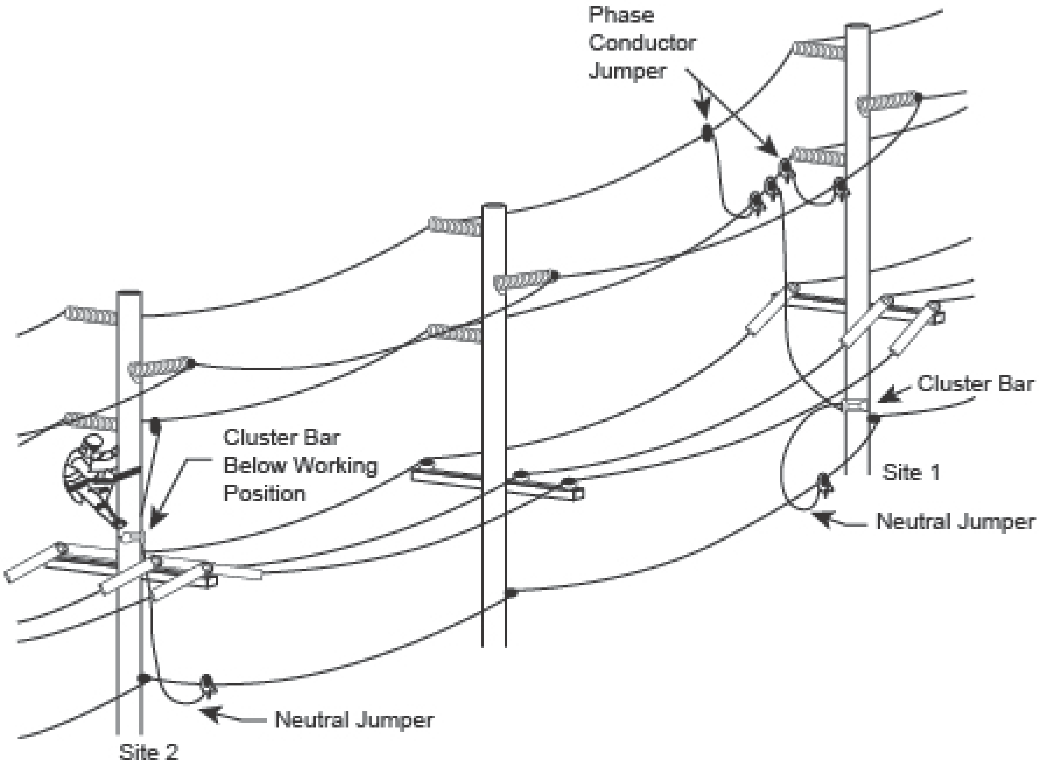


Personal Protective Grounding of Overhead Transmission Lines With Grounds Installed Away from the Work Location

Grounding jumpers between phase conductors and grounds should be installed at the work location. Where this is not possible, working grounds may be installed away from the work location if the following steps are completed:

1. Obtain a clearance, in accordance with local practices.
2. Identify and isolate the line. Obtain visible openings on the source side (and on the load side, if possible) of the line or equipment.
3. One span away from the work location, where the grounds will not interfere with the work, use a voltage detector to ensure that the line or equipment is de-energized.
4. If there is no system neutral, go to step 5. If a system neutral is available, make the grounding connections in the following order:
    a. Install a cluster bar on the pole just below the work area.
    b. Install a grounding jumper from the common neutral to the cluster bar. If necessary, install barriers to prevent the grounding jumpers from contacting energized conductors.
    c. Jumper from the cluster bar to the nearest phase conductor. Jumper the phases together, working from the nearest to the farthest away. It is important to bond the phases together so that protective devices will operate properly.
5. If there is no system neutral, make the grounding connections in the following order:
    a. Install a temporary ground rod a minimum of 25 ft (7.62 m) from the working position of the workers on the ground. Surround the ground rod with safety cones to remind workers of the hazard.
    b. Install a cluster bar on the pole approximately 5 ft (1.52 m) above the ground.
    c. Connect the ground rod and cluster bar with a grounding jumper that is the proper size.
    d. Install a second cluster bar on the pole just below the work area.
    e. Install a grounding jumper from the lower cluster bar to the upper cluster bar.
    f. Jumper from the upper cluster bars to the closest phase conductor. Jumper to the other phases using the remaining jumpers. It is important to bond the phases together so that the protective devices will operate properly.
6. At the work site (site 2 in Figure 11-3), install the cluster bar on the pole below the working position. Leave adequate working space above the bar.
7. Install a grounding jumper from the ground source (system neutral or ground rod) to the cluster bar.
8. Jumper from the cluster bar to the conductor to be worked. When work moves to another conductor, reinstall the grounding jumper on the new conductor.
9. Repeat steps 6, 7, and 8 at each work location on the same electrical circuit.
10. Remove the grounds in the reverse order.

Figure 11-3. Overhead Transmission Line Grounding With Grounds Installed Away from the Work Location

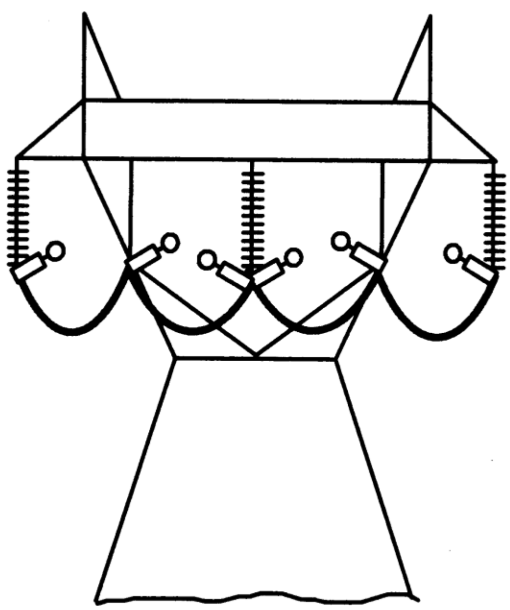


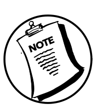
Personal Protective Grounding on Overhead Transmission Towers

Follow these steps to apply personal protective grounds on steel lattice towers:

1. Obtain a clearance in accordance with local practices.
2. Identify and isolate the line. Obtain visible openings on the source side (and on the load side, if possible) of the line or equipment.
3. Use a voltage detector to ensure that the line or equipment is de-energized.
4. Inspect the tower structure grounds to make sure that they are in good condition. If not, the grounds must be repaired.
5. Install tower clamps on the tower legs, leaving adequate working space above them.
6. Clamp one end of the 30-ft (9.14-m) grounding jumper to a tower clamp and the other end to the closest phase conductor. Install the other grounding jumpers to the tower clamps and the other phases if required.
7. Remove the grounds in the reverse order.

Figure 11-4. Overhead Transmission Tower Grounding





If the structure has an isolated shield wire, the shield wire must be bonded to the structure using a minimum 4/0 AWG copper bond installed with a live-line tool prior to using the shield wire as a ground source.

Personal Protective Grounding of Overhead Distribution Lines and Devices

General Requirements

- When a conductor or device that is energized, or may be energized, at over 50 V is removed from service for operation, maintenance, or construction, it must be considered energized until it is identified, isolated, tested, and grounded as specified in this section.
- Lines and devices must be de-energized, tested and grounded only after proper clearances have been issued.
- The best way to make the work area safe around overhead distribution systems is to install personal protective grounding, creating an equal potential zone, using temporary protective grounding equipment. Workers are best protected when personal protective grounding is installed at the work site. However, situations will exist where this is impractical or impossible. In these situations, personal protective grounding must be installed as close to the work site as possible (within one span).
- A tailgate safety meeting must be held with all workers involved and documented before beginning any job to discuss potential hazards. When the work includes grounding of lines and devices, development of personal protective grounding must be discussed and understood by everyone involved with the work.
- Distribution lines and devices must be grounded to the system neutral, if available, when personal protective grounding procedures are used. If no system neutral is available, personal protective grounding must be connected to a driven ground rod.

Results of tests by the industry have shown that temporary driven ground rods may provide little or no protection to workers. Ground rods may be used only when no other ground source is available. Utility vehicles grounded to ground rods must be considered energized and treated as such.

- When grounding is impractical or is more hazardous than working on the lines or devices without grounds, the grounds may be omitted, provided that all work is done as if the line or device is energized.
- If primary phase conductors have been moved from their normal position and are lying or hanging near the ground, personal protective grounds must be installed as close to the work site as possible, and all workers must wear approved rubber gloves or stand on conductive mats. If the primary phase conductors are broken, personal protective grounds must be installed on both sides of the work location, and all workers must wear approved rubber gloves or stand on conductive mats.
- When work is done out of an approved insulated aerial manlift, the lines and devices must be grounded using personal protective grounds within one span of the work area. If work is done out of an uninsulated aerial manlift, the lines and devices must be grounded using personal protective grounds and all workers in the manlift must wear approved rubber gloves. See “Personal Protective Grounding of Utility Vehicles and Equipment” later in this chapter for proper grounding of utility vehicles.
- Only approved temporary protective grounding equipment may be used. Protective grounding equipment shall be capable of conducting the maximum fault current that could flow at the point of grounding for the time necessary to clear the fault. The minimum size ground for distribution work is 2/0 copper.

- Temporary protective grounding equipment must be visually inspected each day before use. This inspection must include visually checking grounding jumpers for broken or loose fittings and chafed or cut insulation. The grounding clamp jaws must be clean, and the cable ferrules must be tightened each day. The grounding clamp jaws must be wire brushed with inhibitor before each use. If any damage is found, the equipment must be replaced. Grounds must be tested annually. A sticker must be placed on the ground showing the last test date.
- Temporary protective grounding equipment must be installed as short, straight, and direct as practical. This equipment must be installed so that the temporary grounding conductor does not contact the pole, arm, hardware, or equipment.
- Temporary protective grounding equipment can make violent whipping actions when energized with fault currents exceeding 15,000 A. When system fault currents exceed 15,000 A, jumpers must be installed so that, if energized, they will not injure workers.
- The ground-end clamp of the grounding cable must always be connected to the ground first and removed last. The conductor end of the ground cable must be connected and disconnected with hot-line tools.
- No part of the temporary protective grounding equipment may be contacted during installation or removal. Workers should not contact any portion of the personal protective grounds after the grounds are in place.
- Workers on the ground can be exposed to step and touch potentials when all types of personal protective grounding procedures are used. While work is in progress, ground personnel should stay a minimum of 10 ft (3.01 m) away from the structure being worked on and any driven ground rod. If ground workers must contact the structure, approved insulated rubber gloves and dielectric overshoes should be worn or conductive mats used.
- Temporary protective grounding equipment must not be removed until all employees are away from the lines or devices. Grounds must be removed from the phase conductors using hot-line tools, with the last connection removed at the ground location.
- Temporary protective grounding equipment may be removed temporarily during testing. However, insulating equipment, rubber gloves, and hot-line tools must be used to isolate all workers from the lines and devices.
- Under normal operating conditions, employees shall not contact or make attempt to get on/off any piece of equipment that has the potential to become energized.
- Workers on the ground can be exposed to step and touch potentials if the utility vehicle contacts energized lines and/or devices. Workers can be exposed even when all types of protective grounding procedures are used. Ground personnel must stay a minimum of 10 ft (3.01 m) away from the utility vehicle, structure being worked on and any driven ground rod.
- There are two acceptable methods of making contact with a utility vehicle, structure or driven ground rod while it has the potential to become energized. They are:
  - The employee is wearing rubber insulating gloves and rubber insulating over shoes that are rated for the voltage of the potential exposure.
  - The employee is standing on a conductive mat that is electrically bonded to that equipment. When accessing the conductive mat, employees must first step from the earth to an insulated platform before stepping onto the conductive mat. Egress from the conductive mat shall be done in reverse order.
- In an emergency condition, employees may get on/off a piece of equipment to operate the lower controls to perform a bucket rescue provided that one of the above personal protective measures is taken.

All grounds must be installed and removed with live-line tools and with proper PPE.

Installing Personal Protective Grounds at the Work Location

The personal protective grounding method described in the following procedure provides an equal potential zone at the work site:

1. Obtain a clearance.
2. Identify and isolate the line.
3. Obtain a visible opening on the source (and load side, if possible) of the line or device.
4. Use an approved voltage detector to test the line or device to be sure that the line or device is de-energized. “Fuzzing” the line is not an approved method of testing the line.
5. Install personal protective grounding by installing a cluster bar on the pole below the work area.
6. Clamp one end of a correct length grounding jumper to the cluster bar and the other end to the common neutral.
7. Install working grounds by jumpering from the cluster bar to the closest phase conductor using hot-line tools. Jumper the other phases together, working from the nearest to the farthest away.
8. Remove personal protective grounds in the reverse order after the work is completed.

Installing Personal Protective Grounds Away from the Work Location

1. Obtain a clearance.
2. Identify and isolate the line.
3. Obtain a visible opening on the source (and load side, if possible) of the line or device.
4. Use an approved voltage detector to test the line or device to be sure that the line or device is de-energized. “Fuzzing” the line is not an approved method of testing the line.
5. Working grounds may be installed one span away from the work site by jumpering from the common neutral or a driven ground rod to the closest phase conductor. Jumper the other phases together, working from the nearest to the farthest away.
6. At the work site, install personal grounds by installing a cluster bar on the pole below the work area.
7. Clamp one end of a grounding jumper of the correct length to the cluster bar and the other end to the common neutral. If a common neutral is not available, install one grounding jumper from the cluster bar to the phase being worked.
8. Remove the grounds in the reverse order after the work is completed.

Personal Protective Grounding of Overhead Distribution Lines With a Common Neutral

Follow these steps to apply personal protective grounds to distribution lines with a common neutral (shown in Figure 11-5):

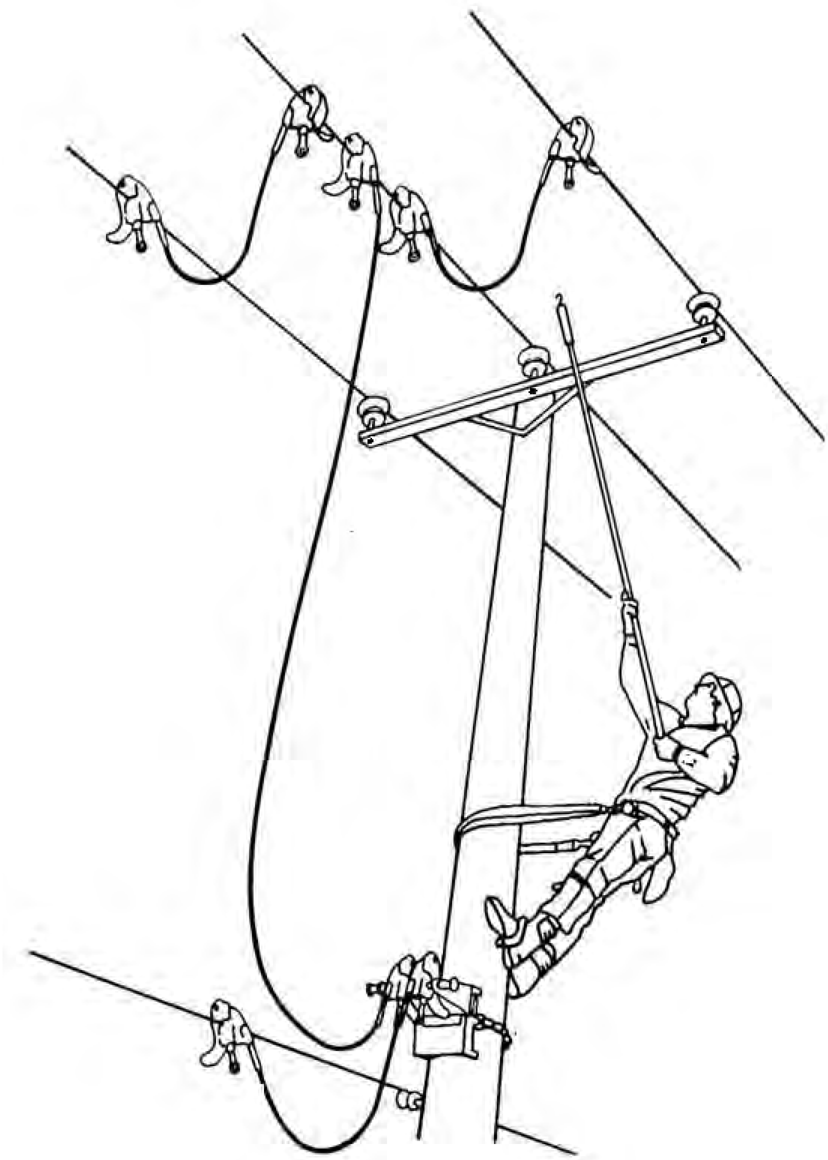
1. Obtain a clearance, in accordance with local practices.
2. Identify and isolate the line. Obtain visible openings on the source side (and on the load side, if possible) of the line or equipment.
3. Use a voltage detector to ensure that the line or equipment is de-energized.
4. Make the grounding connections in the following order:
   a. Install the cluster bar on the pole just below the work area. Leave adequate space above the bar.

b. Clamp one end of a 4-ft (1.22-m) jumper to the cluster bar and the other end to the common neutral.

c. Jumper from the cluster bar to the closest phase conductor. Jumper the other phases together, working from the nearest to the farthest away.

5. Remove the grounds in the reverse order.

Figure 11-5. Single Point Overhead Distribution Line Grounding With a Common Neutral

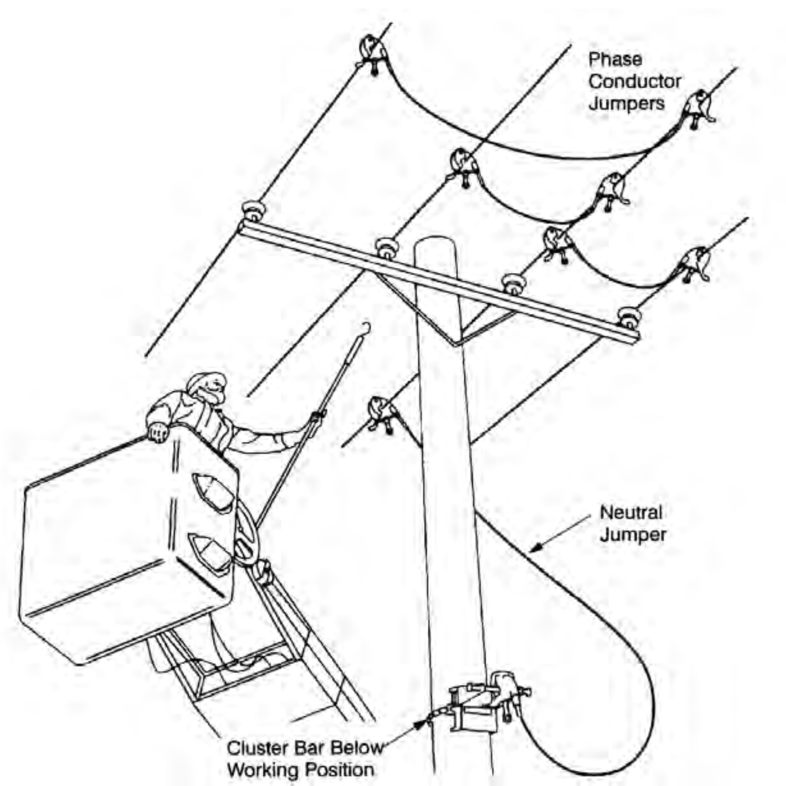


Personal Protective Grounding of Overhead Distribution Lines With a Primary Neutral

The following steps must be used to apply personal protective grounds to distribution lines with a primary neutral (shown in Figure 11-6):

1. Obtain a clearance, in accordance with local practices.
2. Identify and isolate the line. Obtain visible openings on the source side (and the load side, if possible) of the line or equipment.
3. Use a voltage detector to ensure that the line or equipment is de-energized.
4. Make the grounding connections in the following order:
   a. Install the cluster bar on the pole just below the work area. Leave adequate space above the bar.
   b. Clamp one end of a grounding jumper to the cluster bar and the other end to the primary neutral.
   c. Install the proper length jumpers from the primary neutral to the phase conductors.
5. Remove the grounds in the reverse order.

Figure 11-6. Single Point Overhead Distribution Line Grounding With a Primary Neutral

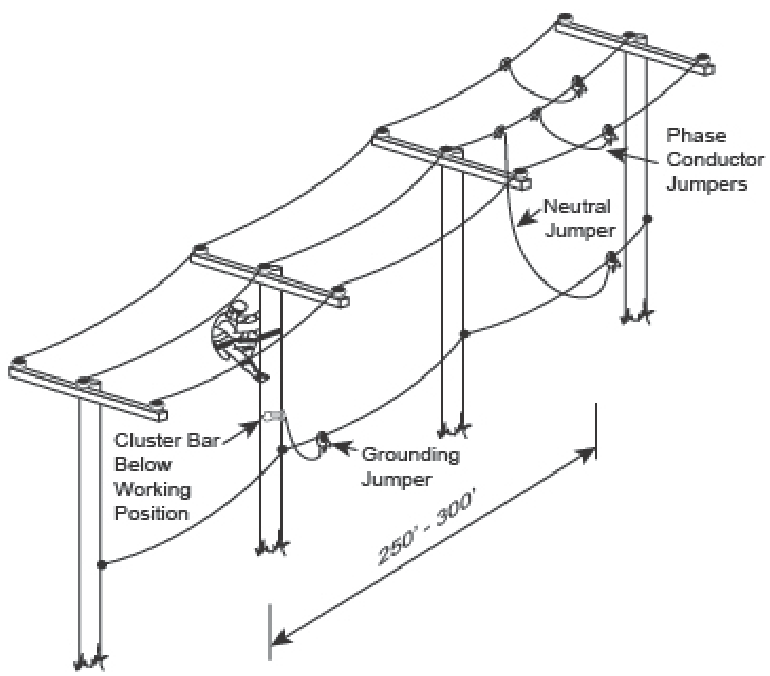


Personal Protective Grounding of Overhead Distribution Lines With Grounds Installed One Span Away from the Work Location

DANGER: Grounding jumpers between the phase conductors and the system neutral should be installed at the work location (shown in Figure 11-7). Where this is not possible, working grounds may be installed within a 250- to 300-ft (76.20- to 91.44-m) span of the work location if the following steps are completed.

1. Obtain a clearance in accordance with local practices.
2. Identify and isolate the line. Obtain visible openings on the source side (and on the load side, if possible) of the line or equipment.
3. Use a voltage detector to ensure that the line or equipment is de-energized.
4. Make the grounding connections in the following order:
   a. One span away from the work location, where the grounds will not interfere with the work, install a grounding jumper from the common neutral to the closest phase conductor (with 4 ft (1.22 m) of separation if the neutral is in the primary position).
   b. From that conductor, jumper to the other phases with the remaining jumpers, working from the nearest to the farthest away.
   c. At the work location, attach a cluster bar to the pole below the work area. Leave adequate working space above the bar.
   d. Clamp one end of a 4-ft (1.22-m) jumper to the cluster bar and the other end to the common neutral or primary neutral.
5. Remove the grounds in the reverse order.

Figure 11-7. Overhead Distribution Line Grounding With Grounds Installed One Span Away



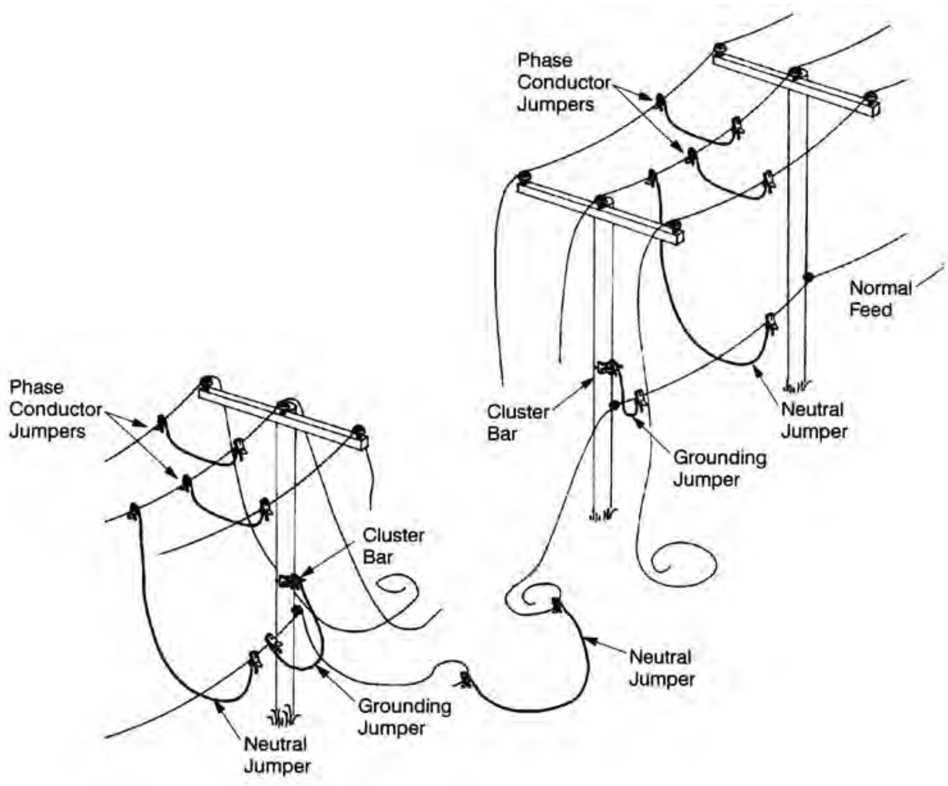
Personal Protective Grounding of Overhead Distribution Lines With a Broken Primary on the Ground

Where work on de-energized and grounded lines and equipment cannot be done within the equal potential zone, approved rubber gloves and sleeves must be worn.

Follow these steps to apply personal protective grounds when primary conductors are broken and lying on the ground (shown in Figure 11-8):

1. Obtain a clearance, in accordance with local practices.
2. Identify and isolate the line. Obtain visible openings on the source side (and on the load side, if possible) of the line or equipment.
3. Use a voltage detector to ensure that the line or equipment is de-energized.
4. Reconnect with a neutral jumper, if common neutral is broken.
5. Install personal protective grounds on both sides of the work location, at the nearest location where primary and neutral conductors are in their normal positions and where the grounds will not interfere with the work.
6. Remove the grounds in the reverse order.

Figure 11-8. Overhead Distribution Line Grounding With a Broken Primary



Personal Protective Grounding of Underground Cables and Devices

General Principles

In underground distribution systems, working grounds (jumpers from the conductor of the cable to the neutral) are installed on both ends of the cable. These grounds are normally remote from the work site unless the work is performed at the elbow of the cable. In overhead distribution systems, this grounding arrangement is called bracket grounding. This method of grounding may not provide protection for workers at a location that is remote from the grounded terminals of the cable. If workers are in contact with the conductor or concentric neutral of the grounded cable during a system fault, workers can see lethal step and touch potential. This method of grounding underground cables and systems can pose much higher risks to workers than overhead systems utilizing equal potential grounding.

Potentially hazardous voltage may appear at underground work sites, remote from working grounds, as a result of:

- Accidental energization of cables or underground equipment being connected to an energized source.
- A back feed through a transformer.
- A ground fault rise impressed on the system neutral.
- Human error.
- Equipment failure.
- Lightning.

When a system fault occurs while one cable of the system is de-energized and grounded to the system neutral, a transfer of potential through the cable conductor and the concentric neutral of the cable to a work site on the cable is possible. This transfer of potential through cable and concentric neutral results in a potentially hazardous voltage difference along the length of the cable between the cable and earth. If protective grounding is inadequate or improperly applied, workers contacting the cable, concentric neutral, or device connected to the cable could be subjected to hazardous potential voltages. Workers standing near grounded cables or equipment could be exposed to excessive step and touch potentials if proper work procedures are not followed.

To eliminate any hazard to workers in contact with the cable or near a de-energized and grounded cable, workers must ensure that they complete one of the following procedures:

- Insulate yourself from any possible potential difference between the cable and earth.
- Isolate yourself from any possible potential difference between the cable and earth.
- Provide an equal potential zone at the work site.

Workers can insulate themselves from any possible potential difference between grounded cables and earth by using insulated rubber gloves, insulated footwear, insulated tools, insulated platforms, insulated mats, or a combination of these items.

Workers can isolate themselves from any possible transfer of potential through a grounded cable by first grounding both ends of the cable by an approved method, removing both cable grounds, and then disconnecting the concentric neutral of the cable from the system neutral. Any connection of the concentric neutral to other cables must be eliminated, such as bare concentric neutrals lying on or in contact with other cables.

Workers can provide an equal potential zone at the work site by first grounding both ends of the cable by an approved method for five minutes and then removing the ground and parking the elbow on an insulating parking bushing. Installing a ground mat at the work site covering the area where workers will be standing during contact with the cable is also necessary. The ground mat must be properly connected to the concentric neutral of the cable being worked, thus creating an equal potential zone for workers in contact with the cable.

The ground mat, when properly installed, will work in the same way as a cluster bar on overhead structures when used in conjunction with overhead equal potential grounding.

General Requirements

- When a cable or device that is energized, or may be energized, at over 50 V is removed from service for operation, maintenance, or construction, it must be considered energized until it is identified, isolated, tested, and grounded as specified in this section.
- Cables and devices must be de-energized and grounded only after proper clearances have been issued.
- A tailgate safety meeting must be held and documented with all workers involved before beginning any job to discuss potential hazards. When the work includes grounding of cables and devices, development of worker protection and development of an equal potential zone must be discussed and understood by everyone involved with the work.
- Underground cables and devices must be grounded to the system neutral when personal protective grounding procedures are used.
- When grounding is impractical or more hazardous than working on the cables or devices without grounds, the grounds may be omitted, provided that all work is done as if the cable or device is energized.
- Temporary protective grounding equipment must be visually inspected each day before use. This inspection must include visually checking grounding jumpers for broken or loose fittings and chafed or cut insulation. The grounding clamp jaws must be clean, and the cable ferrules must be tightened each day. The grounding clamp jaws must be wire brushed with inhibitor before each use. If any damage is found, the equipment must be replaced. Grounds must be tested annually. A sticker must be placed on the ground showing the last test date.
- The ground-end clamp of the grounding cable must always be connected to the ground first and removed last. The cable end of the ground cable must be connected and disconnected with approved live-line tools.
- No part of the personal protective grounding jumpers may be contacted during installation or removal. Workers should not contact any portion of the personal protective grounds after the grounds are in place.
- Workers near the work area may be exposed to step and touch potentials when all types of grounding procedures are used. While work is in progress, ground personnel should stay clear of the immediate work area. If ground workers must contact cables or devices, approved insulated rubber gloves or insulated footwear should be worn or conductive mats should be used.

- Protective grounding equipment shall be capable of conducting the maximum fault current that could flow at the point of grounding for the time necessary to clear the fault. The minimum size ground for underground distribution (URD) is 1/0 copper.

Grounding Cables at Switchgear

1. Obtain a clearance.
2. Identify the equipment and cable.
3. Obtain a visible opening on both ends of the cable.
4. Use an approved voltage detector to test the cable to ensure that it is de-energized.
5. Install a grounding jumper to the ground bus, then attach the other end of the grounding jumper to the other end of the cable. After five minutes, remove the remote cable end and ensure that it is parked in an insulated position. Mark this end with a tag and lock if possible.
6. If work is to be performed on the cable end, install a conductive ground mat to the ground bus of the switch at the work location.

<u>Grounding Cable With 200-A Elbow Systems</u>

1. Obtain a clearance.
2. Identify the equipment and cable.
3. Obtain a visible opening on both ends of the cable by parking the elbows of the cable on feed-through bushings.
4. Use an approved voltage detector to ensure that the cable is de-energized.
5. Use a grounding elbow and ground both ends of the cable.
6. Use one of the three methods described in the principle section (insulation, isolation, or equal potential grounding) if work is required on the cable.
7. Remove personal protective grounds in the reverse order after the work is completed.

Grounding Nonjacketed Cable at Midrun

1. Obtain a clearance.
2. Identify the equipment and cable.
3. Obtain a visible opening on both ends of the cable by parking the elbows of the cable on feed-through bushings.
4. Use an approved voltage detector to ensure that the cable is de-energized.
5. Use a grounding elbow and ground both ends of the cable.
6. Identify the cable to be cut. If there is more than one cable at the work site and testing fails to identify the cable to be worked, all cables must be de-energized and grounded at each end before work continues.
7. Verify that the cable to be cut is de-energized by spiking the cable or cutting the cable with hot cutters.
8. Install a concentric bonding jumper across the portion of the cable to be cut. The bonding jumper must remain on the cable until the cable and the concentric neutral are electrically reconnected. If a ground mat is used, the jumpers of the mat can be attached to each side of the cable. The ground mat will then be a substitute for the concentric bonding jumper.
9. Cut the cable with hot cutters.
10. Test the cable ends with a voltage detector before contacting the cable.
11. Use one of the three methods described previously (insulation, isolation, or equal potential grounding) if work is required on the cable or device.

All grounds must be installed and removed with live-line tools and with proper PPE.

Grounding Jacketed Cable at Midrun

1. Obtain a clearance.
2. Identify the equipment and cable.
3. Obtain a visible opening on both ends of the cable by parking the elbows of the cable on feed-through bushings.
4. Use an approved voltage detector to ensure that the cable is de-energized.
5. Use a grounding elbow and ground both ends of the cable.
6. Identify the cable to be cut. If more than one cable is present at the work site and testing fails to identify the cable to be worked, all cables must be de-energized and grounded at each end before work continues.
7. Verify that the cable to be cut is de-energized by spiking the cable or cutting the cable with hot cutters.
8. If the isolation method is not used, remove the cable jacket on each side of the cut point and install a concentric bonding jumper across the portion of the cable to be cut. The bonding jumper must remain on the cable until the cable and concentric neutral are electrically reconnected. If a ground mat is used, the jumpers of the ground mat can be attached to each side of the cable being worked, and the ground mat will substitute for the concentric bonding jumper.
9. Cut the cable with hot cutters.
10. Test the cable ends with a voltage detector before contacting the cable.

Use one of the three methods described previously (insulation, isolation, or equal potential grounding) if work is required on the cable or device.

Personal Protective Grounding of Utility Vehicles and Equipment

General Requirements

- A tailgate safety meeting must be held and documented with all workers involved before beginning any job to discuss potential hazards. When the work includes working around utility vehicles operating near energized lines and devices, the safe work methods for working around operating utility vehicles and equipment must be understood by everyone involved with the work.
- The electric utility industry and OSHA have determined through testing that grounding of utility vehicles may not provide adequate protection for workers by itself.
- The insulated portion of an aerial manlift operated by a qualified employee in the lift is exempt from this section if the applicable minimum approach distance (MAD) in Table 11-1 or Table 11-2 is maintained between the uninsulated portions of the aerial lift and exposed energized lines and equipment.
- During the tailgate safety meeting, the following factors must be considered to determine if an additional distance should be added to the clearances of Table 11-1 or Table 11-2:
  - ❑ The task to be performed
  - ❑ Length of the boom
  - ❑ Stability of the ground supporting the equipment, wind, and other weather conditions
  - ❑ Skill of the operator
  - ❑ Responsiveness of the controls of the mechanical equipment
  - ❑ Type and condition of winch line, wire, or "hot" rope
    - The exposed energized lines and equipment exposed to contact must be covered with insulating protective material that will withstand the type of contact that might be made during operations. Adequate insulating protective material must be installed so that the mechanical equipment does not enter the minimum approach distances to the exposed energized lines and equipment, as specified in Table 11-1 or Table 11-2.
    - The equipment must be insulated for the voltage involved. The uninsulated portions of the mechanical equipment must not approach the exposed energized lines and equipment any closer than the minimum approach distance specified in Table 11-1 or Table 11-2.
    - The equipment must be grounded to the best available ground to minimize the time that the exposed energized lines and equipment remain energized, and at least one of the following practices must be used:
      - a) Permanent or temporary insulated platforms, conductive grids, or mats bonded to the equipment chassis must be installed at points where employees need to contact the equipment.
      - b) Employees must use protective equipment such as insulated gloves or insulated footwear to be protected from touch potentials around the mechanical equipment.
      - c) The mechanical equipment must be barricaded to prevent employees from contacting the equipment.
- While working within the minimum approach distance during operation of mechanical equipment, if the equipment is operated within the approach distance in Table 11-1 or Table 11-2 to the exposed energized lines and equipment, the operation must comply with the requirements below. This work method is not permitted if the following cannot be met.

- The energized lines and equipment exposed to contact must be covered with insulating protective material that will withstand the type of contact that might be made during operations. Adequate insulating protective material must be installed so that the mechanical equipment does not enter the minimum approach distances to the exposed energized lines and equipment as specified in Table 11-1 or Table 11-2.
- The equipment must be insulated for the voltage involved. The uninsulated portions of the mechanical equipment must not approach the exposed energized lines and equipment any closer than the minimum approach distance specified in Table 11-1 or Table 11-2.

- When any two or more pieces of mechanical equipment at a work site having a boom near exposed energized lines and equipment are positioned in a way that can allow both pieces to be contacted by workers at one time, both pieces of equipment must be bonded together to minimize potential differences.
- Where the general public could contact a utility vehicle operating near energized lines and devices, barricades must be used to keep nonqualified people away from the vehicle.
- When utility vehicles are operated near distribution lines and devices, the equipment ground must be a minimum of 2/0 copper with compatible threaded ferrules and serrated jaw clamps.
- When utility vehicles are operated near transmission lines and devices, the equipment ground must be a minimum of 4/0 copper with compatible threaded ferrules and serrated jaw clamps.
- Utility vehicle and equipment protective grounding equipment must be visually inspected each day before use. This inspection must include visually checking grounding jumpers for broken or loose fittings and chafed or cut insulation. The grounding clamp jaws must be clean, and the cable ferrules must be tightened each day. The grounding clamp jaws must be wire brushed with inhibitor before each use. If any damage is found, the equipment must be replaced. Grounds must be tested annually. A sticker must be placed on the ground showing the last test date.
- Grounding jumpers can make violent whipping actions when energized with fault currents exceeding 15,000 A. When system fault currents exceed 15,000 A, jumpers must be located so that, if energized, they will not injure workers.
- Under normal operating conditions, employees shall not contact or make attempt to get on/off any piece of equipment that has the potential to become energized.
- Workers on the ground can be exposed to step and touch potentials if the utility vehicle contacts energized lines and/or devices. Workers can be exposed even when all types of protective grounding procedures are used. Ground personnel must stay a minimum of 10 ft (3.01 m) away from the utility vehicle, structure being worked on and any driven ground rod.
- There are two acceptable methods of making contact with a utility vehicle, structure or driven ground rod while it has the potential to become energized. They are:
  - The employee is wearing rubber insulating gloves and rubber insulating over shoes that are rated for the voltage of the potential exposure.
  - The employee is standing on a conductive mat that is electrically bonded to that equipment. When accessing the conductive mat, employees must first step from the earth to an insulated platform before stepping onto the conductive mat. Egress from the conductive mat shall be done in reverse order.
- In an emergency condition, employees may get on/off a piece of equipment to operate the lower controls to perform a bucket rescue provided that one of the above personal protective measures is taken.
- Utility vehicle grounds, if used, must not be removed until the vehicle is away from the lines or devices.

Grounding and Bonding During Wire String Operations

General Rules

- Before stringing wire or removing de-energized conductors, a job briefing shall be held setting forth the plan of operation and specifying the type of equipment to be used, grounding devices and procedures to be followed, crossover methods to be employed, and the clearance authorization required.
- Where there is the possibility of the conductor accidentally contacting an energized circuit or receiving a dangerous induced voltage buildup, to further protect the employee from the hazards of the conductor, the conductor being installed or removed shall be grounded or provisions made to insulate or isolate the employee.
- Prior to stringing parallel to an existing energized transmission line, a competent designation shall be made to ascertain where dangerous induced voltage buildups could occur, particularly during switching and ground fault conditions.
- When there is a possibility that such dangerous induced voltage may exist, all provisions of equal potential grounding and bonding will be followed, unless the line is worked as energized.
- When stringing adjacent to energized lines, the tension stringing method or other methods which preclude unintentional contact between the lines being pulled and any employee shall be used.
- All pulling and tensioning equipment shall be isolated, insulated, and effectively grounded.
- A ground shall be installed between the tensioning reel setup and the first structure in order to ground each bare conductor, sub-conductor, and overhead ground conductor during stringing operations. See Figure 11-11 and Figure 11-12.
- During stringing operations, each bare conductor, sub-conductor, and overhead ground conductor shall be grounded at the first tower adjacent to both the tensioning and pulling setup and in increments so that no point is more than 2 miles from a ground. See Figure 11-9 and Figure 11-10.
- The grounds shall be left in place until conductor installation is completed.
- Such grounds shall be removed as the last phase of aerial cleanup.
- Except for moving type grounds, the grounds shall be placed and removed with an approved live-line tool.
- Conductors, sub-conductors, and overhead ground conductors shall be grounded at all dead-end or catch-off points.
- When crossing over energized conductors in excess of 600 volts, rope nets or guard structures shall be installed unless provision is made to isolate or insulate the workman or the energized conductor.
  - Where practical, the automatic reclosing feature of the circuit interrupting device shall be made inoperative.
  - In addition, the line being strung shall be grounded on either side of the crossover or considered and worked as energized.
- A ground shall be located at each side and within 10 feet of working areas where conductors, sub-conductors, and overhead ground conductors are being spliced at ground level.
- The two ends to be spliced shall be bonded to each other. It is recommended that splicing be carried out on either an insulated platform or on a conductive metallic grounding mat bonded to both grounds.

- When a grounding mat is used, it is recommended that the grounding mat be roped off with an insulated walkway for access to the mat. See Figure 11-13.

Establishing Equal Potential Zone for Puller and Tensioner Sites

To protect employees performing wire stringing operations at the puller or tensioner/reel stand location, the equipment should be positioned on an established equal potential work zone. See Figure 11-14.

Constructing an Equal Potential Work Zone for Puller and Tensioner/Reel Stand Sites

1. Determine where equipment shall be positioned.
2. Position grounding mats on ground.
   - If multiple mats are used, bond each of the mats together.
   - If steel matting is used for the mat, weave a minimum #2 AWG bare copper conductor through the mat. (Steel matting should consist of welded wire. Chain link material is not acceptable.) See Figure 11-15.
3. Drive a temporary ground rod in the extreme four corners of the mat.
4. Bond the mat to each of the four driven ground rods.
5. Position Puller/Tensioner/Reel stand on grounding mat.
6. Attach a minimum 4/0 (for transmission stringing) or a 2/0 (for distribution stringing) grounding cable between the stringing equipment and the grounding mat.
7. Build a temporary fence encircling the grounding mat, leaving an opening for access and egress to the equipment.
8. Place an isolation mat in the opening, bridging the ground mat and the earth.
9. Place an insulating mat on the ground, bridging the isolating mat and the earth.
10. Build a second temporary fence around the work site that is approximately 5 feet to the outside of the inner fence.

Figure 11-9. Wire Stringing Diagram

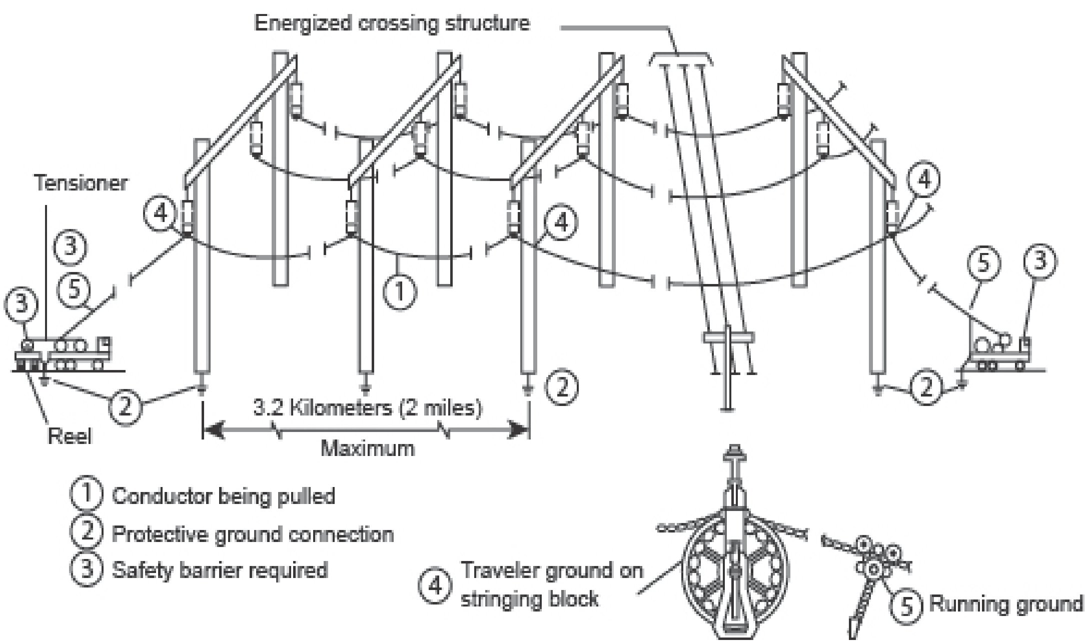


Figure 11-10. Grounding Traveler Installation

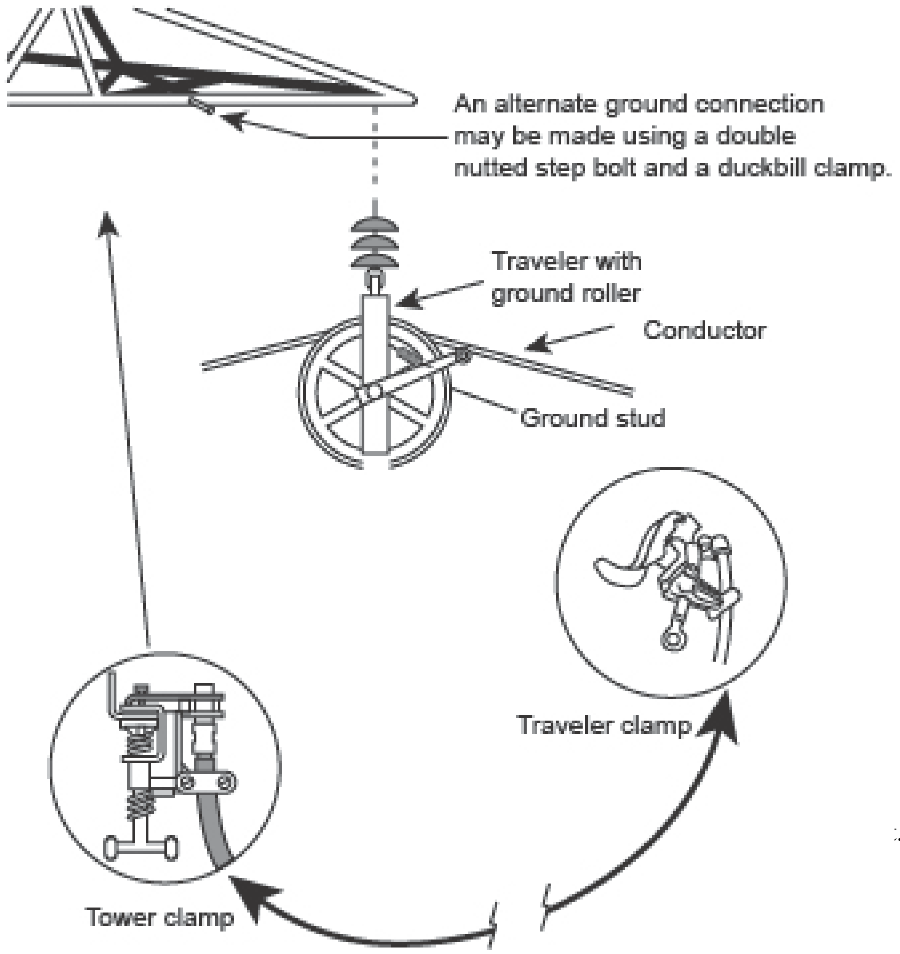


Figure 11-11. Puller Equipped with Pulling Line Connected to Pilot Line

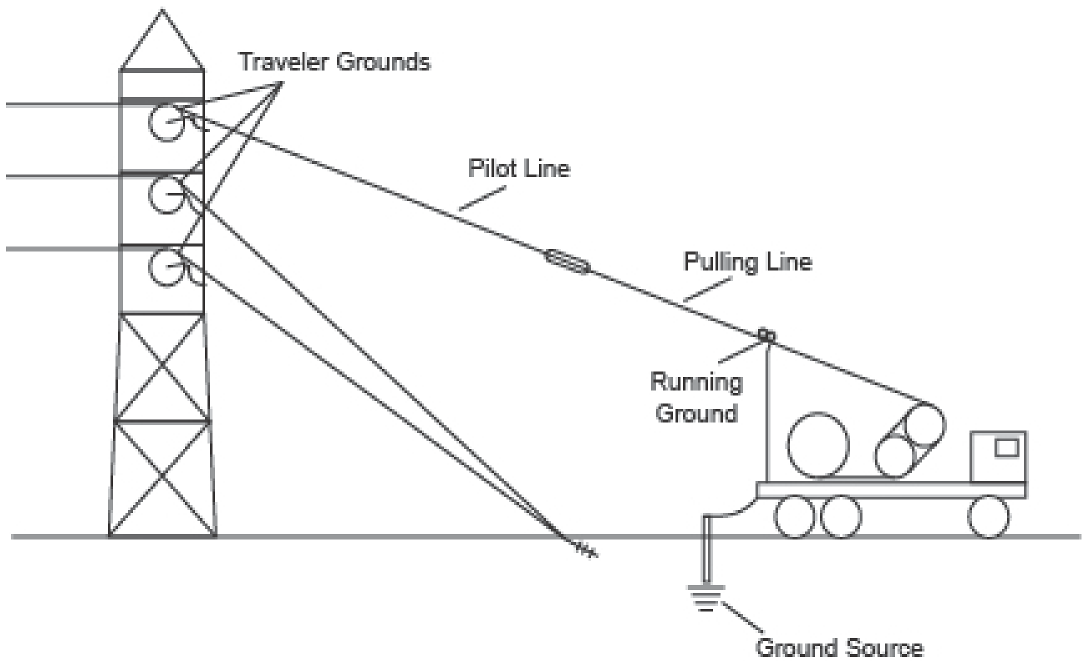


Figure 11-12. Wire Stringing Diagram

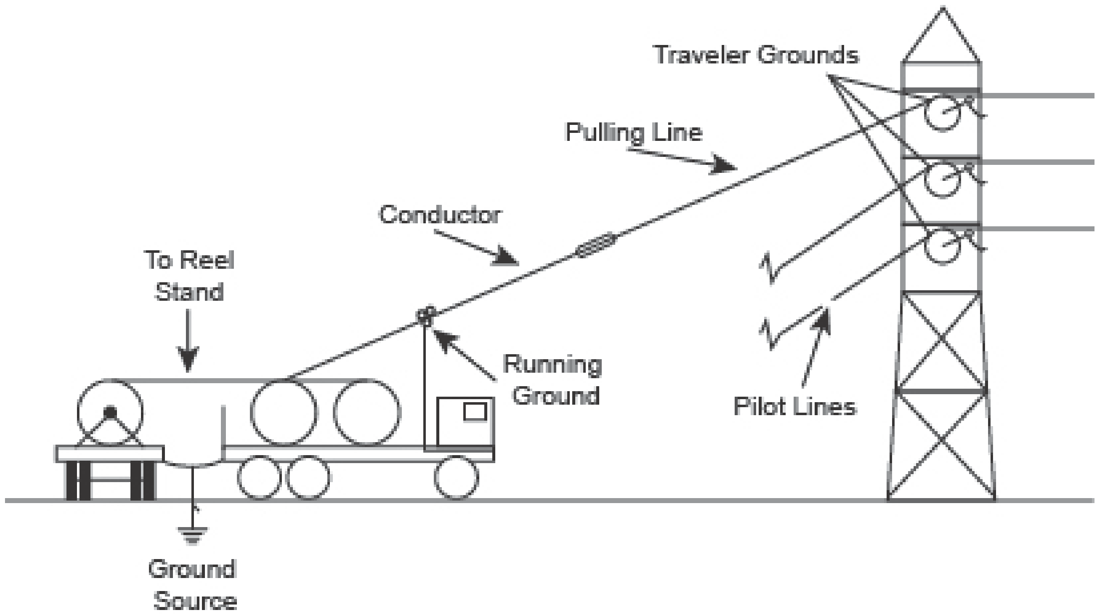


Figure 11-13. Component Parts

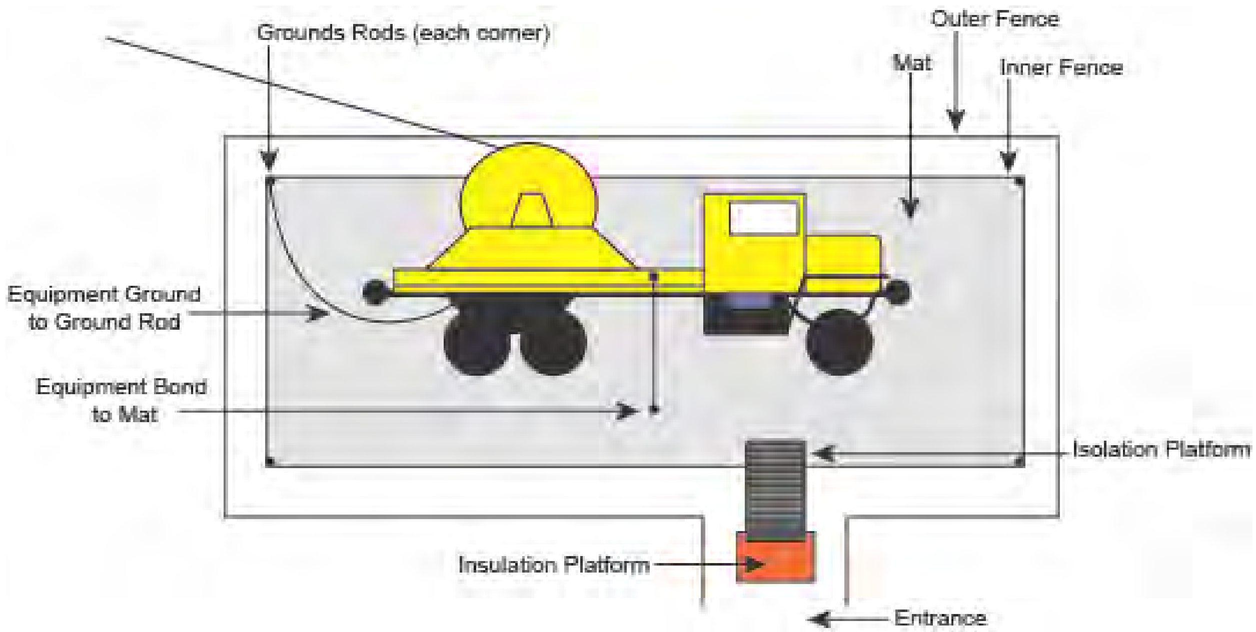


Figure 11-14. Component Parts

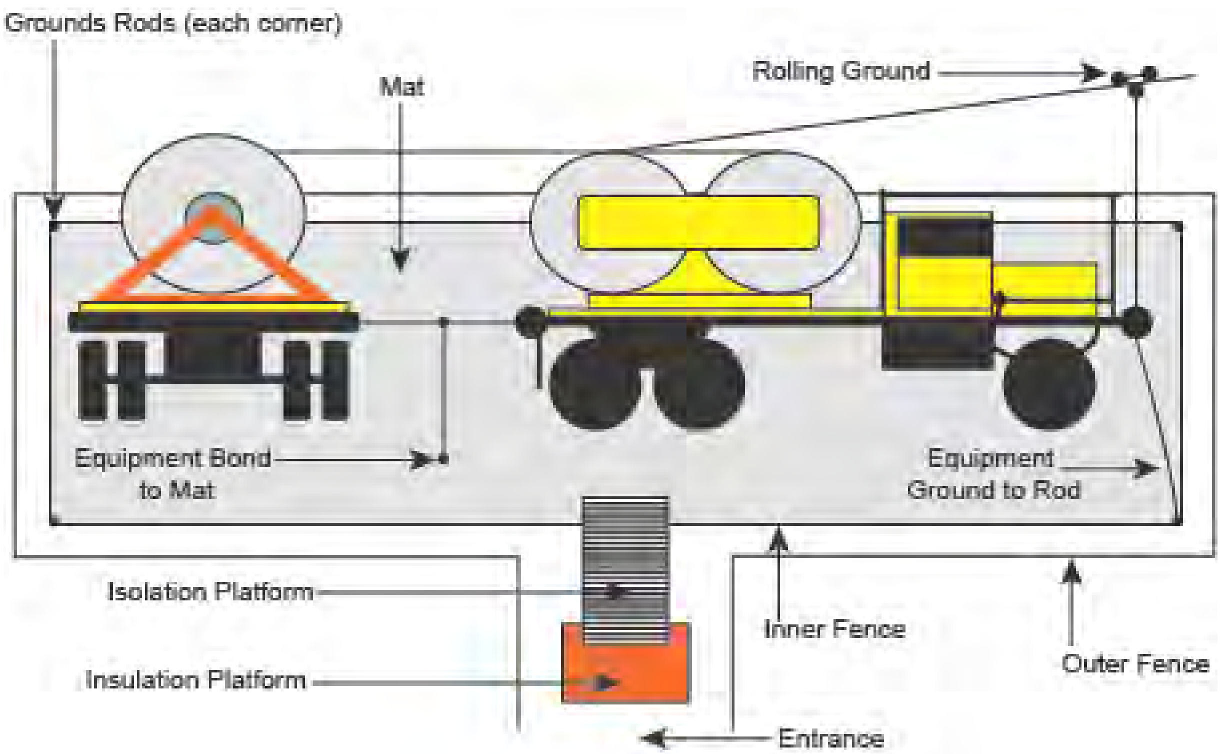
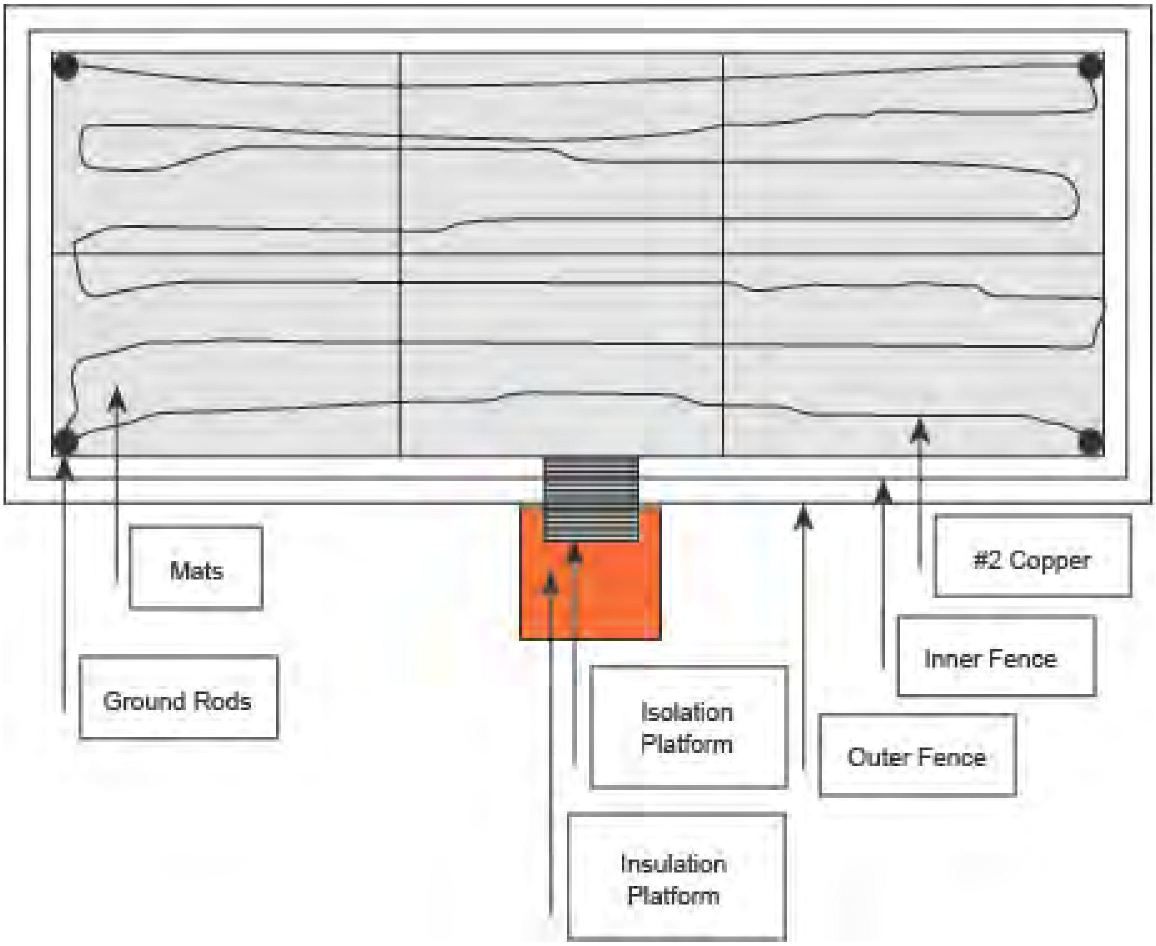


Figure 11-15. Grounding Mat



12

Lockout and Tagout

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

Definitions

Affected employee—An employee who performs the duties of his or her job in an area in which the energy control procedure is implemented and servicing or maintenance operations are performed. An affected employee does not perform servicing or maintenance on machines or equipment and, consequently, is not responsible for implementing the energy control procedure.

Authorized employee—An employee who performs servicing or maintenance on machines and equipment.

Energy isolating device—A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following equipment: a manually operated electrical circuit breaker, a disconnect switch, a manually operated switch in which no pole can be operated independently, a line valve, a block, and any similar device used to block or isolate energy. Push buttons, selector switches, and other control circuit type devices are not energy isolating devices.

Energy source—Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

Lockout and tagout—The placement of a lock or lockout device and a tag indicating that the energy isolating device and the equipment being controlled may not be operated until the lock or lockout device and tag are removed.

General Requirements

This procedure covers the servicing and maintenance of electrical systems, machines, equipment, and piping in which the unexpected energization or startup of the machines, equipment, or electrical systems or the release of stored energy from machines, equipment, or piping could cause injury to employees. This is a general program guide that can be followed when not working under the lockout and tagout procedures of the customer/client.

Follow this lockout/tagout program when you are not working under the provisions of the client's lockout/tagout. The rules of the client's program always take precedence over the following procedures.

Hazardous Energy Isolation Guide

This guideline describes how to affix appropriate lockout and tagout devices to energy isolating devices or otherwise disable machines or equipment to prevent accidental energization, startup, or release of stored energy and to prevent injury to Company employees.

Responsibility

Management must designate an employee as the Company's "authorized employee" who is responsible for:

- Instructing all employees about the importance of the lockout and tagout procedure.
- Instructing each new or transferred affected employee and other employees whose work operations are, or might be, in the area about the purpose and use of the lockout and tagout procedure.
- Having a copy of this procedure available for reference on the construction site.
- Making available for inspection copies of this procedure to clients and authorized regulatory authorities if requested.
- Enforcing the use of this procedure.

Preparation for Lockout and Tagout

A survey will be made by all parties affected who are involved in the procedure to locate and identify all isolating devices to determine which switches, valves, or other energy isolation devices apply to the equipment to be locked or tagged out.

Caution must be taken to ensure that all energy sources, including electrical, mechanical, air, and other bypass, fail-safe, and backup sources, are located, identified, and inventoried.

All Company employees affected by the work will be instructed in the purpose and use of the lockout and tagout procedure and any potential hazardous exposure.

Lockout/Tagout Procedure

1. Notify all affected employees about the use of and reason for a lockout and tagout system.

2. Instruct the authorized employees about the type and magnitude of energy that the machine, electrical system, or pipe utilizes and about the hazards of such energy.
3. If the machine or equipment is operating, shut it down using the normal operating procedure.
4. Operate any switch, valve, or other energy isolating devices that will isolate the equipment, pipe, or vessel from its energy source. Stored energy must also be dissipated, bled off, or restrained.
5. Lock out and tag out the energy isolating devices with assigned, individually keyed locks and tags. Tags must identify the name of the user. Only one key per lock is permitted on-site, and that key must remain in the possession of the user.
6. After ensuring that no personnel are exposed and as a final check on having properly disconnected the energy sources, attempt to operate the equipment to ensure that the equipment will not operate (or no stored energy or pressure is present). (Alternate operating means such as floats, microswitches, and change-over switches must be included in the final check or line or vessel drains must be reopened.) Return controls (drains) to the “neutral” or “off” position after the test.
7. Where it is impossible to ascertain the safety of the lockout, safety jacks and fuses must be removed from starters. Electricians must remove the starters and internal controllers before fuses are pulled.
8. Attach a “Danger—Do Not Operate” tag to the lockout device. This tag must contain the date and name of the persons involved.

The equipment is now locked and tagged out, and work may commence.

In general, lockout/tagout does not apply for tasks performed on machines under normal production operations such as:

- Tool adjustments
- Repetitive minor adjustments
- Cleaning and adjusting using the Inch Stop Safety Method
- Simple tool changes
- Lubricating
- Cleaning

Restoring Machines or Equipment to Normal Operating State

Single Lockout/Tagout Procedure

1. After work is complete and the equipment or pipe is ready for normal operations, check the area to ensure that no one is exposed.
2. Ensure that all tools have been removed from the machine, equipment, or pipe area.
3. Ensure that guards have been properly installed and that employees are clear.
4. Remove the lockout/tagout devices.
5. Operate the energy isolating devices to restore energy to the machine or equipment.

Multiple Lockout/Tagout Procedure

1. As each employee completes his or her work on the job, he or she will remove the lock or tag from the lockout/tagout device or key box.
2. After all craft locks and tags have been removed from the device or box, the construction supervisor will follow the procedure outlined in steps 1 and 2 in Single Lockout/Tagout Procedure before removing the key and energizing the equipment or piping.

Disable the equipment while performing these operations. Performing these tasks falls under the lockout/tagout rules when the tasks increase the risk of injury to employees.

Group Lockout/Tagout Procedure

- Group lockout/tagout involves the performance of servicing or maintenance activities by more than one employee. The group of employees is protected by a group lockout/tagout device (lock box), representing the group as a whole, with one authorized employee in charge directly responsible for the group lockout /tagout.
- Company LOTO locks shall be assigned to the authorized employee by the office and shall only be used for the purpose of lockout/tagout.
- Company Lockout & Tagout form must be completed and approved by the authorized person in charge and the responsible customer prior to de-energizing and isolating the equipment or the performance of any work. The procedure form shall list the equipment that is to be isolated. The form shall also list in detail each step necessary to de-energize, to isolate the equipment from all energy sources, and to install any grounds. The same form shall also list all of the necessary steps to safely re-energize the equipment.
- After the Lockout & Tagout form has been approved and signed, the equipment is to be isolated according to the procedure outlined in this section. This form shall list in sequence the switches, breakers, valves, and so on, to be tagged and locked open in order to safely isolate the equipment from all energy sources.
- The authorized employee in charge shall install all locks and tags needed to safely isolate the equipment. The locks, when installed, will hold the energy isolating devices in the off or safe position. The use of tags only on electrical equipment is not recommended.
  - All Company personnel will use the same type of tags. Tags will be issued at the office. Tags must be secured through the eyelet or with nylon tie-raps issued with the tags. No string or wire will be allowed. The authorized person in charge will include all information, such as equipment number, equipment description, date, signature, and work performed, on his/her tags.
  - If the equipment being secured is incapable of receiving a lock for lockout purposes, in addition to tagging, another means of securing the equipment must be employed (such as disconnecting cables, physical removal, pulling fuses, and so on).
- Before any work begins on the equipment that has been locked or tagged out, the authorized employee in charge is responsible for verifying that the equipment is safely isolated from all energy sources and that all stored energy has been relieved, disconnected, or grounded. Verification of isolation shall be continued by all authorized employees until the servicing or maintenance is completed.

- The authorized employee in charge of the group lockout/tagout will place the key/keys to the locks, used to isolate and secure the equipment, into the group lockout device (lock box). The authorized employee in charge shall install his/her personal lock on the latch of the lock box. All authorized employees, before working on the isolated equipment, shall verify for themselves that the system is indeed de-energized from all energy sources before installing a personal lock and tag on the group lockout device (lock box). Upon completion of work on the equipment, all employees shall remove their personal locks and tags from the group lockout device (lock box). Personal locks must be removed at the end of the shift each day. The authorized employee in charge shall be the last to remove his/her personal lock from the lock box and shall take control of the key(s) inside. The locks and tags used to isolate and secure the equipment shall remain in place until the equipment is ready to be re-energized or put back in service.
- Safety locks used to secure equipment shall be fitted with only two (2) keys. No locks or set of locks may have more than two keys. One of the two keys for each lock will be secured in the home office; the other key along with the lock will be assigned to the authorized person for lockout purposes.
- One or more tags and locks may be required to safely isolate equipment. Each energy source (electrical, mechanical, or otherwise) that could effect the equipment being isolated must be secured by a tag and lock at the switch, valve or other isolating device nearest the equipment being isolated.
- When work is completed and the equipment is ready to be placed back in service, the authorized person in charge shall verify that the equipment is ready to be energized and that all personnel, tools, excess materials, ground leads, and so on, are free and clear before removing his/her locks and tags from the equipment. Everyone shall be made aware that the equipment is to be energized. The equipment can then be energized.
- No employee shall remove another employee's locks and tags. If the employee in charge who installed the locks and tags on the equipment leave the job, he/she may, before leaving and with Management approval, turnover his/her lock and tag responsibility to another authorized employee provided that the second employee installs his/her own personal lock and tag on the lock box latch. The second employee must have a thorough understanding of the equipment and the LOTO procedure. If any employee who has installed locks and tags is not available when the equipment is ready to be re-energized, NO employee other than Company Management may remove the locks and/or tags. The Management shall, after making a thorough investigation to verify that the work is complete and the equipment is ready to be re-energized, assume the responsibility for removing the locks and tags. The circumstances for removing another employee’s lock and tag must be well documented.
- After the locks and tags have been removed, follow the switching sequence listed on the Company Lockout & Tagout form to safely re-energize the equipment.
- The Lockout & Tagout form must be forwarded to the Safety Department for review and filing.

Training and Communication

Training shall be conducted before lockout/tagout operations begin. The training must include the following information:

- Each authorized employee must receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy isolation and control.

- Each affected employee must be instructed in the purpose and use of the energy control procedure.
- All other employees whose work operations are or might be in an area where energy control procedures might be used must be instructed about the procedure and the prohibition relating to attempts to restart or reenergize machines or equipment that are locked out or tagged out.

Tag Limitations

When tagout systems are used, employees must also be trained in the following limitations of tags:

- Tags are essentially warning devices.
- When a tag is attached to an energy isolating means, the tag cannot be removed without authorization of the authorized person responsible for the tag.
- Tags must be legible and understandable by all employees whose work operations are or might be in the area, so that the tags are effective.
- Tags and their means of attachment must be made of materials that will withstand the environmental conditions encountered in the workplace.
- Tags might evoke a false sense of security, and the meaning of tags needs to be understood as part of the overall energy control program.
- Tags must be securely attached to energy isolating devices so that the tags cannot be accidentally detached during use of the devices.

Employee Retraining

- Retraining must be provided for all authorized and affected employees whenever there is a change in job assignments; in machines, equipment, or processes that present a new hazard; or in the energy control procedures.
- Additional retraining must also be conducted whenever a periodic inspection reveals, or whenever the employer has reason to believe, that there are deviations from or inadequacies in the employee’s knowledge or use of the energy control procedures.
- The retraining must reestablish employee proficiency and introduce new or revised control methods and procedures, as necessary.

Certification

The Company must certify that employee training has been provided and is being kept current. The certification shall contain the name and dates of training of employees.

Periodic Inspection

The Company must conduct a periodic inspection of the energy control procedure at least annually to ensure that the procedures and the requirements of the standard are being followed.

- The periodic inspection must be performed by an authorized employee who is not using the energy control procedure being inspected.
- The periodic inspection must be conducted to correct any deviations or inadequacies identified.

- Where lockout is used for energy control, the inspector shall review with each authorized employee that employee's responsibilities under the energy control procedure being inspected.
- Where tagout is used for energy control, the inspector shall review with each authorized and affected employee that employee's responsibilities under the energy control procedure being inspected and the elements set forth in the tagout requirements of the standard.

The employer shall document that periodic inspections have been performed. This documentation shall identify the machine or equipment on which the energy control procedure was being used, the date of the inspection, the employees observed in the inspection, and the person performing the inspection.

Electrical Lockout and Tagout Procedures

Introduction

This procedure establishes minimum requirements to ensure that machines, equipment, and energized electrical circuits are isolated from potential energy sources and are locked and tagged out before maintenance or repairs are done.

This procedure applies to any operation where failure to lock and tag out a potential energy source could cause an accident.

Energy Control

Before employees turn off a machine, equipment, or electrical circuit, the employees must know the type and magnitude of the energy, the hazards of the energy to be controlled, and the method or means to control the energy.

When identifying potential energy sources, all of the following types should be considered:

- Electrical energy sources, including power panels, transformers, capacitors, batteries, and generators
- Fluid energy sources, including high pressure or high temperature lines and lines that carry caustic or flammable materials
- Stored energy sources, including suspended loads, hydraulically lifted loads, compressed springs, and equipment that could shift, move, or rotate unexpectedly

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This information is only a guide to some types of potential energy and is not a complete list of all potential energy sources.

Once the energy type and magnitude are known, the following energy control procedures can be followed:

1. The machine, equipment, or electrical circuit must be turned off or shut down using the procedures established for that machine, equipment, or electrical circuit. An orderly shutdown must be performed to prevent any additional or increased hazards to employees because of the equipment stoppage.
2. All energy isolating devices needed to control the energy to the machine, equipment, or electrical circuit must be located and operated in a way that isolates the machine or equipment from the energy sources.

3. After the equipment is de-energized, each affected employee will lock the energy isolating device in the open position using a multiple locking hasp (for example, three different locks for three different employees) and will retain possession of his or her key to prevent the inadvertent reenergizing of the circuit.

   Each affected employee should be issued a lock (with key) and tag that will identify that particular employee as the sole custodian of that lock, key, and tag. All spare and additional keys must be kept in a locked box labeled “Lockout keys; authorized personnel only” and stored in a different location than the lockout devices. Information should be recorded on the Master Isolation List. Refer to the Master Isolation List located at the end of this chapter.

4. The locked energy isolation device must be tagged as out of service (for example, “DANGER DO NOT OPERATE” or “DANGER EMPLOYEES WORKING ON MACHINERY”). Tags must be attached to prevent inadvertent or accidental removal. Tag attachments must be of a non-reusable type, attachable by hand, and self-locking with a minimum unlocking strength of 50 lb (22.67 kg). All-weather nylon cable ties are acceptable tag attachments.

5. Locks and tags must be attached in a way that will hold the energy isolating devices in a “safe” or “off” position.

6. Locks and tags must be attached in a way that will clearly indicate that the operation or movement of energy isolating devices from the “safe” or “off” position is prohibited.

7. Following the attachment of locks and tags to energy isolating devices, all potentially hazardous stored or residual energy must be relieved, disconnected, restrained, and otherwise rendered safe.

8. If there is a possibility that stored energy could accumulate to a hazardous level, the isolation device must be monitored until the servicing or maintenance is completed or until the possibility of stored energy accumulation no longer exists.

9. After machines, equipment, or electrical circuits have been locked and tagged out, the machine or equipment must be test-started to ensure that the right energy sources were locked out, and any remaining stored energy must be bled off or released in a controlled, safe manner.

Testing

When necessary to perform testing on equipment that is under lockout and tagout, these steps shall be followed:

1. Clear the machine or equipment of tools and materials
2. Remove employees from the machine or equipment
3. Remove the lockout or tagout devices
4. Energize and proceed with testing or positioning
5. Upon completion of testing or positioning, de-energize all systems and reapply energy control measures established for the task

The foreman and/or Competent Person shall be responsible for this process.

Shift or Personnel Changes

Should a shift change occur during the work process, these steps must be followed:

- The two (2) crews (current and on-coming) will have a meeting to discuss the status of the work project.

- The current crew members shall remove their individual locks and/or tags in the presence of the on-coming crew.
- The on-coming crew members will place their individual locks and/or tags on the system.
- The on-coming crew can continue the work after approval by their foreman or Competent Person.

Release from Lockout and Tagout

After maintenance or repairs have been completed, the affected area will be inspected to ensure that tools and nonessential items have been removed, guards have been replaced, and employees have been notified that the machine, equipment, or electrical circuit is being reenergized.

Each lock and tag must be removed from each energy-isolating device by the employee who applied the device.

Exception: If the employee who applied a lock and tag is not available to remove them, the lock and tag may be removed by the supervisor. The supervisor must notify the affected employees that the lock and/or tag was removed when they return to work.

The supervisor removing the lock and tag must complete the following actions:

- Confirm that the employee who applied the lock and tag is not at the facility.
- Personally inform the employee, before the employee returns to work, that his or her lock and tag have been removed.

Training

- All employees likely to be assigned tasks involving maintenance or repairs of equipment, machinery, or electrical circuits should be trained using this lockout and tagout procedure before their assignments are given.
- Employees should be trained to identify potential energy sources within systems and job sites and to properly lock and tag out all devices controlling them.
- Employees who are or may be in an area where energy control procedures are used should be instructed about the procedure and about the prohibition relating to attempts to restart or reenergize machines or equipment that are locked and tagged out.
- Employees should be instructed that compliance with danger, warning, and lockout tags is mandatory.
- Retraining should be provided for all affected employees whenever there is a change in their job assignments; a change in machines, equipment, or processes that present a new hazard; or a change in these lockout and tagout procedures.
- Retraining should also be conducted whenever a periodic evaluation reveals or whenever a supervisor thinks that there are deviations from or inadequacies in the employee’s knowledge or use of the energy control procedures.
- Training and retraining should be documented and certified as being accomplished and current. The certification must contain the names of the employees and dates of training.

Periodic Evaluation

Supervisors responsible for this procedure should conduct a periodic evaluation of the energy control procedure to confirm that the procedure is being followed. Refer to the Job Specific Lockout/Tagout Survey located at the end of this chapter. The evaluation should include:

- Observation of employees using the lockout and tagout procedure.
- A review of employee responsibilities and correction of any misunderstanding or misapplication of the procedure.

The supervisor must certify that the evaluation has been completed. The certification must include the following information:

- The machinery, equipment, or energy source on which the energy control procedure was used
- The names of all the employees included in the evaluation
- The date and location of the evaluation
- The name and position of the evaluator

Sample 12-1. Master Isolation List

Master Isolation List

Job Identified: ____ Page: ________________________

Device Type Lock=L Tag=T Blind=B	Location	Isolation Position Open to Closed Closed to Open	Equipment Isolated	Time On Time Off	Signature of Person Installing Isolation Device
1.		From: ______ To: ______			
2.		From: ______ To: ______			
3.		From: ______ To: ______			
4.		From: ______ To: ______			
5.		From: ______ To: ______			
6.		From: ______ To: ______			
7.		From: ______ To: ______			

Version 1, 09/01

Sample 12-2. Job-Specific Lockout/Tagout Survey

JOB NUMBER ____________

JOB-SPECIFIC LOCKOUT/TAGOUT SURVEY

This Lockout/Tagout Plan is specific to the following project: ____________________

Location of Job: ____________________

Customer: ____________________

Date Plan Prepared/Modified: ____________________

Plan Prepared By: ____________________ Safety Coordinator

Plan Approved By: ____________________ Safety Coordinator and Site Supe[illegible]

Plan Supervised By: ____________________ Site Supervisor

A copy of this plan is to be maintained at the job site. [illegible] is [illegible] the respons[illegible] of the Site Supervisor.

This plan addresses [illegible] of lock[illegible] tag[illegible] procedu[illegible] job site [illegible] activ[illegible]

[illegible] design[illegible] Sup[illegible] yee[illegible] recognize the hazards on this job and to [illegible]ablish the proce[illegible] to [illegible] potentially hazardous energy source. Each [illegible] will be [illegible] procedures and [illegible] strictly adhere to them, except when doing so [illegible] greater ha[illegible]. If, in the opinion of the employee, this is the case, the [illegible] Supervisor at the jobsite. The concerns of the employee must be address[illegible] proceedin[illegible]

LOCK[illegible]OUT TO BE USED ON THIS PROJECT

The following lockout and tagout devices will be used on this job:

____

____

____

____

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(Job-Specific Lockout/Tagout Survey, Continued)

JOB NUMBER ____________________

TYPICAL LOCKOUT DEVICE

Lockout devices will be used for the following tasks:

____

____

____

____

TYPICAL TAGOUT DEVICE

The tagout devices will be used for the following purposes:

____

____

____

____

TYPICAL MULTIPLE [illegible]OUT H[illegible]

Th[illegible]ockout ha[illegible] used fo[illegible] pu[illegible]ses:

____

____

____

____

Version 1, 09/01

(Job-Specific Lockout/Tagout Survey, Continued)

JOB NUMBER ____________________

IDENTIFICATION OF HAZARDS AT THIS JOBSITE

Other Hazards

Version 1, 09/01

13

Arc Flash Protection

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites when working on electric wiring, switches, switchgear, capacitors, breakers, panels, motors, batteries, and other related electrical equipment on commercial, industrial, and residential sites when the work is performed on or near energized parts.

Definitions

Arc Thermal Performance Value (ATPV)—The ATPV represents the thermal exposure from an electric arc that will generate a second degree burn in human tissue. The NFPA 70E requires that garments have a minimum ATPV.

Attendant—A qualified person who has the skills and knowledge to operate equipment in case of emergency and who has received safety training on hazards that can occur while operating equipment.

Electrically Safe Working Condition—A state in which the conductor or circuit part to be worked on or near has been disconnected from energized parts, locked and tagged, tested to ensure the absence of voltage, and, if necessary, grounded.

Flash Hazard Analysis—A study investigating a worker's potential to arc flash energy. It is conducted for the purpose of injury prevention and the determination of safe work practices and appropriate levels of PPE.

Flash Protection Boundary—An approach distance from exposed live parts. Within the boundary a person could receive a second degree burn or greater if an electrical arc flash were to occur.

Limited Approach Boundary—The minimum approach distance for an "unqualified" person. No unqualified person may approach any exposed energized conductor any closer than its limited approach boundary. This boundary is to be crossed only by qualified persons (at a distance from live parts).

Job Hazard Analysis—An assessment of the job tasks to be completed before the work is started by the qualified persons to ensure personnel, resources, and work performed are done in a safe and consistent work manner within the scope of the work procedures.

Prohibited Approach Boundary—A shock protection boundary to be crossed by only qualified persons (at a distance from live parts) which when crossed by a body part or object, requires the same protection as if direct contact is made with a live part.

Qualified Person—One who has skills and knowledge related to the construction and operation of the electrical equipment and has received the necessary training of the hazards involved. A qualified person may be considered "qualified" for certain equipment in the workplace, but "unqualified" for other equipment. An employee, who is undergoing on-the-job training and who, in the course of such training, has demonstrated an ability to perform those duties safely might be considered "qualified" when working under the direct supervision of a qualified person.

Restricted Approach Boundary—An approach limit at a distance from an exposed live part where there is an increased risk of shock due to electrical arc over combined with inadvertent movement for personnel working in close proximity to the live part.

Unqualified Person—Employees that do not have the skills and knowledge related to the construction and operation of the electrical equipment and have not received safety training on the hazards involved. Unqualified persons shall not be permitted to enter spaces that are accessible to qualified persons only, unless the electrical conductors and equipment involved are in an electrically safe work condition and under direct supervision of a qualified person in charge of work space where electrical hazard exists.

Working Near Energized Circuits—Working near (in close proximity to) a safe approach distance of exposed electrical conductors or circuit parts that are or can be energized and are likely to result in injury from inadvertent or accidental contact or equipment failure.

Working On Energized Circuits—Handling or touching components (including when wearing voltage rated gloves) that are carrying or could carry electrical energy.

Objectives

- To protect workers from potential harm.
- To avoid arc flash related incidents and reduce exposure of body parts to arc flash in case of an accident by providing guidance as to what rating of flame resistant (FR) clothing must be worn and when arc rated face shields must be used.
- To avoid electrical shock incidents by providing a matrix which identifies when voltage rated gloves and voltage rated insulated tools must be used.
- To provide training necessary to assist operations in their adoption of minimum standards for electrical installation and appropriate electrically related safe work practices.

General Requirements

- Whenever possible, work will be not be performed on known energized circuits or equipment.
- This policy does not cover installations under the exclusive control of electric utilities for the purpose of communication or metering; or for the generation, control, transformation, transmission, and distribution of electric energy. Refer to Chapter 8, 9, or 10 regarding Arc Flash Protection when performing electrical transmission and distribution work.

- All live parts greater than 50 V to ground that an employee might be exposed to must be put into an electrically safe condition before an employee works on or near the equipment. All options to eliminate the exposure must be exhausted unless it can be demonstrated that de-energizing increases the hazards or it is infeasible due to equipment design, operational limitations or life safety systems.
- If live parts are not placed into an electrically safe work condition, work to be performed is considered to be energized work and shall be performed by use of an Energized Electrical Work Permit only.
- A Job Hazard Analysis, an assessment of the jobs shall be completed before work being started by the qualified persons, to ensure personnel and resources and work performed are done in a safe and consistent manner within the scope and procedures of this policy.

Approach Boundaries to Live Parts

- Observing a safe approach distance from exposed electrical conductors or circuit parts is an effective way of maintaining electrical safety. As the distance between a person and the live parts decreases, the potential for electrical incident increases.
- A Shock Hazard Analysis shall be performed to determine the voltage to which personnel will be exposed, boundary requirements and the personal protective equipment necessary to minimize the chance of electric shock.
- Shock Protection Boundaries are identified as Limited, Restricted, and Prohibited. Boundaries are designed by the degree to which approaching personnel are exposed to live electrical parts. A Flash Protection Boundary might exceed all shock protection boundaries.
- No qualified person shall approach or take a conductive object closer to exposed parts operating at greater than 50 V than the Restricted Approach Boundary unless one of the following conditions are met:
    - The qualified person is insulated or guarded from the exposure and no uninsulated part of the person crosses the Prohibited Approach Boundary.
    - The live part is insulated from the qualified person and from any other conductive object at a different potential.
- Unqualified persons are not permitted to enter spaces such as rooms, vaults, or other approved enclosures, partitions etc. where live parts of electrical equipment is operating at greater than 50 V unless the electrical conductors and equipment involved are in an electrically safe work condition.
    - Unqualified persons working close to the Limited Approach Boundary shall be advised of the electrical hazards and warned to stay outside of the Limited Approach Boundary.
    - Unqualified persons are instructed not to enter the Limited Approach Boundary area unless a qualified person advises them of the possible hazards. Then, the unqualified person must work under the direction of a qualified person at all times. The unqualified person must wear the same level of PPE as the qualified person while inside the Limited Approach Boundary.

Approach Boundaries to Live Parts for Shock Protection

Table 13-1: All dimensions are distance from live part to employee

(1)	(2)	(3)	(4)	(5)
	Limited Approach Boundary			
Nominal System Voltage Range, Phase to Phase	**Exposed Movable Conductor**	**Exposed Fixed Circuit Part**	**Restricted Approach Boundary; Includes Inadvertent Movement Added**	**Prohibited Approach Boundary**
Less than 50 V	Not specified	Not specified	Not specified	Not specified
50 V to 300 V	10 ft 0 in (3.05 m)	3 ft 6 in (1.07 m)	Avoid contact	Avoid contact
301 V to 750 V	10 ft 0 in (3.05 m)	3 ft 6 in (1.07 m)	1 ft 0 in (304.8mm)	0 ft 1 in (25.4 mm)
751 V to 15kV	10 ft 0 in (3.05 m)	5 ft 0 in (1.53 m)	2 ft 2 in (660.4 mm)	0 ft 7 in (177.8 mm)
15.1 kV to 36 kV	10 ft 0 in (3.05 m)	6 ft 0 in (1.83 m)	2 ft 7 in (784.4 mm)	0 ft 10 in (254 mm)
36.1 kV to 46 kV	10 ft 0 in (3.05 m)	8 ft 0 in (2.44 m)	2 ft 9 in (838.2 mm)	1 ft 5 in (431.8 mm)
46.1 kV to 72.5 kV	10 ft 0 in (3.05 m)	8 ft 0 in (2.44 m)	3 ft 2 in (965.2 mm)	2 ft 1 in (635 mm)
72.6 kV to 121 kV	10 ft 8 in (3.25 m)	8 ft 0 in (2.44 m)	3 ft 3 in (991 mm)	2 ft 8 in (812.8 mm)
138 kV to 145 kV	11 ft 0 in (3.36 m)	10 ft 0 in (3.05 m)	3 ft 7 in (1.093 m)	3 ft 1 in (939.8 mm)
161 kV to 169 kV	11 ft 8 in (3.56 m)	11 ft 8 in (3.56 m)	4 ft 0 in (1.22 m)	3 ft 6 in (1.07 m)
230 kV to 242 kV	13 ft 0 in (3.97 m)	13 ft 0 in (3.97 m)	5 ft 3 in (1.6 m)	4 ft 9 in (1.45 m)
345 kV to 362 kV	15 ft 4 in (4.68 m)	15 ft 4 in (4.68 m)	8 ft 6 in (2.59 m)	8 ft 0 in (2.44 m)
500 kV to 550 kV	19 ft 0 in (5.8 m)	19 ft 0 in (5.8 m)	11 ft 3 in (3.43 m)	10 ft 9 in (3.28 m)
765 kV to 800 kV	23 ft 9 in (7.24 m)	23 ft 9 in (7.24 m)	14 ft 11 in (4.55 m)	14 ft 5 in (4.4 m)

Flash Hazard Analysis

- A Flash Hazard Analysis is required to protect personnel from the possibility of being injured by arc flash. The analysis will determine the flash protection boundary and the PPE required within the boundary.
    - The Flash Protection Boundary is the distance required to prevent injury from a potential arc flash (farthest distance).
- Protective clothing and PPE for application with a Flash Hazard Analysis.
    - Work performed within the Flash Protection Boundary requires that a Flash Hazard Analysis be performed. The analysis shall document the incident energy exposure of the worker (in calories per square centimeter). The incident energy exposure level shall be based on the working distance of the employee's face and chest areas from the prospective arc source.
    - When working on electrical apparatus (switchgear, panel boards, motor control centers, etc.) the incident energy or available fault current to produce an arc flash should be clearly identified on each respective enclosure or piece of electrical equipment. This is a client/facility owner responsibility. Work cannot be performed until the incident energy available is determined.
    - The Energized Electrical Work Permit shall be used to document the arc rating for employees working within flash protection boundaries. This permit should involve only those "qualified" employees working on "energized" circuits. The hazards associated with arc flash would be eliminated with a circuit that as been verified to be de-energized.
    - As an alternative, the PPE requirements of the PPE Matrix (Table 13-2) shall be permitted to be used in lieu of the detailed Flash Hazard Analysis.

Table 13-2: Protective Safety Equipment Selection Matrix

	Hazard Risk Category	Rubber Insulating Gloves	Insulated and Insulating Hand Tools
Panelboards or Other Equipment Rated 240 V and Below – See Note 1			
Perform infrared thermography and other non-contact inspections outside the restricted approach boundary	**0**	**N**	**N**
Circuit-breaker (CB) or fused-switch operation with covers on	**0**	**N**	**N**
CB or fused-switch operation with covers off	**0**	**N**	**N**
Work on energized electrical conductors and circuit parts, including voltage testing	**1**	**Y**	**Y**
Removal/installation of CBs or fused switches	**1**	**Y**	**Y**
Removal of bolted covers (to expose bare, energized electrical conductors and circuit parts)	**0**	**N**	**N**
Opening hinged covers (to expose bare, energized electrical conductors and circuit parts	**0**	**N**	**N**
Work on energized electrical conductors and circuit parts of utilization equipment fed directly by branch circuit of the panelboard	**1**	**Y**	**Y**
Panelboards or Switchboards Rated between 240 V and 600 V (with molded-case or insulated-case circuit breakers) – See Note 1			
Perform infrared thermography and other non-contact inspections outside the restricted approach boundary	**1**	**N**	**N**
CB or fused switch operation with covers on	**0**	**N**	**N**
CB or fused switch operation with covers off	**1**	**Y**	**N**
Work on energized electrical conductors and circuit parts, including voltage testing	**2**	**Y**	**Y**
Work on energized electrical conductors and circuit parts of utilization equipment fed directly by branch circuit of the panelboard	**2**	**Y**	**Y**

	Hazard Risk Category	Rubber Insulating Gloves	Insulated and Insulating Hand Tools
600 V Motor Control Centers (MCCs) – See Note 2 (except as indicated)			
Perform infrared thermography and other non-contact inspections outside the restricted approach boundary	**1**	**N**	**N**
CB, fused switch, or starter operation with enclosure doors closed	**0**	**N**	**N**
Reading a panel meter while operating a meter switch	**0**	**N**	**N**
CB, fused switch, or starter operation with enclosure doors open	**1**	**N**	**N**
Work on energized electrical conductors and circuit parts, including voltage testing	**2**	**Y**	**Y**
Work on control circuits with energized electrical conductors and circuit parts 120 V or below, exposed	**0**	**Y**	**Y**
Work on control circuits with energized electrical conductors and circuit parts higher than 120 V, exposed	**2**	**Y**	**Y**
Insertion or removal of individual starter "bucket(s)" from MCC – See Note 3	**4**	**Y**	**N**
Application of safety grounds after voltage test	**2**	**Y**	**N**
Removal of bolted covers (to expose bare, energized electrical conductors and circuit parts) – See Note 3	**4**	**N**	**N**
Opening hinged covers (to expose bare, energized electrical conductors and circuit parts) – See Note 3	**1**	**N**	**N**
Work on energized electrical conductors and circuit parts of utilization equipment fed directly by a branch circuit of the MCC	**2**	**Y**	**Y**

	Hazard Risk Category	Rubber Insulating Gloves	Insulated and Insulating Hand Tools
600 V Switchgear (with power circuit breakers or fused switches) – See Note 4			
Perform infrared thermography and other non-contact inspections outside the restricted approach boundary	**2**	**N**	**N**
CB or fused switch operation with enclosure doors closed	**0**	**N**	**N**
Reading a panel meter while operating a meter switch	**0**	**N**	**N**
CB, fused switch, or starter operation with enclosure doors open	**1**	**N**	**N**
Work on energized electrical conductors and circuit parts, including voltage testing	**2**	**Y**	**Y**
Work on control circuits with energized electrical conductors and circuit parts 120 V or below, exposed	**0**	**Y**	**Y**
Work on control circuits with energized electrical conductors and circuit parts higher than 120 V, exposed	**2**	**Y**	**Y**
Insertion or removal of CBs from cubicles, doors open or closed	**4**	**N**	**N**
Application of safety grounds after voltage test	**2**	**Y**	**N**
Removal of bolted covers (to expose bare, energized electrical conductors and circuit parts)	**4**	**N**	**N**
Opening hinged covers (to expose bare, energized electrical conductors and circuit parts)	**2**	**N**	**N**

	Hazard Risk Category	Rubber Insulating Gloves	Insulated and Insulating Hand Tools
Other 600 V Class Equipment (277 through 600 V, nominal) – See Note 2 (except as indicated); Lighting or small power transformers (600 V maximum)			
Removal of bolted covers (to expose bare, energized electrical conductors and circuit parts)	**2**	**N**	**N**
Opening hinged covers (to expose bare, energized electrical conductors and circuit parts)	**1**	**N**	**N**
Work on energized electrical conductors and circuit parts, including voltage testing	**2**	**Y**	**Y**
Application of safety grounds after voltage test	**2**	**Y**	**N**
Insertion or removal of revenue meters (kW-hour at primary voltage and current)	**2**	**Y**	**N**
Removal or installation of cable-through or tray cover	**1**	**N**	**N**
Removal or installation of miscellaneous equipment cover	**1**	**N**	**N**
Work on energized electrical conductors and circuit parts, including voltage testing	**2**	**Y**	**Y**
Application of safety grounds after voltage test	**2**	**Y**	**N**
Insertion or removal of plug-in devices into or from busways	**2**	**Y**	**N**

	Hazard Risk Category	Rubber Insulating Gloves	Insulated and Insulating Hand Tools
NEMA E2 (fused contactor) Motor Starters, 2.3 kV through 7.2 kV			
Perform infrared thermography and other non-contact inspections outside the restricted approach boundary	**3**	**N**	**N**
Contractor operation with enclosure	**0**	**N**	**N**
Reading a panel meter while operating a meter switch	**0**	**N**	**N**
Contractor operation with enclosure doors open	**2**	**N**	**N**
Work on energized electrical conductors and circuit parts, including voltage testing	**4**	**Y**	**Y**
Work on control circuits with energized electrical conductors and circuit parts 120 V or below, exposed	**0**	**Y**	**Y**
Work on control circuits with energized electrical conductors and circuit parts higher than 120 V, exposed	**3**	**Y**	**Y**
Insertion or removal (racking) of CBs from cubicles, doors open or closed	**4**	**N**	**N**
Application of safety grounds after voltage test	**3**	**Y**	**N**
Removal of bolted covers (to expose bare, energized electrical conductors and circuit parts)	**4**	**N**	**N**
Opening hinged covers (to expose bare, energized electrical conductors and circuit parts)	**3**	**N**	**N**
Insertion or removal (racking) of starters from cubicles of arc-resistant construction, tested in accordance with IEEE C37.20.7, doors closed only	**0**	**N**	**N**

	Hazard Risk Category	Rubber Insulating Gloves	Insulated and Insulating Hand Tools
Motor Clad Switchgear 1 kV Through 38 kV			
Perform infrared thermography and other non-contact inspections outside the restricted approach boundary	**3**	**N**	**N**
CB operation with enclosure doors closed	**2**	**N**	**N**
Reading a panel meter while operating a meter switch	**0**	**N**	**N**
CB operation with enclosure doors open	**4**	**N**	**N**
Work on energized electrical conductors and circuit parts, including voltage testing	**4**	**Y**	**Y**
Work on control circuits with energized electrical conductors and circuit parts 120 V or below, exposed	**2**	**Y**	**Y**
Work on control circuits with energized electrical conductors and circuit parts higher than 120 V, exposed	**4**	**Y**	**Y**
Insertion or removal (racking) of CBs from cubicles, doors open or closed	**4**	**N**	**N**
Application of safety grounds after voltage test	**4**	**Y**	**N**
Removal of bolted covers (to expose bare, energized electrical conductors and circuit parts)	**4**	**N**	**N**
Opening hinged covers (to expose bare, energized electrical conductors and circuit parts)	**3**	**N**	**N**
Opening voltage transformer or control power transformer components	**4**	**N**	**N**

	Hazard Risk Category	Rubber Insulating Gloves	Insulated and Insulating Hand Tools
Arc-Resistant Switchgear Type 1 or 2 (for clearing times of less than 0.05 with a perspective fault current not to exceed the arc-resistant rating of the equipment)			
CB operation with enclosure doors closed	**0**	**N**	**N**
Insertion or removal (racking) of CBs from cubicles, doors closed	**0**	**N**	**N**
Insertion or removal of CBs from cubicles, doors open	**4**	**N**	**N**
Work on control circuits with energized electrical conductors and circuit parts 120 V or below, exposed	**2**	**Y**	**Y**
Insertion or removal (racking) of ground and test device with door closed	**0**	**N**	**N**
Insertion or removal (racking) of voltage transformers on or off the bus with door closed	**0**	**N**	**N**
Other Equipment 1 kV Through 38 kV Metal-enclosed interrupter switchgear, fused or unfused			
Switch operation of arc-resistant construction, tested in accordance with IEEE C37.20.7, doors closed only	**0**	**N**	**N**
Switch operation, doors closed	**2**	**N**	**N**
Work on energized electrical conductors and circuit parts, including voltage testing	**4**	**Y**	**Y**
Removal of bolted covers (to expose bare, energized electrical conductors and circuit parts)	**4**	**N**	**N**
Opening hinged covers (to expose bare energized electrical conductors and circuit parts)	**3**	**N**	**N**
Operation of outdoor disconnect switch (hookstick operated)	**3**	**Y**	**Y**
Operation of outdoor disconnect switch (gang operated, from grade)	**2**	**Y**	**N**
Examination of insulated cable, in manhole or other confined space	**4**	**Y**	**N**
Examination of insulated cable, in open area	**2**	**Y**	**N**

General Notes (applicable to the entire table)
(a) Rubber insulating gloves rated for the maximum line-to-line voltage upon which work will be done.
(b) Insulated and insulating hand tools are tools rated and tested for the maximum line-to-line voltage upon which work will be done and are manufactured and tested in accordance with ASTM F1505, Standard Specification for Insulated Hand Tools.
(c) Y = Yes (Required) N = No (Not Required)
(d) For systems rated less than 1,000 volts, the fault currents and upstream protective-device clearing times are based on an 18-inch working distance.
(e) For systems rated 1 kV and greater, the hazard risk categories are based on a 36-inch working distance.
(f) For equipment protected by upstream current-limiting fuses with arcing fault current in their limiting range (1/2-cycle fault-clearing time or less), the hazard risk category required may be reduced by one number.
Specific Notes (as referenced in the table)
1. Maximum of 25 kA short-circuit current available; maximum of 0.03-second (2-cycle) fault-clearing time.
2. Maximum of 65 kA short-circuit current available; maximum of 0.03-second (2-cycle) fault-clearing time.
3. Maximum of 42 kA short-circuit current available; maximum of 0.33-second (20-cycle) fault-clearing time.
4. Maximum of 35 kA short-circuit current available; maximum of up to 0.5-second (30-cycle) fault-clearing time.
The assumed maximum short-circuit capacities and maximum fault-clearing times for various tasks are listed in the notes to table 130.7 (C) (9). For tasks not listed, or for Power systems with greater than the assumed maximum short-circuit current capacity or with longer than the assumed maximum fault-clearing times AN ARC FLASH ANALYSIS SHALL BE REQUIRED IN ACCORDANCE WITH 130.3.

Other Precautions for Personnel Activities

- Work shall not be performed near live electrical parts operating at greater than 50 V where there is a lack of illumination or an obstruction precludes observation of the work to be performed.
- Employees shall not wear conductive articles of jewelry and clothing (such as watch bands, bracelets, key chains, necklaces, metalized aprons, cloth with conductive thread, metal headgear, metal frame glasses or metal rings whether on the finger or any other part of the body) where they present a contact hazard with exposed live parts.
- Employees shall not wear plastic articles of jewelry and clothing (such as watch bands, bracelets, necklaces, or plastic rings whether on the finger or any other part of the body) where they present a melting hazard with exposed live parts.
- Conductive materials, tools, and equipment shall be handled in a manner that prevents accidental contact with live parts.
- Means shall be developed to ensure that conductive materials, tools, and equipment approach no closer than permitted by the approach boundaries outlined in Table 13-1.
- Means shall be developed to ensure that plastic materials, tools, and equipment approach no closer than permitted by the approach boundaries outlined in Table 13-1.
- When performing work in a confined space or enclosed space such as a manhole or vault that contains live parts operating at greater than 50 V or more or an electrical hazard exists, the employee shall use protective shields, barriers, or insulating materials as necessary to avoid inadvertent contact with these parts.
- Reclosing a circuit that has been de-energized by a circuit protective device shall not be manually re-energized until it has been determined that the equipment and circuit can be safely energized.

Personal and Other Protective Equipment

- Employees working in areas where electrical hazards are present shall use protective equipment that is designed and constructed for the specific part of the body to be protected and for the work to be performed.
- Protective equipment shall be visibly inspected before each use.
- Employees working within the Flash Protection Boundary will wear FR protective clothing and other appropriate PPE in accordance with the PPE Matrix or Flash Hazard Analysis.
- When FR clothing is worn to protect an employee, it shall cover all ignitable clothing and allow for movement and visibility.
- Employees shall wear nonconductive head protection whenever there is a danger of head injury from electrical shock or burns from flying objects from an electrical explosion. Employees shall wear nonconductive protective equipment for the face, neck, and chin whenever there is a danger of injury from exposure to electrical arc or flashes or from flying objects resulting from electrical explosion.

- Employees shall wear approved eye protection whenever there is a danger from electrical arcs, flashes or flying objects resulting from electrical explosion.
    - Face shields shall have an arc rating suitable for the arc flash exposure. Face shields without an arc flash rating shall not be used. Additional lighting may be necessary to compensate for a dark shield.
    - Safety glasses and hearing protection shall always be worn under face shields or hoods.
- Where insulated footwear is needed for step and/or touch potential, dielectric overshoes are required. Insulated shoes shall not be used as primary electrical protection.
- Employees shall wear rubber insulating gloves with leather protectors where there is a danger of hand and arm injury from electrical shock due to contact.

Other Protective Equipment

- Using insulated tools provide a secondary line of protection for the employee. The primary method of protecting an employee is PPE. Consideration should be given to utilizing only insulated tools.
- When utilizing insulated tools, the insulated tools shall be rated for the voltages on which they are used.
- Insulated tools shall be designed and constructed for the environment to which they are exposed and the manner in which they are used.

Alerting Techniques

- When working within a Limited Approach Boundary, safety signs, safety symbols, or accident prevention tags should be used where necessary to warn employees about electrical hazards that might endanger them. The warning signs should designate the nominal voltage, equipment supplied, and disconnect points.
- Switchboards, panel boards, industrial control panels, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized shall be marked to warn qualified persons of potential electrical arc flash hazards. The warning signs should be clearly visible and remind the worker that a serious hazard exists and that the worker should follow appropriate work practices and wear appropriate PPE for the specific hazard. When working within a client/customer’s facility, the labeling of customer owned equipment shall be addressed with that client/owner before the start of the work.
- Barricades shall be used in conjunction with safety signs where necessary to prevent or limit access to work areas containing live parts. If barricade tape is used, it shall be red in color and have informational signs attached.
- Position an attendant appropriately if signs and barricades do not provide sufficient warning and protection from live electrical hazards. The primary duty shall be to manually signal, alert, and keep unqualified personnel away from the hazard. The attendant shall maintain communication with the employees performing the work at all times.

Employee Training

- Only qualified persons may work on or near an area where they are exposed to energized electrical parts or circuits of 50 V or more.
- Unqualified persons may work on de-energized circuits or equipment only. Unqualified persons must be trained in electrical safe work practices that are necessary to ensure their safety such as the limited approach boundary.
- A qualified person must be trained and knowledgeable of the construction and operation of equipment and the specific work method being used. Additionally, they must be trained to recognize and avoid the electrical hazards that might be present with respect to the equipment they are working on or the work method they are using. They should be familiar with the use of special precautionary techniques, PPE, insulating and shielding materials, and insulated tools and testing equipment.
- Persons permitted within the Restricted Approach Boundary of exposed live parts operating at 50 V or more must also have been trained in all of the following:
    - The skills and techniques necessary to distinguish exposed energized parts of electrical equipment.
    - The skills and techniques necessary to determine the nominal voltage of exposed live parts.
    - The minimum approach distance to the corresponding voltage (Table 13-1).
    - The ability and skills necessary to recognize and avoid the potential hazards and the ability to perform the job safely.
    - Employees must also be trained in Cardiopulmonary Resuscitation (CPR) and First Aid. For energized electrical work at 480 V or more involving two or more employees, two qualified persons must be present at all times.
- All training for qualified persons must be documented and should be periodically refreshed.

References

NFPA 70E – 2012 edition

Sample 13-1. Energized Electrical Work Permit

Energized Electrical Work Permit

Company Name:	Date:	Time:	Job #:
Location:		City:	State:
Describe job task:			
Justification for the Energized Work Request	☐ Deenergizing creates an increased/additional hazard (Specify)		
	☐ Shut down is infeasible due to design or operational limitations (Specify)		
	☐ Timeframe: Next available date for shutdown		
Designated Assembly (Muster) Area:		Qualified Person:	
Person responsible for First Aid / CPR/AED:			
Name and Location of Emergency Medical Facility:			
Location of the AED:		Emergency Contact Number: 911	

Hazard Risk Category			Yes / N/A		Yes / N/A		Yes / N/A
Category 0	☐	Di-electric blankets	☐☐	Competent person/persons	☐☐	GFCI	☐☐
Category 1 (minimum 4 cal)	☐	Low-voltage blankets	☐☐	LOTO Procedure Review	☐☐	Survey of Daily Conditions	☐☐
Category 2 (minimum 8 cal)	☐	Insulated blankets barrier	☐☐	Grounding	☐☐	Assured Grounding	☐☐
Category 3 (minimum 25 cal)	☐	Workplace barrier/barricade	☐☐	Daily Inspection tools/cords	☐☐	Hypotting	☐☐
Category 4 (minimum 40 cal)	☐	Fire extinguisher	☐☐	Copy of NFPA 70-E	☐☐	Infrared screening	☐☐

Arc Flash Label if present on Equipment

Incident Energy @ working distance ☐
Flash Protection Boundary ☐
Limited Approach Distance ☐
Restricted Approach Distance ☐
Glove Class ☐

Voltage Rated Meter
Minimum Class III
Only Units

Check ... Pro...

Equipment/Circuit Testing

Energized ☐☐
De-Energized ☐☐
...nergized Line... ☐☐
...ergized Load... ☐☐
...e-Energized Li... ☐☐
...e-Energized Lo... ☐☐

Who will perform the work:

...ting...

Work assignments not addr... ...ll b... .../M...

All employees must print an... ...ir names below

Printed Name	Signature	Printed Name	Signature
1.		5.	
2.		6.	
3.		7.	
4.		8.	

Foreman Signature ________ PM Signature ________

Client Representative: ________ Safety Representative: ________

Utility (if Necessary): ________

SAMPLE

This is the back side of the Energized Electrical Work Permit form.

Category	What Personal Protective Equipment (PPE) You Shall Wear:
0	Cotton Undergarments
	Long Sleeved Shirt (Natural Fiber)
	Long Pants (Natural Fiber)
	Safety Glasses or Goggles
	Hearing Protection (Inserts)
	Leather Gloves (as needed) or Insulating Gloves w/Protectors
1	Cotton Undergarments
	Arc Rated Long Sleeved Shirt (or FR Coveralls)
	Arc Rated Long Pants (or FR Coveralls)
	Hard Hat with Arc Rated Face Shield
	Hearing Protection (Inserts)
	Safety Glasses or Goggles
	Leather Gloves or Insulating Gloves w/Protectors
	Leather Shoes (as needed)
2	Cotton Undergarments
	Short Sleeved "T" Shirt (Natural Fiber)
	Arc Rate (12 cal) Arc Flash Hood or Hard Hat with Arc Rated Face Shield w/Sock Balaclava with Coveralls or Jacket & Bibs or 50" Coat with Leggings
	Safety Glasses or Goggles
	Hearing Protection
	Arc Rated Leather Gloves or Insulating Gloves w/Protectors
	Leather Shoes
3	Cotton Undergarments
	Short Sleeved "T" Shirt (Natural Fiber)
	Arc Rated (25 cal) Arc Flash Hood with Coveralls or Jacket & Bibs or 50" Coat with Leggings
	Hard Hat
	Safety Glasses or Goggles
	Hearing Protection
	Leather Gloves or Insulating Gloves w/Protectors
	Leather Shoes (as needed)
4	Cotton Undergarments
	Short Sleeved "T" Shirt (Natural Fiber)
	Arc Rated (40 cal) Arc Flash Hood with Coveralls or Jacket & Bibs or 50" Coat with Leggings
	Hard Hat
	Safety Glasses or Goggles
	Hearing Protection
	Leather Gloves or Insulating Gloves w/Protectors
	Leather Shoes (as needed)
Always wear voltage rated rubber glove liners when working above 50 volts in all categories!	

14

Helicopter Safety

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

General Requirements - Transporting Passengers on Helicopters

This guide provides a set of safe practices to follow for transportation of employees to or from their work area inside the cab of a helicopter.

- Always approach the helicopter in full view of the pilot, from the front on the pilot's side of the aircraft. Never approach the helicopter from the rear or walk around behind it.
- A qualified person should escort passengers at all times while boarding or leaving a helicopter on a helideck.
- Any equipment being carried should not extend into the air or to the rear of the aircraft to avoid contact with the rotor blades.
- Keep clear of rotors, especially the tail rotor. Never pass under the tail boom of the aircraft.
- Never run when approaching a helicopter.
- Maintain a safe, firm grip on hand-carried items and all belongings while boarding or leaving the helicopter.
- Hearing protection should be worn in and around operating helicopters.
- Tools or freight shall be carried, packed, or removed at the discretion of the pilot.
    - Cargo should not be carried in the passenger compartment if passengers are on board.

  - Passengers shall ensure that all gear (hardhats, boots, etc.) in the vicinity of helicopter operations is properly stored inside a bag or container or properly strapped to the exterior of a bag or container.

- If the helicopter is damaged while loading or unloading freight, notify the pilot immediately.
- Do not jump from the helicopter. Exit only after the pilot has set the aircraft firmly down, throttled down the engine, and given permission to exit.
- When meeting the helicopter on an offshore platform, remain below the heliport and off the stairway. After the helicopter has throttled down, passengers may proceed up the stairs. Do not wait on the stairway.
- On an offshore platform, after all passengers are on board the helicopter and the area is clear for departure, the qualified person that escorted the passengers should stand in front of the helicopter in clear view of the pilot.
- Check to see that no materials are loose on the heliport, all doors are secured, all other personnel are clear, and nothing is hanging out on the aircraft. Then, using the thumbs-up sign, wave the all-clear to the pilot for take-off.

Safety Briefing

All passengers should receive a safety briefing before the flight. The briefing should discuss:

- Seat belts
  - Seat belts must be worn at all times.
- Emergency equipment
  - Location of fire extinguishers, first aid kits, life rafts, and emergency exits.
- Emergency procedures
  - Obey all orders given by the pilot.
  - Remain in your seat with seat belt fastened during an emergency or auto-rotation landing.
  - Remove sharp objects from your pockets and place eyeglasses between your thighs. Lean over and clasp your hands behind your knees (ditching position).
  - Remain in the ditching position until aircraft movement stops.
  - Remain with the aircraft until given direction from the pilot.
  - If a water ditching occurs, flotation gear will keep the aircraft afloat for a considerable time in relatively rough waters.
  - Do not exit the aircraft or deploy the life raft until instructed to do so by the pilot.
  - Never inflate the raft inside the helicopter.
  - If the raft is deployed, make sure the retaining line is secured and the raft does not float away before all passengers can enter.
  - Obey all instructions from the pilot.
  - Remain calm, care for the injured, and utilize radio equipment and signaling devices.

- Smoking policy
  - Smoking is not permitted in the passenger area on the aircraft.
  - Smoking is not permitted on a helideck or in the vicinity of helicopter operations.

General Requirements - Helicopter Operations

This guide provides a set of safe practices to follow when performing operations where Company employees are working with, around, under, or on a helicopter. Not all Company employees are required to participate in helicopter operations. The supervisor must designate employees to work with helicopters.

The Company provides training to affected workers on the following subjects:

- Safe work practices rules from the Company *Safety, Health, and Environmental Program Manual*
- Ingress, egress, approach, and departure to and from a helicopter
- Safe zones around helicopters
- Verbal and nonverbal communication between the pilot, employees, and crew members
- PPE
- Work positioning for employees waiting to board a helicopter
- How to respond to emergencies
- Fall protection requirements
- External loads
- Tool and equipment inspection
- Landing zone (LZ) requirements

Types of Helicopters Used

The scope of work to be performed shall dictate the type of helicopter to be utilized. Each type of helicopter is significantly different. A competent person shall determine the type of helicopter to be utilized for the specific task to be performed. Specific training must be included for all employees on the type of aircraft utilized.

Controls and Work Practices

The Company works with the helicopter company and pilot to institute controls and work practices that minimize the possibility of falls, rotor strikes, and exposure to other hazards. These controls shall be in place before the beginning of operations.

Personal Protective Equipment

Employees who are working in close proximity (50 feet) to an operating helicopter, within the LZ, working off the skid of a helicopter, or transferring from a helicopter to a structure or conductor must wear the appropriate PPE.

PPE must be accessible and available in appropriate sizes. PPE also must be kept clean and in good repair. The types of PPE that may be needed include:

- Hard hat (type II side impact protection) with three-point chin strap
- Safety glasses or goggles
- Hearing protection
- Fall protection equipment
- Rubber insulating gloves
- Work gloves
- FR (fire retardant) clothing

Housekeeping Techniques

Equipment and work areas such as the LZ must be clean and free of debris that can be blown into the rotor or otherwise create a hazard as a result of rotor wash. Keep all vehicle doors and windows closed and clear trash off all equipment in the LZ to prevent injury or damage to the vehicle and keep paperwork from blowing out of trucks. Designate an employee to ensure that the LZ is clean at all times.

LZs must be free of blowing dust and dirt. Water trucks may be necessary for dust suppression.

Recordkeeping

Maintain records for all employees who receive helicopter training. Each record, which must be available to the employee, should include:

- Employee name, signature
- Date of training
- A summary of program contents
- Name and qualifications of the trainer
- Names and job titles of all participants
- Project location
- Results of all skills proficiency tests. Refer to the Helicopter Operations Test and Helicopter Operations – Skills Profession Sheet located at the end of this chapter.
- Copy of valid first aid/CPR card
- Copy of information provided to the helicopter company
- Copy of training materials used by the helicopter company

Training and Retraining

All employees with occupational exposure to the hazards associated with helicopter operations must be trained during work hours at no cost to the employee.

Company-provided training includes:

- Training applicable to the employee's roles and responsibilities as a member of the flight crew shall be performed upon initial assignment.
- Additional training when changes are made in the employee’s work tasks or when other changes are made that may affect the employee’s exposure. The additional training may be limited to the new exposure risks.
- Retraining under any of the following conditions:
  - Supervision or inspections indicate that the employee is not complying with the safety-related work practices required by this program.
  - New technology, new types of equipment or changes in procedures necessitate the use of safety-related work practices that are different from those that the employee would normally use.
  - The employee must use safety-related work practices that are not normally used during his or her regular job duties.
  - Tasks are performed less often than once per year (in this case, employees are retrained before beginning the tasks).

The content and vocabulary of the material included in the training must be appropriate for the education level, literacy level, and language of the employees being trained.

The training program must provide the following minimum elements:

- A general explanation of skills proficiency requirements
- Methods of identifying potential exposure situations and the engineering controls, work practices, and PPE that are used to prevent exposure
- Appropriate action in the event of an emergency and responsibilities in the event of an incident involving a helicopter.
- A trainer knowledgeable with the particular workplace and how it will affect the possibility for exposure to helicopter operations

Responsibilities of the Pilot

The pilot has the overall responsibility for the safe operation of the aircraft and for how the helicopter crew’s various duties are carried out. The pilot is responsible for determining who may fly on the aircraft, and has the authority to remove any person from the aircraft at any time. The pilot is responsible for ensuring that the aircraft related equipment is being properly maintained. The pilot may delegate some of these tasks to the other members of the crew, but is responsible for ensuring that the duties are being completed.

Control of Flights

The pilot is the final authority and is responsible for the safe operation of the helicopter. The pilot has the authority to initiate or terminate each flight. The pilot shall make the flight decision with input from all crew members. The flight decision shall be made with safety being paramount.

Authority of Pilot in Command

The pilot in command of an aircraft is directly responsible for and is the final authority as to the operation of that aircraft.

Basic Operations

Knowledge of Normal and Emergency Procedures

The pilot and crew shall know and understand the normal procedures as set forth by the Rotorcraft Flight Manual.

The pilot and crew shall understand the emergency procedures as set forth by the Rotorcraft Flight Manual and any other emergency procedures relative to the task being performed.

Airworthiness

The pilot is directly responsible for determining the airworthiness of the aircraft and aircraft-related equipment.

Operational Check Flights

An Operational Check Flight shall be accomplished if the helicopter has been repaired or altered in a manner that may have changed its flight characteristics or substantially affected its operation in flight. The pilot conducting the acceptance flight must sign the helicopter maintenance record indicating that the flight was accomplished and indicate the outcome of the flight. It is a good practice to have the maintenance technician aboard to assist the pilot in ensuring that the helicopter is performing to specification. These flights will be conducted within ***Visual Flight Rules*** (VFR) conditions. Only appropriate crew members shall be permitted on operational check flights. If a ground run can show conclusively that the maintenance, repair, or alteration has not changed the flight characteristics or substantially affected the flight operation of the helicopter, an acceptance flight is not required. The results of the ground run shall be entered into the records.

Limitations

Weather

- **Cross-Country (Enroute Ferry) Flight**—VFR minimums shall apply at all times.
- **Work Location**—The ceiling and visibility shall be sufficient as not to impair safe and efficient operations. Wind direction and speed shall be evaluated at each structure. Wind values that adversely influence the controllability of the helicopter shall be cause to terminate operations.

Helicopter

The pilot shall not exceed the Operating Limits set forth in the Rotorcraft Flight Manual.

Crew Flight and Duty Time

The FAA does not prescribe specific duty limitations for general aviation or external load operations. The Company is cognizant of the effect of fatigue on the safety of flight. The Company will plan ahead to minimize flight crew exposure to fatigue and will keep safety a paramount concern. The flight crew must consider the following elements:

- Start and finish time of the working day
- Length of the working day
- Heat
- Dehydration
- Flight time
- Duties other than those associated with flying
- Rest time

These elements must be balanced and limited to prevent flight crew fatigue. Management and the flight crew will establish flight and duty times for each particular operation. The flight crew shall have the option to stop operations if fatigue becomes a safety factor.

Crew Rest Time

Adequate rest time is an important element of flight and duty time considerations. Again, the type of flight operations needs to be taken into account. A minimum period of eight hours should be considered as a baseline. However, in most instances, a flight crew member needs at least 10 hours of rest within a 24-hour period. This helps ensure that the flight crew has time for adequate rest and a balanced meal. In addition, each week should contain a scheduled period of extended relief from duty consisting of one or more consecutive days. .

Positioning Flights/Cross Country Flights

Positioning flights shall be undertaken in the most expeditious and efficient manner. The flights shall be planned as direct as operationally feasible. A flight plan shall be filed with the FAA or authorized company personnel. Any deviation from the planned flight plan shall be relayed to company personnel. VFR weather minimums (and special VFR weather minimums when approved) shall be observed at all times. In the case of inadvertent adverse weather, the pilot will land at the nearest suitable landing site and notify company personnel of the circumstances. Flight below weather minimums is not an option. The pilot will notify company personnel before resuming the flight.

Helicopter Noise Policy

Helicopters shall not be operated in such a manner as to be construed as a public nuisance. Be aware of the flight surroundings. Locate noise sensitive areas and avoid these as much as possible. . The helicopter shall be operated in such a manner as to minimize the noise footprint.

Preflight Meeting

Before flight operations begin, a preflight meeting must be conducted and documented. This meeting must address all aspects relating to the operations, including the responsibility of each individual, rigging, safety issues, and emergency procedures. The pilot-in-command (PIC) must ensure that all persons working with the helicopter fully comprehend their functions and responsibilities. Documentation of the meeting is required and all personnel attending the meeting shall sign an attendance roster.

Communications

The following guidelines regarding communications must be observed during operations involving helicopters:

- Establish and maintain reliable communications among the pilot, the employees transferring to or from the helicopter, and the employees on the ground. Verbal communication through radios is the preferred method of communication.
- If possible, establish a backup frequency.
- Identify each person with a radio by a name or a call sign that is maintained throughout the operation.
- Ensure that the pilot makes a radio check with each affected employee before the first flight.
- For wire stringing, establish a "lost communication" procedure with the pilot and ground crew before the first flight.
- Designate one employee as the signalperson when delivering loads. The signalperson should identify themselves by extending their arm toward the load to "accept" it.
- Use hand signals in the absence of or in combination with radio communications (see Figure 14-1).
- Use the same terminology throughout the flight. Keep radio communications concise and to a minimum.
- When providing the pilot with directions, give the pilot specific distances, for example, "6 inches up" and "20 ft forward."

Occupants and Ground Personnel

The following guidelines must be followed by all occupants of a helicopter and all personnel on the ground during helicopter operations:

- Only Company employees, customer representatives, and employees of the helicopter company are allowed to ride in the helicopter. All unauthorized personnel must stay at least 50 ft (15.24 m) from the helicopter.
- All personnel riding in the helicopter must receive instructions required by the Federal Aviation Administration prior to flight.
- Employees must receive instruction about the safest routes for approach to and departure from the helicopter, including any special consideration for the type of helicopter or terrain specific to the operations area.
- Personnel must receive permission from the pilot before approaching or exiting the helicopter. All personnel must remain secured in the helicopter until the pilot gives clearance to exit.

- All employees on the ground during helicopter operation must wear safety glasses with side shields.
- Employees may not wear loose-fitting clothing, especially gloves with loose cuffs that could snag the rigging or grapple hook.
- Employees riding the skid, platform, or longline of a helicopter must wear approved headgear secured with a 3-point chinstrap.
- All employees riding on the skid of a helicopter must wear a full body harness equipped with a shock-absorbing lanyard that has one end attached to the harness and the opposite end attached to a FAA approved load attachment point designed for human external cargo.
- Ground personnel must exercise special caution to keep clear of rotors when visibility is reduced by dust or other conditions.

Cargo and Equipment

Observe the following guidelines concerning cargo and equipment involved in helicopter operations:

- Secure for flight all material and equipment loaded or carried on the helicopter. Secure items, such as preform ties, preform taps, armor rods, and so on, that could possibly spring up into the rotor blades.
- Carry long objects such as shovels and hot sticks horizontally below the waist to avoid contact with the main rotor blades.
- Never throw any objects in the vicinity of a helicopter while the helicopter is being loaded or unloaded. Thrown items might contact and damage the rotor blades and cause serious injury to ground personnel.
- Remove trash and secure items around the landing area. Rotor downwash can cause these items to contact the rotor blades or ground personnel.
- Keep all unnecessary equipment, people, and vehicles away from the landing and staging areas during flight operations.
- Secure or remove loose gear within 100 ft (30.48 m) of rotor downwash.

Operations

Observe the following guidelines during helicopter operations:

- Be aware of the increased danger of walking into the rotor system when a helicopter is operating on an irregular surface, such as sloped terrain where rotor blade or terrain clearance might be reduced.
- On rocky or uneven terrain, the skids can move or slide, resulting in potential foot injuries. To avoid injury when loading or unloading the helicopter, step or stand directly on the skid, not immediately near or outside of it.
- Ensure that only trained employees load, unload, enter, or exit the helicopter while it is hovering in flight or when the landing gear is only in partial contact with the surface.
- Provide a safe means of access when employees are required to work under hovering craft to reach the hoist line or hook to engage or disengage cargo slings.
- Do not permit open fires in areas where such fires might be spread by rotor downwash.

Rigging

Observe the following guidelines when using rigging during helicopter operations:

- Inspect all rigging before use.
- Test all cargo and remote hooks to be utilized before flight operations.
- Before commencing flight operations, determine the complete rigging requirements, including slings and taglines. Consider the type of rigging to be used, the weight of the object to be lifted, and what type of hooks or other hardware is needed.
- Give special consideration to the use of nylon rigging materials. The elastic properties of these materials can cause them to snap back into the helicopter in the event of a failure.
- Ensure that taglines are short enough that they cannot fly into the rotor systems.
- For overhead lifting, do not use hand-braided loops or splices or cable slings that have eyes and are formed using cable clamps.
- Use of non-conductive Dyneema® (or similar) synthetic rope is required when working in areas with electrical hazards and is preferred for all operations.
- A swivel should be incorporated into the rigging to avoid unwrapping wire rope during flight operations using wire rope.
- Identify the best way to attach sock lines, bull lines, or conductor to the helicopter.
- Dissipate the static charge on suspended loads, cargo hooks, or rigging by touching the load, cargo hook, or rigging to the ground or shunting the load with a grounding device before allowing ground personnel to touch it. Alternatively, all ground personnel touching the suspended load must wear 30 kV rubber gloves, or di-electric longlines in clean, dry condition must be utilized.
- Drag shuts may be required on loads that spin or are flying great distances.
- No rope of any kind shall be placed directly into the helicopter's cargo hook without a ring or shackle of suitable size to prevent roll-out.
- Baskets with lightweight items must have latching lids to prevent objects from coming out in flight.
- Secondary securement systems shall be utilized in situations that can effect safe helicopter operations, such as during clipping wire.

Suspended (Jettisonable) Loads

Observe the following guidelines during operations that involve suspended loads:

- Ensure that when a sling or line is attached to the cargo hook of the helicopter that the line is freely suspended and not entangled in the landing gear or other equipment. A preflight procedure must be developed to ensure the pilot is knowledgeable of line attachment during the take-off process.
- After the cargo is hooked to the line attached to the helicopter, ensure that the lift proceeds smoothly. Ground observers must inform the pilot of any unusual circumstances.
- After the load is released, assist the pilot from the ground to determine that the hook is clear before continuing operations.

Line Stringing Operations

Observe the following guidelines regarding line stringing operations:

- Ground or barricade all tension and pulling equipment or consider it to be energized.
- Ensure that all pulling and tensioning equipment has properly functioning brake systems.
- Use swivels between the helicopter and the line being pulled to prevent the line from becoming twisted.
- Ensure that rope slings or cables do not twist around the cargo hook, preventing proper operation of the hook or clean release when the hook is opened.
- Place guards to preclude vehicular traffic from coming in contact with moving line. Any movement of or over the sockline must be done with the coordination of the pilot.
- During the pull, give consideration to any and all inactive socklines in the vicinity of the helicopter. No sag changes may be made to those lines until the pull is completed and the pilot is clear of the line.
- Allow the pilot to make the initial decision about the order in which lines are pulled to help keep the tail rotors and main rotors out of the lines behind and above the helicopter.
- Do not attach the line at the base of a tower that is already threaded to the helicopter. Consider using a long line if a tower base hookup is required.
- Do not allow anyone under the helicopter or sockline during the course of a pull.
- Consider conductors and metal cables as energized until properly grounded and caught off in that order.
- All road and hot crossings should be guarded and covered to the extent practical.
- Have a person with radio communications with the pilot monitor all road and hot crossings.
- Congested Area Plans from the FAA shall be obtained when required.

Working from the Skid of a Helicopter

- Employees working from the skid of a helicopter (such as installing marker balls or spacers, or performing inspections) must be trained and qualified, and must demonstrate proficiency in the safe work practices for that operation before performing those duties.
- Employees working from the skid of a helicopter (such as installing marker balls or spacers, or performing inspections) should wear a full-body harness and body belt with a positioning-device attachment. The employee will attach a “rodsman” lanyard (18 inches or less in length) with one end to the positioning device D-ring attachment, and the other end (hook) to an FAA approved load attachment point designed for human external cargo.
- Employees working from the skid of the helicopter must check the condition of the load attachment device to ensure that the device is securely attached, in proper working condition, and capable of supporting the individual.

Transferring to a Wooden Structure

Observe the following guidelines when using a helicopter to transfer employees onto a wooden structure:

- Employees transferring from a hovering helicopter to a structure must be trained and qualified, and must demonstrate proficiency in the safe work practices for that operation before performing those duties.
- Employees riding on the skid of the helicopter should wear a full-body harness and body belt with front D-rings for positioning and a dorsal D-ring for fall protection.
    - A shock-absorbing lanyard attached to the harness dorsal D-ring shall be connected to an FAA approved load attachment point designed for human external cargo. The employee must remain attached to the helicopter at all times when riding from the ground to the structure.
    - The other lanyard "pole strap" (an integrated wood pole fall-protection system) will attached to the front D-rings and be used during the transfer process to attach to the structure and afterwards while working on the structure.
- Employees riding on the skid of the helicopter must check the condition of the FAA-approved load attachment device to ensure that the device is securely attached, in proper working condition, and capable of supporting the individual.
- When transferring to a wooden structure, it is important to dissipate any possible static charge that might exist. Employees transferring from a helicopter to a wooden structure must use a bonding wand that is also attached to the helicopter to equalize the potential of the helicopter to any conductive surface (structure, conductor, static) near the transfer site before coming in contact with the structure.
- If the transfer takes place in close proximity to a strung sockline or conductors in blocks that may be energized by induction, a personal ground shall be attached from the conductor to the structure ground to create an equipotential zone and protect the lineman.
- Then employees may begin the transfer process.
    1. Remove the shock absorbing lanyard from the FAA-approved load attachment point on the helicopter.
    2. Immediately attach the second lanyard (pole strap) to the structure.
    3. The employee should have both hands free during the transfer process.
    4. Transfer to the structure.
    5. Employees must transfer to and from the helicopter as smoothly as possible and only after receiving permission from the pilot.
    6. Return the bonding wand to the stored position on the helicopter.

It is very important to dissipate any potential static charge, and create an equal potential zone between the helicopter and the structure, before an employee transfers to the structure.

Transferring to a Steel Structure

Observe the following guidelines when using a helicopter to transfer employees onto a steel structure:

- Employees transferring from a hovering helicopter to a structure must be trained and qualified, and must demonstrate proficiency in the safe work practices for that operation before performing those duties.

- Employees riding on the skid of the helicopter should wear a full-body harness and body belt with front D-rings for positioning and a dorsal D-ring for fall protection.
  - The employee will attach a “rodsman” lanyard (18 inches or less in length) from the positioning device D-ring attachments to the helicopter in a manner that puts the lineman in a proper work position. The employee must remain attached to the helicopter at all times when riding from the ground to the structure.
  - A shock absorbing lanyard attached to the harness dorsal D-ring will be attached to the FAA-approved load attachment point designed for human external cargo and used afterwards while working on the structure.
- Employees riding on the skid of the helicopter must check the condition of the FAA approved load attachment device to ensure that the device is securely attached, in proper working condition, and capable of supporting the individual.
- When transferring to a steel structure, it is important to dissipate any possible static charge that might exist. The pilot must first make firm contact with the skid of the helicopter to the structure to dissipate any possible static charge. If possible, the pilot will maintain firm contact with the structure during the transfer process. The pilot will determine whether to maintain contact or hover as close to the steel structure as necessary to maintain safe control of the helicopter.
- If continuity cannot be maintained, the employee will attach a bonding wand to the structure before making contact with the structure.
- Place all tools or gear onto the structure prior to transferring. Be careful not to lean out excessively with heavy gear or you will shift the helicopter’s center of gravity.
- Then employees may begin the transfer process.
  1. Remove the hook end on the “rodsman” lanyard (18 inches or less in length) from the attachment point on the helicopter.
  2. Remove the shock absorbing lanyard from the FAA-approved load attachment point and immediately attach the lanyard to the structure.
  3. The employee should have both hands free during the transfer process.
  4. Transfer to the structure.
  5. Employees must transfer to and from the helicopter as smoothly as possible and only after receiving permission from the pilot.
  6. Return the bonding wand to the stored position on the helicopter.

It is very important to dissipate any potential static charge, and create an equal potential zone between the helicopter and the structure, before an employee transfers to the structure.

Transferring to a Conductor

Observe the following guidelines when using a helicopter to transfer employees onto a conductor:

- Employees transferring from a hovering helicopter to a conductor must be trained and qualified, and must demonstrate proficiency in the safe work practices for that operation before performing those duties.
- Employees riding on the skid of the helicopter should wear a full-body harness and body belt with front D-rings for positioning and a dorsal D-ring for fall protection.
  - The employee will attach a “rodsman” lanyard (18” or less in length) from the positioning device D-ring attachments to the helicopter in a manner that puts the lineman in a proper work position. The employee must remain attached to the helicopter at all times when riding from the ground to the structure.
  - A shock absorbing lanyard attached to the harness dorsal D-ring will be attached to the FAA-approved load attachment point designed for human external cargo and used afterwards while working on the conductor.
- Employees riding on the skid of the helicopter must check the condition of the load attachment device to ensure that the device is securely attached, in proper working condition, and capable of supporting the individual.
- To dissipate any possible static charge that might exist, employees transferring from a helicopter to a conductor must contact the conductor with a wand (ground lead) that is also attached to the helicopter before coming in contact with the conductor.
- The employee will then attach a bonding wand to the conductor before making contact with the conductor.
- Then employees may begin the transfer process.
  1. Remove the hook end on the “rodsman” lanyard (18 inches or less in length) from the attachment point on the helicopter.
  2. Remove the shock absorbing lanyard from the FAA-approved load attachment point and immediately attach it to the conductor.
  3. The employee should have both hands free during the transfer process.
  4. Transfer to the conductor.
  5. Employees must transfer to and from the helicopter as smoothly as possible, and only after receiving permission from the pilot.
  6. Return the bonding wand to the stored position on the helicopter.

It is very important to dissipate any potential static charge, and create an equal potential zone between the helicopter and the conductor, before an employee transfers to the conductor.

Riding a Long Line Suspended Underneath a Helicopter

Observe the following guidelines when riding a long line suspended underneath a helicopter:

- Use only Dyneema® (or similar) non-conductive longlines.

- Inspect the ropes daily for any contamination that might allow conductivity.
- Longlines should be stored in a manner that keeps them clean, dry, and protected from extra wear.
- Employees riding on a longline suspended underneath a helicopter to transfer to a structure and/or conductor must be trained and qualified, and must demonstrate proficiency in the safe work practices for that operation before performing those duties.
- Employees transferring to a structure and/or conductor from a suspended position underneath a helicopter should wear a fall arrest system consisting of a full body harness with dual attachment points (front and rear), and a shock absorbing lanyard attached to the rear attachment point. The long line of the helicopter attaches to the front attachment point.
- Other methods of attachment can be considered but must be pre-approved prior to start of operations.

Riding a longline suspended underneath a helicopter (human cargo work) should only be performed when it has been determined to be the safest method of performing the work operation.

Transport of Injured Personnel

Personnel with **life threatening** injuries may be carried onboard the aircraft only if:

- There is no other medical transport available.
- Moving the injured person is not going to cause greater injury.
- There is a greater risk of loss of life or limb by not immediately transporting the person.

Call 911 immediately when medical assistance is needed. It is not recommended to transport injured persons unless medical assistance can not be obtained by other means. Attempt to obtain approval from emergency responders before making a decision to transport injured employees.

Non-life threatening injuries may be carried on board the aircraft only if:

- The injury is not fall related and it is not a back or neck injury.
- The injured person(s) can be transported in the seat of the helicopter with the seat belt fastened.
- There is no chance of furthering the injury by transporting the injured in the helicopter.

Rescue operation may be conducted if it is the safest way to move the injured persons to a point of transfer to an EMS transporter.

Rescue Operations

Observe the following guidelines when conducting rescues using helicopters or in emergencies during operations involving helicopters:

- Before the beginning of each helicopter operation, develop an emergency action plan that lists the procedures to use in the event of an emergency.
- Review and practice rescue and resuscitation techniques at least once a year.
- Identify radio calls for emergency medical assistance in life-threatening situations with the words, “Mayday, Mayday.” Identify calls for other emergency situations with the words, “This is an emergency.” All other radio communication must cease while the emergency is underway.
- Notify the immediate supervisor of emergency situations. The supervisor will then call for emergency assistance in accordance with the approved Company incident reporting policy.
- Consider keeping a backboard or stokes basket available on helicopter projects to transport injured employees in the helicopter.
- Ensure that each employee knows the procedure to summon emergency assistance and how to give emergency services adequate directions to the location in the event of an emergency.

Passenger Loading/Unloading

Pilots are responsible for ensuring the safety of passengers in and around the aircraft. Operating the aircraft properly, common sense and adherence to good operating procedures help to accomplish this goal.

Unauthorized personnel shall remain away from the helicopter at all times when it is on the ground, (running or shutdown). No one shall approach the helicopter without receiving permission from the pilot, authorized crewmember or maintenance technician.

Hazardous Material Transportation

Definition of Hazardous Materials

“Hazardous materials” means a substance or material that is capable of posing an unreasonable risk to health, safety and property when transported in commerce. The following terms are considered synonymous: dangerous goods, materials and cargo, hazardous materials and substances, regulated materials and restricted articles.

Responsibilities

Persons offering Hazardous Materials for transportation are responsible for properly identifying, describing, and classifying the material as required by CFR 49. They are also responsible for properly completing the communications and packaging requirements prior to offering the shipment for transportation.

Hazardous Material Transportation Policy

Each operator who carries hazardous materials including fuel of any type, lithium batteries, aerosols, or explosives will maintain a current FAA-approved "Will-Carry" manual and DOT-PHMSA special permit onboard the helicopter at all times.

Helicopter operators are responsible for making sure pilots are trained in accordance with procedures for hazardous materials handling every 2years.

The Company will train all personnel who accept or handle cargo, including crewmembers who handle, load, or unload hazardous cargo every 3 years.

Standard Operating Procedures

Flights within the Work Area

Flights conducted on a daily basis within the work area do not require a flight plan. Prior to starting work each day, the pilot and helicopter support crew will conduct a pre-flight meeting with the employees who will be involved in performing work off of the helicopter. All affected employees will be involved in pre-planning the work that will be conducted. All employees will be made aware of the plan, and a route of travel will be established for the helicopter. If the work conditions, environment, or scope of work changes, work operations will cease until the pilot and helicopter support crew meet with the employees who are involved in performing work off of the helicopter and a new plan is developed.

Cross Country (Ferry Flights)

All flights will be VFR. Flights are to be conducted in accordance with a flight plan filed with appropriate Company personnel. Flights will be operated in accordance with that flight plan. The Company will be notified of any deviations from the flight plan as soon as possible.

Pilot in Command Responsibilities

- Provide the company with the information required in a VFR flight plan. Also include the names and addresses of any passengers.
- Inform the company upon arrival at the destination, or if required to land at other than the proposed destination, the company will be informed immediately.
- Provide the locations and estimated time for re-establishing contact if operating in an area where communications cannot be maintained.
- Progress/position reports are to be made at least every two hours or at each fuel stop.

Flight Following Personnel Responsibilities

- Flight Following of all flights is recommended and may be required on some jobs. (See Sample 14-1)
- Flight Following personnel must be available until the completion of the flight following responsibilities.
- Flight Following personnel will attempt to contact the flight crew when they are ½ hour (30 minutes) late for a position report or a destination report.

References

- Federal Aviation Administration – FAR Parts 91 and 133
- Department of Transportation – CFR Part 49

Sample 14-1. Flight Following Form

Flight Following Form

Flight Following Number	Actual Departure Time	Arrival Time	Helicopter Identification	
Departure Point		Destination		
Fuel on Board	Minutes	Color of Helicopter	Pilot's Name	Number Aboard
Passenger's Name, Address Phone Number				
Route of Flight: Waypoint 1			Estimated Time Enroute	
Waypoint 2			Estimated Time Enroute	
Waypoint 3			Estimated Time Enroute	
Waypoint 4			Estimated Time Enroute	
Waypoint 5			Estimated Time Enroute	
Waypoint Arrival Time: Waypoint 1	Waypoint 2	Waypoint 3	Waypoint 4	Waypoint 5
Waypoint Departure Time: Waypoint 1	Waypoint 2	Waypoint 3	Waypoint 4	Waypoint 5
Position Report: Time Location Coordinates				
Position Report: Time Location Coordinates				
Position Report: Time Location Coordinates				
Position Report: Time Location Coordinates				
Position Report: Time Location Coordinates				
Position Report: Time Location Coordinates				
Remarks:				

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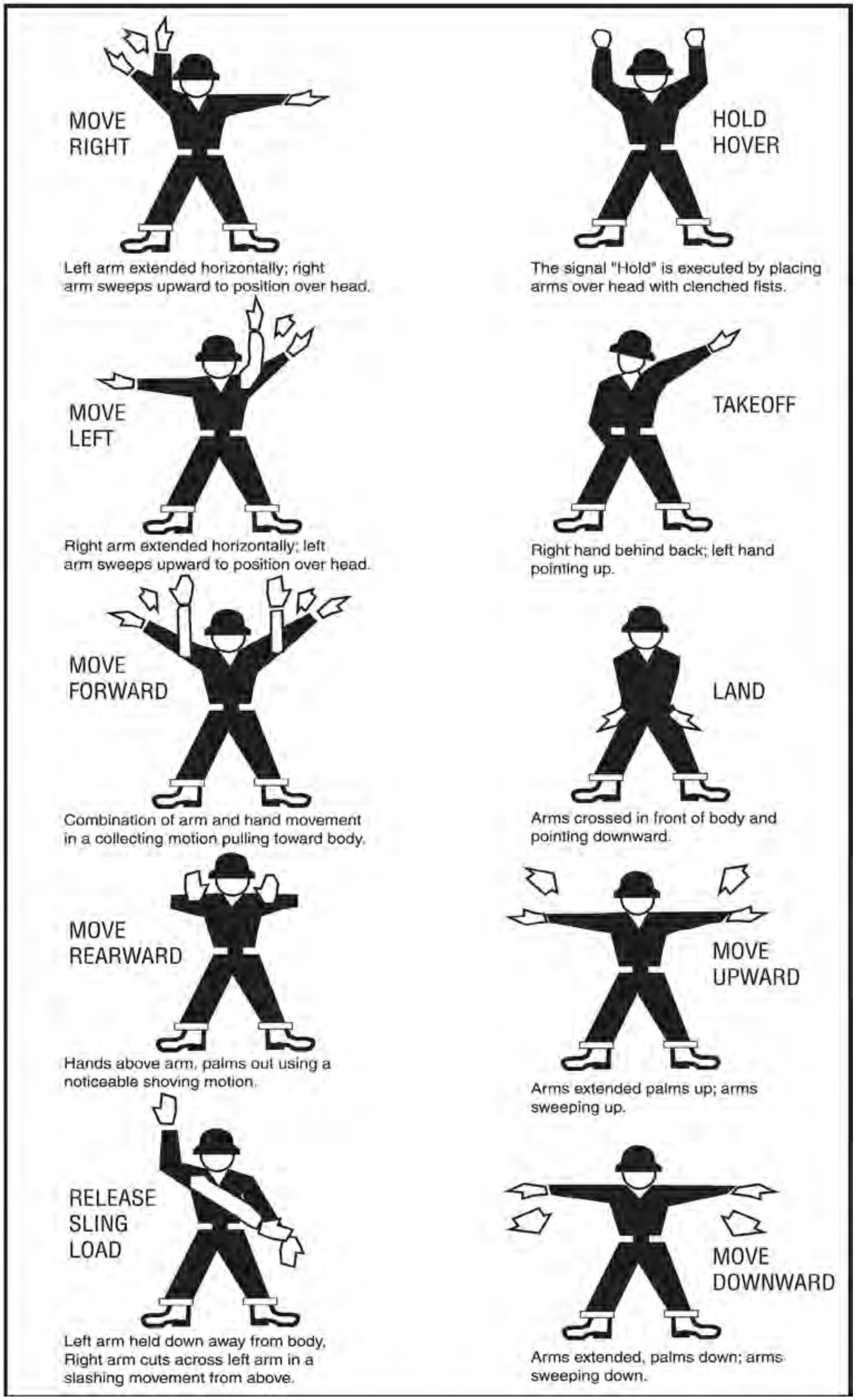
Figure 14-1. Nonverbal Communication Hand Signal Chart



Sample 14-2. Helicopter Operations Test

Helicopter Operations Test

Name (Print) ______________ SSN ______________ Date ______________

Name (Sign) ______________ Project ______________

20 questions total. Each question has only one answer.		T	F
1.	The crew must conduct a daily job task analysis before the start of operations each day and if the scope of the work changes during the day.	T	F
2.	Communication procedures must be established before the beginning of any helicopter operation.	T	F
3.	Unauthorized persons must stay at least 20 feet from a helicopter.	T	F
4.	Employees shall receive instruction on the safest route for approach to and departure from the aircraft.	T	F
5.	Personnel must receive permission from the pilot before approaching or exiting the helicopter.	T	[illegible]
6.	Only MSA approved headgear with a chin strap attachment may be worn by employees working around and on an operating helicopter.	[illegible]	[illegible]
7.	Objects to be loaded on an operating helicopter may be carried at shoulder level [illegible]elow.	[illegible]	[illegible]
8.	At no time may any objects be thrown in the vicinity of an opera[illegible]	[illegible]	[illegible]
9.	Special caution must be taken when approaching an [illegible]ng [illegible]opte[illegible] is [illegible]oned on uneven or sloped terrain.	[illegible]	F
10.	The static charge on a suspen[illegible]d load m[illegible] diss[illegible]y a[illegible]ad to [illegible]h the ground or structure or by u[illegible] shunt [illegible]mp[illegible]e[illegible]ouc[illegible].	[illegible]	[illegible]
11.	Employe[illegible] only to [illegible]dy be[illegible]h[illegible]o[illegible] stra[illegible]ached to the[illegible] when r[illegible] skid o[illegible]craft.	T	F
12.	Each [illegible]ployee must ins[illegible]t c[illegible]g ec[illegible]ne[illegible] p[illegible]ctio[illegible]ipment, and PPE before each[illegible]	T	F
13.	Empl[illegible]ansf[illegible]the[illegible]icop[illegible]as smoothly as possible and only with the permissio[illegible]lot[illegible]	T	F
14.	Emplo[illegible]es do[illegible]ne[illegible] attach a shunt when transferring from the helicopter to a steel tower.	T	F
15.	Befo[illegible]of each helicopter operation, the crew must develop an emergency action plan to det[illegible]emergency phone numbers, location of emergency services, and a procedure for caring for injured employees.	T	F
16.	At least two employees per crew must hold a current first aid and CPR card.	T	F
17.	The words "THIS IS AN EMERGENCY" may be used for any emergency situation including life threatening injuries and situations.	T	F
18.	The pilot does not need to make a radio check with each affected employee before the start of operations.	T	F
19.	All employees working on the ground during helicopter operations must wear safety glasses with side shields.	T	F
20.	Safety of life must outweigh all other considerations.	T	F

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Sample 14-3. Helicopter Operations – Skills Profession Sheet

HELICOPTER OPERATIONS

SKILLS PROFICIENCY SHEET

Name (Print)	SSN	Date	Project #
Name (Sign)	Instructor Name (Print)	Instructor Name (Sign)	

SKILLS—GENERAL KNOWLEDGE	PASSED
Demonstrate understanding of helicopter operator's safety requirements	
Demonstrate knowledge of noncompliance disciplinary action procedures	
Demonstrate knowledge of procedure to report an unsafe act or condition	
Demonstrate safe approach to a helicopter (skid width)	
Demonstrate safe positioning while awaiting pickup by helicopter	
Demonstrate understanding and use of verbal communication	
Demonstrate correct hand signals listed on Figure 1 Nonverbal Communication Hand Signal Chart	
Demonstrate proper Go and No-Go head signals while keeping eye contact with pilot	
Demonstrate knowledge of safe and restricted access zones	
Demonstrate understanding of housekeeping requirements at landing zone	
Demonstrate understanding of requirements for equipment located at the landing zone	
Demonstrate understanding of required PPE	
Demonstrate inspection of PPE	
Demonstrate knowledge of the location of emergency equ[illegible]nt (f[illegible]xtin[illegible]er)	
Demonstrate knowledge of location of fuel shut [illegible] helic[illegible]	
Demonstrate knowledge of location of mai[illegible] shu[illegible]h fo[illegible]con[illegible]	
Demonstrate knowledge of [illegible]on of Em[illegible] Loc[illegible]ice ([illegible]copter	
Demonstrate knowledge o[illegible] as it aff[illegible] ess [illegible] *helicopter*	
Demo[illegible]wledge [illegible]ng and [illegible]	

SK[illegible]S—SITE SPEC[illegible]C	PASSED
De[illegible] tech[illegible]hing [illegible] re[illegible]ng suspended loads	
Dem[illegible]led[illegible]e sh[illegible]s	
Demonstrate [illegible]er [illegible] shunts	
D[illegible]strate [illegible]le[illegible]f terrain as it affects ingress and egress to the *helicopter*	
De[illegible]spection of fall protection/climbing equipment before use	
Dem[illegible]te safe positioning while awaiting pickup by helicopter	
Demonstrate understanding of fall protection attachment point ratings	
Demonstrate proper attachment of fall protection equipment to helicopter	
Demonstrate smooth transfer from helicopter to structure	
Demonstrate smooth transfer from structure to structure	
Demonstrate safe approach to helicopter with material	
Demonstrate method to load, unload, and secure material on and off helicopter	
Demonstrate knowledge of site specific PPE requirements	

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(Helicopter Operations – Skills Profession Sheet, Continued)

SKILLS—GENERAL KNOWLEDGE	PASSED

SKILLS—SITE SPECIFIC	PASSED

Version 2, 03/04

15

Cranes

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

General Requirements

The following requirements are designed to ensure that crane safety training, operation, and maintenance practices are communicated to and understood by the affected employees. These requirements also ensure that procedures are in place to protect the health and safety of all employees.

- Provide a safe working environment
- Govern operator use of cranes
- Ensure proper care and maintenance of cranes

The Company and its operators must comply with all requirements for construction activities and the manufacturer specifications and limitations that apply to the operation of any and all cranes and side booms. Where manufacturer specifications are not available, the limitations assigned to the equipment will be based on the determinations of a qualified engineer competent in this field, and such determinations will be appropriately documented and recorded. Attachments used with cranes and side booms must not exceed the capacity, rating, or scope recommended by the manufacturer.

Rated load capacities, recommended operating speeds, special hazard warnings, or instructions must be clearly posted on equipment. Instructions or warnings must be visible to the operator while at the control station.

A signal person shall be provided if the crane operator's view is obstructed, if site specific or pre-job planning safety concerns require a signal person, or if the operator determines that a signal person is necessary. Hand signals to crane operators must be those prescribed by the applicable American National Standards Institute (ANSI) standard for the type of crane in use. Only trained and qualified signal persons shall signal a crane. An illustration of the signals must be posted on the equipment or at the jobsite. Refer to the Crane Signals poster located at the end of this chapter. (See Figure 15-1.)

At no time shall the equipment's lifting capacity, as set by the manufacturer, be exceeded for any reason.

Training Certification and Evaluation

Training can be provided by Company trainers or through third-party vendors. The Company may utilize a third-party vendor to test the competency of operators and to certify crane operators.

It is impractical to develop a single generic training program that fits all cranes; therefore, training describes the operational hazards of cranes, which include:

- Hazards associated with the particular make and model of the crane.
- Hazards of the workplace.
- General hazards that apply to the operation of all or most cranes.

Training Certification

Crane trainees are tested on the type of equipment they will be operating.

The Company Safety Department keeps certifications for each operator who has successfully completed training and testing. Each certificate includes the name of the operator, the dates of the training, and the signature of the person who administered the training and evaluation.

Performance Evaluation

Once potential operators have successfully taken a skills knowledge exam, they are ready to demonstrate through performance that they can operate the equipment. Crane operators are evaluated to verify competence in operating the equipment safely. When an operator has an accident or near miss or is observed using unsafe operating procedures, the Company may provide retraining.

The potential operator must successfully complete a performance evaluation on each type of crane that they will operate.

Preoperational Review

Before a crane is used at a particular site or in a specific operation, the area and operation are reviewed for possible hazards, which include the following:

- Possible interferences with a safe lift, including:
    - Overhead lines
    - Unstable soil
    - High wind conditions

  - Other work activities in the area
- Characteristics of the load, including:
  - Hazardous or toxic materials
  - Weight
  - Dimensions
  - Center of gravity
- Rigging sketches and information, including:
  - Lift points
  - Methods of attachment
  - Sling angles
  - Load vectors
  - Boom and swing angles
  - Crane orientations
  - Rated capacities
  - Other factors affecting equipment operation
- Operating procedures, including:
  - Step-by-step procedures
  - Applicable rigging precautions
  - Safety measures
  - Emergency procedures
- Additions and modifications to equipment, including:
  - Tags, instruction plates, and decals
  - Possible reduction of the safety factor by additions or modifications to equipment

Crane Inspections

The crane operator or designated competent person will inspect all machinery and equipment before each use and during use to ensure that it is in safe operating condition. The Company must maintain a record of the dates and results of each of these inspections. If unsafe conditions are discovered during an inspection, the equipment cannot be used until repairs or adjustments have been made. The proper inspection schedule for each piece of equipment can be found in the Operations Manual written and provided by the manufacturer. Refer to the Monthly Crane Inspection Report (See Sample 15-2) located at the end of this chapter.

Types of inspections include:

- Frequent inspections—Daily visual walk-around of the equipment.
- Monthly inspections—Documented inspection per requirements of the equipment Operations Manual for the equipment involved.
- Annual inspections—A thorough, annual inspection shall be made by a qualified crane inspector employed by the Company, by a government agency or through a private recognized testing agency.

Frequent Inspections

Frequent inspections are preoperational walk-arounds or pre-startup checks performed as a minimum of each day that the crane is in use. Daily inspections should be performed by the crane operator or designated competent person. When performing a frequent inspection:

- Ensure that there is evidence of a current Annual Inspection in the cab of the crane.
- Ensure that all exposed moving parts, such as belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, or chains are guarded if such parts are exposed to contact with employees or otherwise create a hazard.
- Ensure that all exhaust pipes are guarded or insulated in areas where contact with employees performing normal duties is possible.
- Ensure that high voltage warning signs are displayed properly.
- Visually inspect all components of the crane used for lifting, swinging, or lowering the load for defects.
- Inspect all wire rope for wear, kinking, heat damage, or reduced nominal diameter.
- Ensure that all swivels have proper freedom of rotation.
- Inspect tires for defects and damage.
- Inspect equipment for fluid leaks.
- Inspect batteries for corrosion, water level, and connector tightness.
- Inspect the crane for proper lubrication.
- Inspect sheaves, drums, rigging, hardware, and attachments for defects and damage.
- Ensure that all operating mechanisms are functioning properly.
- Ensure that all guardrails, handholds, and steps are sturdy.
- Inspect platforms and walkways for damage and slippery conditions.
- Inspect turntable connections for defects and damage.
- Inspect anti-2 block device.
- Inspect booms and jibs for:
    - Cracking, bending, or other flaws in straightness or deformation of welds.
    - Corrosion.

- ❑ Cracking or peeling paint—a condition that can indicate metal fatigue preceding failure.
- ❑ Bent lacing on lattice booms.

- Inspect outriggers for:
  - ❑ Distortion and cracking of beams or cylinders.
  - ❑ Cracks in welds.
  - ❑ Extension and retraction of beams and cylinders to ensure smooth operation and holding of the load.
  - ❑ Condition of the floats.
- Inspect the cab for:
  - ❑ Proper maintenance of inspection and maintenance records.
  - ❑ Cleanliness.
  - ❑ Proper labeling on controls.
  - ❑ Proper functioning of gauges, warning lights, signal horn, and back up alarms while the engine is resting.
  - ❑ Proper functioning of the service and parking brake.
  - ❑ Proper functioning of seat and cab door.
- Inspect fire extinguishers to ensure that they:
  - ❑ Are accessible.
  - ❑ Have a rating of 5BC or higher.
  - ❑ Are placed at each operator station or cab.
- Ensure that the operator's field of vision is not interrupted by broken or cracked windows.
- Verify proper operation of cranes by ensuring:
  - ❑ Proper adjustment and functioning of brakes and clutches.
  - ❑ Proper calibration and functioning of boom hoist lockout, anti-two-block devices, and load moment indicators.
  - ❑ Proper readings for all gauges and warning lights while the engine is running.
  - ❑ Proper functioning of all controls.
- Inspect any crane-suspended personnel platform in use with the crane.
- Inspect any boom-attached personnel basket in use with the crane.

Monthly Inspections

- The monthly inspection interval varies depending on crane use and site conditions. Monthly crane inspections are documented. Records of monthly crane inspections should be maintained on the crane for a period of three (3) months. Monthly crane inspections should be performed by the crane operator or designated competent person. Monthly inspections should include the following equipment:
- Brakes
- Crane hooks
- Hoist chains
- Ropes
- Rigging Equipment

Inspection records must include:

- The date of inspection.
- The signature of the inspector.
- The serial number or other identifier of the component inspected.

Periodic inspections include the items listed for daily preoperational walk-arounds (frequent inspections), in addition to the verification or evaluation of the following:

- Structural damage such as distortion and cracks
- Deformed, cracked, or corroded members in the load stress-bearing structure
- Cracks in all welded connections
- Damage or defects of all sheaves
- Main hoist and auxiliary drum damage or defects
- Even distribution of the wire rope on the hoist drum
- Proper wire rope integrity
- Excessive wear of brake and clutch parts
- Worn, cracked, or distorted parts, including pins, bearings, shafts, gears, rolls, locking devices, hook roller brackets, removable outrigger attachments, lugs, and welds
- Defects or damage of the main boom, jib, and boom extensions
- Certification that repaired boom members meet the original design standard of the manufacturer
- Defects or damage of the load hooks and hook block
- Excessive wear of the drive sprockets and chain stretch
- Positive stops on jibs to prevent jib movement of more than 5 degrees
- Deterioration of all hydraulic and pneumatic hoses, fittings, and tubing

- The stamp of the working pressure on flexible hose
- Defects and damage of turntable
- Permanent and legible marking of the identification number on jibs, blocks, equalizer beams, and all other accessories
- Securing and locking of the counterweight
- Providing easy access to the car or cab using guardrails, handholds, and steps
- Proper function of boom stops, boom hoist disconnects, boom angle indicator, and jib stops
- Proper operation of power plants
- Proper functioning of all other operating mechanisms

Wire Rope Inspection

Wire rope safety factors must be in accordance with applicable regulatory requirements. Wire rope must be taken out of service if:

Running Ropes

- Six (6) or more randomly distributed broken wires are found in one lay of a running rope.
- Three (3) or more broken wires are found in one strand in one lay.
- One-third of the original diameter of the individual outside wires has been worn away.
- There is kinking, crushing, bird caging, or any other damage resulting in distortion of the rope structure.
- There has been a reduction from the nominal diameter greater than the following:
  - 1/64 inch for diameters up to and including 5/16 inch
  - 1/32 inch for diameters of 3/8 inch to 1/2 inch
  - 3/64 inch for diameters of 9/16 inch to 3/4 inch
  - 1/16 inch for diameters of 7/8 inch to 1-1/8 inches
  - 3/32 inch for diameters of 1-1/4 inches to 1-1/2 inches

Rotation Resistant Ropes

- In rotation resistant ropes: two (2) randomly distributed broken wires in six (6) rope diameters or four randomly distributed wires in thirty (30) rope diameters.

Standing Ropes

- There are more than two broken wires in one lay in sections beyond end connections or more than one broken wire at an end connection in standing ropes.

Annual Inspections

Annual inspections must be conducted by a qualified crane inspector. Records for annual inspections must be maintained on the equipment for a minimum of twelve (12) months or until after the next annual inspection is performed.

Repairs and Adjustments

Modifications of equipment must be made by a qualified representative of the manufacturer and must not affect the safe operation or capacity of the crane.

Only designated personnel are authorized to perform repairs and adjustments on cranes. All repairs and adjustments must be done promptly to ensure the safe operation of the crane.

Preventative Maintenance

Keeping a crane in good operating condition requires preventive maintenance as well as timely repairs.

Follow the Company preventive maintenance program based on the manufacturer recommendations on preventive maintenance. Some components must be adjusted regularly to maintain their proper operation, for example:

- Limit switches
- Control systems
- Brakes
- Power plants

While following maintenance procedures, observe the following precautions:

- Move the crane to a location where it will cause the least amount of interference with other cranes or operations.
- Place all controls in the off position.
- Lock the main or emergency switch in the off position.
- Place **Out of Order** signs on the crane and on the hook or on the floor beneath the crane.
- Provide rail stops or other suitable means to prevent the interference of other cranes operating on the same runway as the idle crane.
- After repairs or adjustments have been made, reinstall all guards, reactivate all safety devices, and remove all maintenance equipment before operating the crane.

Safety Considerations for Crane Operation

Use the operating manual provided by the manufacturer for proper operating procedures. For stationary, overhead, or gantry cranes, clearly post the operating rules near the crane. When operating cranes, observe the following precautions:

- Inspect all lifting equipment and rigging for defects before each use. Equipment found to be damaged or defective in any way must not be used and must be removed from service.
- When mechanical lifting equipment is equipped with outriggers, always use the outriggers. Use additional mats under outriggers for increased stability when working on unstable ground.

- Know the weight of the load to be lifted.
- Make every effort to prevent overloading of winches, cables, and derricks. Do not exceed the load limit recommended by the manufacturer or bypass load limit warning devices. Be sure to include all items that add to the weight of the load, such as the load blocks and slings:
  - Do not change the recommended counterweights, or the boom may collapse.
  - Do not lift an unsecured or unbalanced load.
  - Do not lift two separately rigged loads at the same time.
  - Do not wrap tag lines around your body.
- Ensure that all hoisting equipment has a load-capacity chart and a functional boom-angle indicator in view of the operator.
- Do not shock load lifting or pulling straps, slings, chains, or wire rope. Increase the tension and load in a gradual, steady, and safe manner.
- Keep employees clear of loads about to be lifted. Avoid carrying loads over people. Prevent employees from standing or passing under a suspended load or standing adjacent to, over, or under a loaded winch line.
- When a winch line is operated, prevent employees from standing inside the angle (bite) made by the line when tension is applied.
- Do not walk away from the crane with a load suspended.
- Move loads slowly and avoid sudden acceleration or deceleration.
- Do not handle cable or wire rope with bare hands.
- In assembling derricks, ensure that all pins are properly locked in place with locking keys. Do not use wire in place of cotter pins.
- Ensure that cranes, boom trucks, digger derricks, and knuckle boom trucks have an approved hand signal chart posted in a visible location on the machine.
- Ensure that a 10bc or larger fire extinguisher is mounted in the cab and within accessible reach of the operator’s position on each machine.
- Use non-conductive tag lines to stabilize the load and guide the load into place. Do not permit employees to ride on suspended loads or use their body weight to balance suspended loads.
- Do not allow anyone to ride the hook or load during hoisting, lowering, or traveling.
- Do not carry items in hands while climbing a ladder.
- Store necessary clothing and personal belongings in such a manner that they do not interfere with the access or operation of the crane.
- Store tools, fuses, and oilcans in the toolbox. These items must not lie loose in the cab.
- When operating a crane in an enclosed space or an area with limited air flow and the engine exhaust cannot be exhausted to an outside area, the cab of the crane should be tested on a frequent basis to see that the operator is not exposed to an unsafe level of toxic gases nor has an oxygen deficient atmosphere. Testing shall be documented.

- Ensure that the swing radius is clearly identified and that precautions have been taken to prevent personnel from entering that area during crane operations. Mark the boundaries of the crane swing radius with warning lines, railings, or other similar boundaries.

Crane Operation Near Power Lines

Crane Operations for Electrical Transmission and Distribution Work

When cranes are used for electrical transmission and distribution construction, the crane may be operated according to the Limits of Crane Approach to Live Conductors or what is referred to as the minimum approach distances (MAD), if the crane is operated by a qualified electrical worker. Please refer to training requirements for qualified employee in this section.

Minimum Approach Distances

The minimum approach distances for voltages less than 72.5 kilovolts can be found in Table 15-1.

No employee may approach or take any conductive object closer to exposed energized parts than the established minimum approach distance unless:

- The employee is insulated from the energized part (insulating gloves and sleeves);
- The energized part is insulated from the employee and any other conductive object at a different potential;
- The employee is insulated from any other conductive object, as during live-line bare-hand work.

Refer to Table 15-1 for minimum approach distances.

Table 15-1. AC Minimum Approach Distances

Voltage Phase-to-Phase	Distance Phase-to-Ground Exposure		Distance Phase-to-Phase Exposure	
0.751 to 5.0 kV	0.63m	2.07ft	0.63m	2.07ft
5.1 to 15.0 kV	0.65m	2.14ft	0.68m	2.24ft
15.1 to 36.0 kV	0.77m	2.53ft	0.89m	2.92ft
36.1 to 46.0 kV	0.84m	2.76ft	0.98m	3.22ft
46.1 to 72.5 kV	1.00m	3.29ft	1.20m	3.94ft
These minimum approach distances can be used provided the jobsite is at an elevation of 900 meters (3000 feet) or less. If working above 900 meters (3000 feet) above mean sea level, the distances must be calculated using the altitude correction factor.				

For voltages over 72.5 kilovolts, the minimum approach distance can be calculated by determining the maximum anticipated per-unit transient overvoltage, phase to ground, through an engineering analysis or assume a maximum anticipated per-unit transient overvoltage, phase to ground or use the minimum approach distance found in Table 15-2.

Table 15-2. AC Minimum Approach Distances

Voltage Phase-to-Phase	Distance Phase-to-Ground Exposure		Distance Phase-to-Phase Exposure	
72.6 to 121.0 kV	1.13m	3.71ft	1.42m	4.66ft
121.1 to 145.0 kV	1.30m	4.27ft	1.64m	5.38ft
145.1 to 169.0 kV	1.46m	4.79ft	1.94m	6.36ft
169.1 to 242.0 kV	2.01m	6.59ft	3.08m	10.10ft
242.1 to 362.0 kV	3.41m	11.19ft	5.52m	18.11ft
362.1 to 420.0 kV	4.25m	13.94ft	6.81m	22.34ft
420.1 to 550.0 kV	5.07m	16.63ft	8.24m	27.03ft
550.1 to 800.0 kV	6.68m	22.57ft	11.38m	37.34ft
1. These minimum approach distances can be used provided the jobsite is at an elevation of 900 meters (3000 feet) or less. If working above 900 meters (3000 feet) above mean sea level, the distances must be calculated using the altitude correction factor. 2. The phase to phase minimum approach distances may be used provided that no insulated tool spans the gap and no large conductive object is in the gap. 3. The clear live-line tool distance shall equal or exceed the values for the indicated voltage ranges.				

When performing electric transmission and distribution work at elevations above 900 meters, the minimum approach distances should be adjusted by the appropriate factor in Table 15-3 for the elevation of the work.

Table 15-3. Altitude Correction Factor

Altitude Above Sea Level (meters)	Factor
0 to 900 m	1.00
901 to 1200 m	1.02
1201 to 1500 m	1.05
1501 to 1800 m	1.08
1801 to 2100 m	1.11
2101 to 2400 m	1.14
2401 to 2700 m	1.17
2701 to 3000 m	1.20
3001 to 3600 m	1.25
3601 to 4200 m	1.30
4201 to 4800 m	1.35
4801 to 5400 m	1.39
5401 to 6000 m	1.44

Instead of using the minimum approach distances contained in Table 15-1 or Table 15-2, a person knowledgable and competent in the field of electric transmission and distribution system design, can perform an engineering analysis and determine the maximum transient overvoltage. When the engineering analysis of the system shows the maximum transient overvoltage is lower and the minimum approach distance can be lowered from the distance shown in Table 15-1 or Table 15-2, the minimum approach distances can be adjusted accordingly. To reduce the distances, we must ensure that any conditions assumed in the analysis, for example, blocking the recloser on a circuit or installing portable protective gaps, are present during energized work. To calculate the minimum approach distances for voltages over 72.5 kV, use Table 15-4.

Table 15-4 AC Live-Line Minimum Approach Distance

For phase to phase system voltages of more than 72.5 kV nominal

MAD= $0.3048(C+a)V_{L-G}TA+M$, where

C= 0.01 for phase to ground exposures that the employer can demonstrate consist only of air across the approach distance (gap),

0.01 for phase to phase exposures if it can be demonstrated that no insulated tool spans the gap and That no large conductive object is in the gap, or

0.11 otherwise

V_{L-G}= phase to phase rms voltage, in kV

T= maximum anticipated per-unit transient overvoltage; for phase to ground exposures, T equals T_{L-G}, the maximum per-unit transient overvoltage, phase to ground, determined by the employer; for phase to phase exposures, T equals $1.35T_{L-G}+0.45$

A= altitude correction factor. See Table 15-1.

M= 0.31 m, the inadvertent movement factor

a= saturation factor, as follows

Phase to Ground Exposures				
$V_{Peak}=T_{L-G}V_{L-G}\sqrt{2}$	635 kV or less	635.1 to 915 kV	915.1 to 1050 kV	More than 1050 kV
a	0	$(V_{Peak}-635)/140{,}000$	$(V_{Peak}-645)/135{,}000$	(VPeak-675)/125,000

Phase to Phase Exposure					
$V_{Peak}=(1.35T_{L-G}+0.45)V_{L-G}\sqrt{2}$	630 kV or less	630.1 to 848 kV	848.1 to 1131 kV	1131.1 to 1485 kV	More than 1485 kV
a	0	$(V_{Peak}-630)/155{,}000$	$(V_{Peak}-633.6)/152{,}207$	$(V_{Peak}-628)/153{,}846$	$(V_{Peak}-350.5)/203{,}666$

Methods of Controlling Possible Transient Overvoltage

There are several means of controlling overvoltages that occur on transmission systems. The operation of circuit breakers or other switching voltages can be modified to reduce switching transient overvoltages. Overvoltages can also be held to an acceptable level by installing surge arrestors or portable protective gaps on the system. The use of switching restrictions can also minimize overvoltages.

Operation of Circuit Breakers

The maximum transient overvoltage that can reach the worksite is often the result of switching on the line on which employees are working. Disabling automatic reclosing during energized line work, so that the line will not be reenergized after being opened for any reason, limits the maximum switching surge overvoltage to the larger of the opening surge or the greatest fault-generated surge, provided that the devices (for example, insertion resistors) are operable and will function to limit the transient overvoltage and that circuit breaker restrikes do not occur. The insertion resistors must properly function to limit the overvoltage level. If the automatic recloser cannot be disabled, other methods of controlling the switching surge may be necessary.

When working on double circuit construction, surges on an adjacent line can cause significant overvoltages. The engineering analysis must account for coupling to adjacent lines.

Surge Arrestors

The use of modern surge arrestors allows a reduction in the basic impulse-insulation levels of much transmission system equipment.

Switching Restrictions

Another form of overvoltage control involves establishing switching restrictions, whereby the employer prohibits the operation of circuit breakers until certain system conditions are present. Switching is restricted by using a tagging system, similar to that used for a permit, except that the common term used for this activity is a "hold-off" or "restriction". These terms indicate that the restriction does not prevent operation, but only modifies the operation during the live-line work activity.

Qualified Employee Training Requirements

Employees shall be trained in and familiar with the safety-related work practices, safety procedures, and other safety requirements in this section that pertain to their respective job assignments. Employees shall also be trained in and familiar with any other safety practices, including applicable emergency procedures that are not specifically addressed in this section but are related to their work and necessary for their safety and the safety of their fellow employees.

Employee training is not confined to this section and can be found throughout this safety manual in more specific sections. Qualified employees shall be trained and competent in:

- The skills and techniques necessary to distinguish exposed live parts from other parts of electrical equipment.
- The skills and techniques necessary to determine the nominal voltage of exposed live parts.
- The skills and techniques necessary to determine the minimum approach distances corresponding to the voltages to which they are exposed.
- The proper use of the special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools for working on or near exposed energized parts of electrical equipment.
- Emergency techniques such as pole top, bucket, and manhole rescue.

Training may be classroom or on-the-job and shall establish employee proficiency in the work practices required.

Crane Operations for All Other Types of Work

The Company complies with all applicable crane regulations. Except where electrical distribution and transmission lines have been de-energized and visibly grounded at the point of work or where insulating barriers that not part of or attached to the equipment or machinery have been erected to prevent physical contact with the lines, equipment or machine operation near power lines must meet the following specifications:

Inform workers of the hazards created by overhead lines and appropriate power line clearance.

All overhead lines are to be considered energized unless the electrical utility owning the line indicates that the line is not energized and that the line is visibly grounded and has been appropriately marked.

To ensure safe operation of cranes around overhead power lines:

- Ground the crane.
- Request that the utility company de-energize all electrical lines, and ground them. If the utility will not de-energize the line, request that the utility cover the energized line.
- Erect insulating barriers to prevent physical contact with the lines.
- Before work begins near transmitter towers where an electrical charge can be induced in the equipment or materials being handled, de-energize the transmitter or conduct tests to determine whether the electrical charge is induced on the crane. Take the following precautions to dissipate induced voltages, when necessary:
    - Provide equipment with an electrical ground attached directly to the upper rotating structure supporting the boom.
    - Attach ground jumper cables to materials being handled by boom equipment when electrical charge is induced while working near energized transmitters. Provide crews with nonconductive poles with large alligator clips or similar protection to attach the ground cable to the load.
- If the equipment could become energized, insulate the energized line or ground or barricade the mechanical lifting equipment. Assume that the equipment is energized at the exposed voltage.
- When operating a crane in an elevated position near overhead lines, maintain the following clearances between any part of the equipment and the power lines:

Table 15-5

Voltage Range Phase-to-Phase	**Minimum Working Distances**
Up to 50kV	10 feet (3.05 m)
Over 50 kV to 200 kV	15 feet (4.57 m)
Over 200 kV to 350 kV	20 feet (6.10 m)
Over 350 kV to 500 kV	25 feet (7.62 m)
Over 500 kV to 750 kV	35 feet (10.67 m)
Over 750 kV to 1000 kV	45 feet (13.72 m)
Source - Table A (1926.1408)	

- In transit with no load and boom lowered, maintain the following clearances between any part of the equipment and the power lines:

Table 15-6

Voltage Range Phase-to-Phase	**Minimum Working Distances**
Less than 50 kV	6 feet (1.22 m)
50 kV to 345 kV	10 feet (3.05 m)
345 kV to 750 kV	16 feet (4.88 m)
750 kV to 1000 kV	20 feet (6.10 m)
Source - Table T (1926.1411)	

- Designate a person to be a dedicated spotter to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to visually maintain the desired clearance.
    - ❑ The operator and signal person must be familiar with all hand signals for the crane being operated.
    - ❑ A chart of the appropriate hand signals must be available at the crane site.
- Cage-type boom guards, insulating links, or proximity warning devices used on cranes must not alter the requirements of any other regulation in this section, even if the use of such a device is required by law or regulation.
- Use nonconductive taglines to stabilize the load.
- Use insulating boots and gloves.

Do not make any modifications or additions that affect the capacity or safe operation of the equipment without the written approval of the manufacturer. If such modifications or changes are made, change the capacity, operation, and maintenance instruction plates, tags, or decals accordingly. The original safety factor of the equipment must not be reduced.

Rigging

All rigging shall be performed by a qualified rigger.

A qualified rigger is a person who meets the criteria for a qualified person. A qualified person means a person who: by possession of a recognized degree, certificate or professional standing, or by extensive knowledge, training and experience, successfully demonstrated the ability to solve/resolve problems related to the subject matter, the work or the project..

The person designated as the qualified rigger must have the ability to properly rig the load for a particular job.

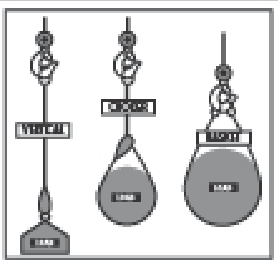
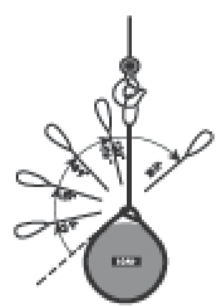
Rigging Equipment

Crane lifts require the use of slings. Slings are generally made of nylon or wire rope. Nylon slings are easy to wrap around a load, but the nylon can easily be cut or damaged if not used properly. When nylon slings become damaged or worn, a red thread will show through. The red thread appears at the surface where the nylon sling is damaged. Inspect all slings before each use. Remove damaged slings from service.

Wire rope slings can become damaged, kinked, or stretched when not used properly. Inspect all slings before each use. Remove damaged slings from service.

Rigging slings can be utilized in three basic configurations: vertical, choker, and basket. The weight rating for each sling has an established rating according to which configuration is used. When choosing slings, the configuration used must be known to adequately select the right sling for the lift.

Table 15-7: How Slings are Rigged

<table>
<tr><td colspan="3">Vertical
Single leg to load in straight lift. The full rated lifting capacity can be used, but not exceeded. Load should not be allowed to rotate since this can damage the sling.</td><td></td><td>Basket
A basket hitch equally distributes the load between the two legs of a sling. Consideration must be given to the angles created in basket hitches since they reduce the rated capacity.
(See "How Angles Affect Sling Stress" below)</td></tr>
<tr><td rowspan="6">Choker
Using the sling as a choker reduces its rated capacity. Ratings in the following sling charts have lower capacity for choker hitches than vertical loadings to reflect this. When using a choker sling at an angle of less than 120 degrees (see drawing), the choker rated capacity must be reduced.</td><td>Angle of Choke</td><td></td><td>Rated Capacity Factor</td><td rowspan="6">Choker Hitch rated Capacity Adjustment
</td></tr>
<tr><td>120 – 180°</td><td>=</td><td>100%</td></tr>
<tr><td>90 – 119°</td><td>=</td><td>87%</td></tr>
<tr><td>60 – 89°</td><td>=</td><td>74%</td></tr>
<tr><td>30 – 59°</td><td>=</td><td>62%</td></tr>
<tr><td>0 – 29°</td><td>=</td><td>49%</td></tr>
</table>

When using rigging equipment, observe the following safety precautions:

- Use a shackle or a ring to hold two or more eyes of a choker in a hook.
- All hooks should have a safety latch except when shake-out hooks are properly used.

- Do not rig from a structural member until a supervisor has ascertained that the member will support the load being raised.
- Use only rigging equipment designed for the intended use. Always use at least a safety factor of five when selecting rigging equipment, except where a larger factor is required.
- Visually inspect hooks, shackles, chain hoists, and beam clamps before use.
- Never use chain hoist with loads beyond their rated capacities.
- Do not leave unsecured and unattended loads suspended for long periods. Use top lines to control the loads.
- Allow no part of the body below a suspended load.
- Do not wrap the load chain around the load.
- Use softeners where possible to obtain a “bite” on the material being rigged.
- Do not use fiber rope (manila and synthetics) in or near operations involving the use of corrosive substances. Visually inspect rope for excessive broken fibers, wear, and deteriorated strands before each use.
- Do not use wire rope on hoisting equipment after the rope has been exposed to fire or extreme heat, burned from contact with electricity, or when visual inspection shows damaged strands, corrosion, or more than 10% broken wires.

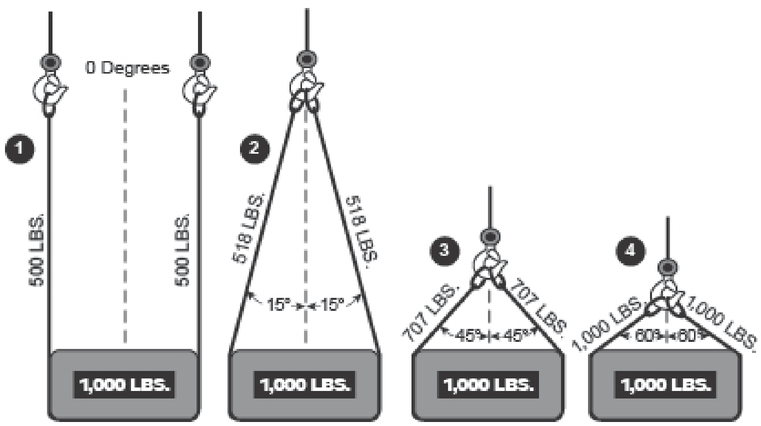
The angle at which a sling holds a given load influences the effective weight of the load. (Refer to Table 15-8).

Table 15-8: How Angles Affect Sling Stress

As the angle between the legs of the sling increases, the load each leg has to lift increases. This applies to a single sling used in a basket hitch as well as a multileg sling or bridle. See illustration below.

1. Divide the total load to be lifted by the number of legs to be used. This provides the load per leg if the lift were being made with all the legs lifting vertically.
2. Determine the angle between the legs of the sling and the vertical.
3. **Multiply** the load per leg by the Load Factor for the leg angle being used (from the table at right) to compute the **actual load** on each leg for this lift and angle.
4. **Example:** In drawing three (sling angle of 45 degrees): 1000 ÷ 2 = 500 (Load Per Leg if a vertical lift) 500 x 1.414 = 707lbs. = **actual load** on each leg at the 45 degree horizontal angle being used.

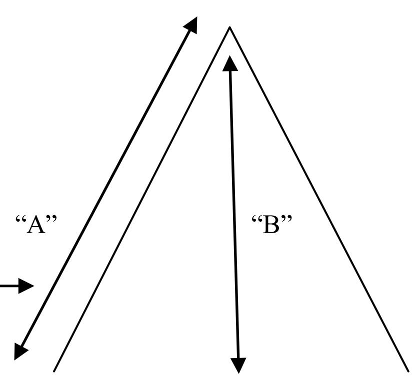
Leg Angle (Degrees)	Load Factor
0	1.000
5	1.003
10	1.015
15	1.035
20	1.064
25	1.103
30	1.154
35	1.220
40	1.305
45	1.414
50	1.555
55	1.743
60	2.000



Sling Angle

The angle of the sling to the horizon effects the tension on the sling. This is called the Load Angle Factor.

This length "A" is divided by the distance of "B"



When using multiple slings to lift a given load, to determine the tension on a sling, divide the length of the sling by the distance from the top of the load to where the sling attaches to the lifting hook, ring or shackle. Once you have that number, multiply it by half the load weight. The sum is the tension on each sling leg.

Example: If "A" is 15 feet and "B" is 8 feet the 15/8 = 1.875

1.875 X 500 pounds = 938 pounds of tension on each sling leg

THE ACTUAL LOAD MUST NOT EXCEED THE RATED SLING CAPACITY.

Storage of Rigging Equipment

- When not in use, rigging equipment shall be removed from the work area and properly stored. The proper method for storing rigging equipment is in a rack where slings can be hung in a clean and dry environment.
- Synthetic slings must be stored away from direct sunlight.

Material Hoisting Equipment

When using material hoists, observe the following safety precautions:

- Permit only an authorized operator to operate material hoists.
- Do not use material hoists to lift personnel.
- Be aware of the weight of the material and capacity of the elevator or hoist before using a hoist. Position material so that it cannot shift or extend beyond cage limits.
- Ensure that the signal system is posted at each landing. Only one signal person is allowed to signal a load at a time.
- Ensure that all signal devices are protected against unauthorized use, unintentional use, breakage, or interference.
- Prevent exposure of hands and other body parts at all landings and openings.
- Ensure that the hoist complies with local codes.
- Ensure that the operator of a hoisting engine has overhead protection of 2-inch (5.08-cm), unfinished planking, or its equivalent, supported to develop its full strength.
- Ensure that all gears, belts, sprockets, drums, sheaves, and contact points between moving parts of power-driven machines are enclosed in substantial guards or suitable guardrails when not guarded by location.
- Stop engines before refueling.
- Ensure that hoist brakes are capable of stopping and holding 150% of the rated hoisting capacity. Ensure that a ratchet and pawl are provided on the drum to hold the load.

Critical Lifts

Critical lifts must be thoroughly planned before the lift. Details of the lift will be written (load weight, crane capacity, swing radius, height of lift, size of rigging, and other factors). The crane operator, jobsite supervisor, rigging crew, and Safety Department must all agree on the plan before the lift is made. Lifts that meet any of the following criteria are considered critical lifts:

- Lifts that are defined as critical lifts under client contractual requirements
- Lifts over 50 tons
- Loads that exceed 75% of the crane capacity

- Tandem lifts (Lifts requiring more than one crane)
- Lifts of non-rigid objects (such as tank shell)
- Lifts over active work area (public transportation systems, office buildings, homes, etc)
- Lifts over energized power lines
- Lifts over “live” operating equipment, including live pipe racks, in a process facility
- Lifts that require multiple cranes
- Lifts of specialized equipment that cannot be readily replaced

Prior to performing a critical lift, complete the Critical Lift Checklist (See Sample 15-3), which describes the work to be performed, documents the lift and verifies compliance with the procedure.

If there is any doubt whatsoever concerning either the techniques being used, condition of the lifting equipment, weight of the lift or the equipments ability to make the lift, the operation should be stopped immediately until more information can be obtained.

Use of Crane for Lifting Employees

Boom-Attached Personnel (Pin-On) Basket

The use of boom-attached personnel (pin-on) baskets is a work practice used commonly in the electrical transmission and distribution industry. The use of equipment to hoist employees is prohibited except where the employer demonstrates that the erection, use, and dismantling of conventional means of reaching the work area, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform, or scaffold, would be more hazardous, or is not possible because of the project's structural design or worksite conditions.

Pre-Lift Meeting

All employees must meet to review procedures and safety instructions involved in the personnel lift operation. This meeting must include the supervisor, the crane operator, the signal person, the workers to be hoisted, and any other employees necessary for the task. This meeting is held before the trial lift is attempted.

The pre-lift meeting shall be documented on the Boom Attached Personnel Platform Lift Planning and Authorization (See Sample 15-4).

The checklist describes the work to be performed, gives reasons that justify use of the crane-suspended platform, and verifies compliance with the procedures described in the following sections. The checklist serves as management approval for use of the boom-attached personnel basket.

The completed form should be maintained on the jobsite for a minimum of three (3) months.

General Safety Requirements

- Lift controls and basket shall be tested and inspected each day prior to use to determine the system is in safe working condition.

- Only trained and authorized persons shall operate the crane and personnel platform.
- Each worker in the platform wears a full-body harness and shock-absorbing lanyard attached to the designated anchor point.
- Never connect your harness to an adjacent pole or structure while working in a personnel basket.
- The personnel basket must not be loaded in excess of its rated capacity. The weight of the platform and its rated capacity must be conspicuously posted on the platform with a plate or other permanent marking.
- Stand firmly on the floor of the basket. Do not climb on the mid rail or top rail of the basket or use planks or ladders for extended reach.
- Boom and basket load limits shall not be exceeded.
- The crane and/or truck on which it is mounted shall not be moved when the boom is elevated.
- Climbers should not be worn while working from a personnel basket.
- Before moving the crane for road travel, the boom, platform and outriggers should be properly stored.
- Do not use load line to lift or handle loads while personnel are in the basket.
- Employees being hoisted must remain in direct communication with the signal person (when used) or the operator.
- Consult the Manufacturer's Specifications in the Operations Manual and follow the recommended guidelines for operation during high winds. When wind speed (sustained or gusts) exceeds 20 mph at the personnel basket, the operation must be terminated unless a qualified person determines that, regardless of the wind conditions, it is safe to continue operations.
- Personnel baskets are to be used only for personnel, their tools and sufficient material to do the work. Do not use personnel basket to transport bulk materials.

Testing and Inspections

All equipment used in lifting of personnel should be tested and inspected to protect against failure during lifting operations.

Daily Inspection

The basket, attachment points and controls shall be inspected at least once a day before each use. They should be inspected for damage and excessive wear.

Proof Testing

At each new jobsite, prior to lifting personnel in the basket, the basket and rigging shall be proof tested to 125% of the basket's rating.

The boom must be lowered and held in a suspended position for a minimum of five (5) minutes with the test load evenly distributed on the basket.

After making any repair or modification, the basket and rigging must be proof tested again to 125% of the rated capacity before any personnel are hoisted.

The proof test may be done concurrently with the trial lift.

The Personnel Platform Proof Test sticker (See Sample 15-5) should be completed and the sticker affixed to the personnel platform. Document and maintain a record of the test on the job site for a minimum of three (3) months.

Trial Lift

Perform a trial lift each day the basket is used to lift personnel on the job site. This lift is used to ascertain that equipment set-up and configuration is correct, load capacities are adequate, equipment is functioning correctly, and to further demonstrate the operator's proficiency. The trial lift should be performed with a weight which reflects the intended total weight of occupant(s), tools and material to be lifted.

Documentation of the trial lift requires completion of the Boom Attached Personnel Platform Lift Planning and Authorization (See Sample 15-4), which describes the work to be performed and verifies compliance with the requirements described in this section.

The trial lift must be repeated prior to lifting personnel on each shift the basket is used and after change or setup location, hoist equipment configuration or operator.

Document and maintain a record of the trial lift on the job site for a minimum of three (3) months.

Crane-Suspended Personnel Platform

The use of a crane or derrick to hoist employees on a personnel platform is prohibited except when the erection, use, and dismantling of conventional means of reaching the work location, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform, or scaffold, would be more hazardous or is not possible because of structural design or work site conditions. The use of a crane-suspended personnel platform must be approved in writing by Company Management on a case-by-case basis.

Prelift Meeting

All employees must meet to review procedures and safety instructions involved in the personnel lift operation. This meeting must include the supervisor, the crane operator, the signal person, the workers to be hoisted, and any other employees necessary for the task. This meeting is held before the trial lift is attempted.

The pre-lift meeting shall also be documented on the Crane-Suspended Personnel Pre-Lift Meeting Checklist Crane-Suspended Personnel Platform Pre-Lift Meeting Checklist (See Sample 15-6).

The checklist describes the work to be performed, gives reasons that justify use of the crane-suspended platform, and verifies compliance with the procedures described in the following sections. The checklist serves as management approval for use of the crane-suspended personnel platform.

The checklist must be completed for every separate task and before hoisting personnel. The completed form should be maintained on the jobsite for a minimum of three (3) months.

Crane Requirements

Cranes used to hoist personnel with a crane-suspended personnel platform must meet the following safety specifications:

- Load lines must be capable of supporting at least five times the maximum intended load (rotation-resistant wire rope must support 10 times the maximum intended load).

- The load line hoist drum must have a system or device on the power train that provides power-controlled load lowering (power up and power down).

Do not use the hoist break to control load lowering. Free fall lowering is prohibited. Do not use cranes with live booms to hoist personnel.

- The crane must be equipped with a positive acting anti-two-block device, which deactivates the hoisting or boom extension action before a two-block situation occurs.
- The crane must be equipped with a boom angle indicator that is readily visible to the operator.
- Cranes with telescoping booms must be equipped with a boom length indicator.
- The total weight of the loaded personnel platform with related rigging must not exceed of the rated capacity for the operating radius and configuration of the crane.
- The crane must be located on firm ground, leveled within one percent of level grade, with outriggers fully deployed in accordance with manufacturer specifications.

Personnel Platforms

Personnel platforms must meet the following safety specifications:

- The personnel platform and suspension system must be designed by a qualified engineer who is competent in structural design.
- The platform must be capable of supporting its own weight and at least five times the maximum intended load.
- The platform must be equipped with standard guardrails (42 inches high), midrails, and toe boards (4 inches high) and must be enclosed (at least from the toe board to midrail) with either solid material or expanded metal having openings no greater than 1/2 inch (1.27 cm). A grab rail must be installed inside the entire perimeter of the platform.
- Access gates, if installed, must not swing outward and must be equipped with a restraining device or latch to prevent accidental opening.
- The platform must have enough headroom for employees to stand upright.
- When employees on the platform may be exposed to falling objects, a canopy for overhead protection must be provided.
- The platform must be identified with a plate, or other permanent marking, that shows the weight and rated load capacity of the platform.
- Personnel platforms must be used only for personnel, their tools, and the materials necessary to do their work and must not be used to hoist only materials or tools.
- Tools and materials accompanying personnel during a lift must be evenly distributed for balance and must be secured to prevent displacement.

Rigging Equipment

Rigging used during a personnel lift must meet the following safety specifications:

- Wire ropes, chains, ropes, and other rigging equipment must be inspected before use and as necessary during use to ensure safe performance. Defective equipment must be removed from service.
- Wire rope, shackles, rings, master links, and other rigging hardware must be capable of supporting at least five times the intended load transmitted to that component. Rotation-resistant wire rope slings that are used must be capable of supporting at least 10 times the maximum intended load.
- Each bridle leg of a wire rope bridle must be connected to a master link or shackle in such a manner that the load is evenly divided between the bridle legs.
- The hook on the load block or other attachment assembly must be a type that can be closed and locked, eliminating the throat opening. An anchor type alloy shackle with a bolt, nut, and retaining pin may be used instead.
- All eyes in wire rope slings must be fabricated with thimbles. Wire rope clips must not be used to form eyes in slings.
- Bridles and associated attachment rigging for the personnel platform must not be used for any other purpose.
- Job or shop hooks and links and makeshift fasteners, formed from bolts, rods, or other such attachments must not be used.
- When U-bolts are used for eye splices, the U-bolt shall be applied so that the “U” section is in contact with the dead end of the rope.
- When U-bolt wire rope clips are used to form eyes, the number and spacing of clips must adhere to the specifications in Table 15-9.

Table 15-9: Number and Spacing of U-Bolt Wire Rope Clips

Improved Plow Steel, Rope Diameter (Inches)	Minimum Number of Clips		Clip Spacing (Inches)
	Drop Forged	Other Material	
½	3	4	3
⅝	3	4	3 ¾
¾	4	5	4 ½
⅞	4	5	5 ¼
1	5	6	6
1-⅛	6	6	6 ¾
1-¼	6	7	7 ½
1-⅜	7	7	8 ¼
1-½	7	8	9

Testing and Inspections

All equipment used in lifting of personnel should be tested and inspected to protect against failure during lifting operations.

Daily Inspection

The platform, suspension system, attachment points and platform controls shall be inspected at least once a day before each use. They should be inspected for damage and excessive wear.

Proof Testing

At each new jobsite, prior to lifting personnel, the platform and rigging shall be proof tested to 125% of the basket's rating.

The platform must be lowered by controlled load lowering, braked, and held in a suspended position for a minimum of five (5) minutes with the test load evenly distributed on the platform.

After making any repair or modification, the platform and rigging must be proof tested again to 125% of the rated capacity before any personnel are hoisted.

The proof test may be done concurrently with the trial lift.

The Personnel Platform Proof Test sticker (See Sample 15-5) should be completed and the sticker affixed to the personnel platform. Document and maintain a record of the test on the job site for a minimum of three (3) months.

Trial Lift

Perform a trial lift each day the platform is used to lift personnel on the job site. This lift is used to ascertain that equipment set-up and configuration is correct, load capacities are adequate, equipment is functioning correctly, and to further demonstrate the operator's proficiency. The trial lift should be performed with a weight which reflects the intended total weight of occupant(s), tools and material to be lifted.

Documentation of the trial lift requires completion of the Crane-Suspended Personnel Platform Trial Lift (See Sample 15-7), which describes the work to be performed and verifies compliance with the requirements described in this section.

The trial lift must be repeated prior to lifting personnel on each shift the basket is used and after change or setup location, hoist equipment configuration or operator.

Document and maintain a record of the trial lift on the job site for a minimum of three (3) months.

Work Practices

During a personnel lift, the following safety precautions for work practices must be observed:

No lifts may be made with any other load line while workers are suspended on a platform.

Employees occupying an open cage platform must use a full-body harness with the lanyard attached to a secure position above the load block. In closed cage platforms, employees must use a full-body harness with the lanyard attached to a structural member within the platform.

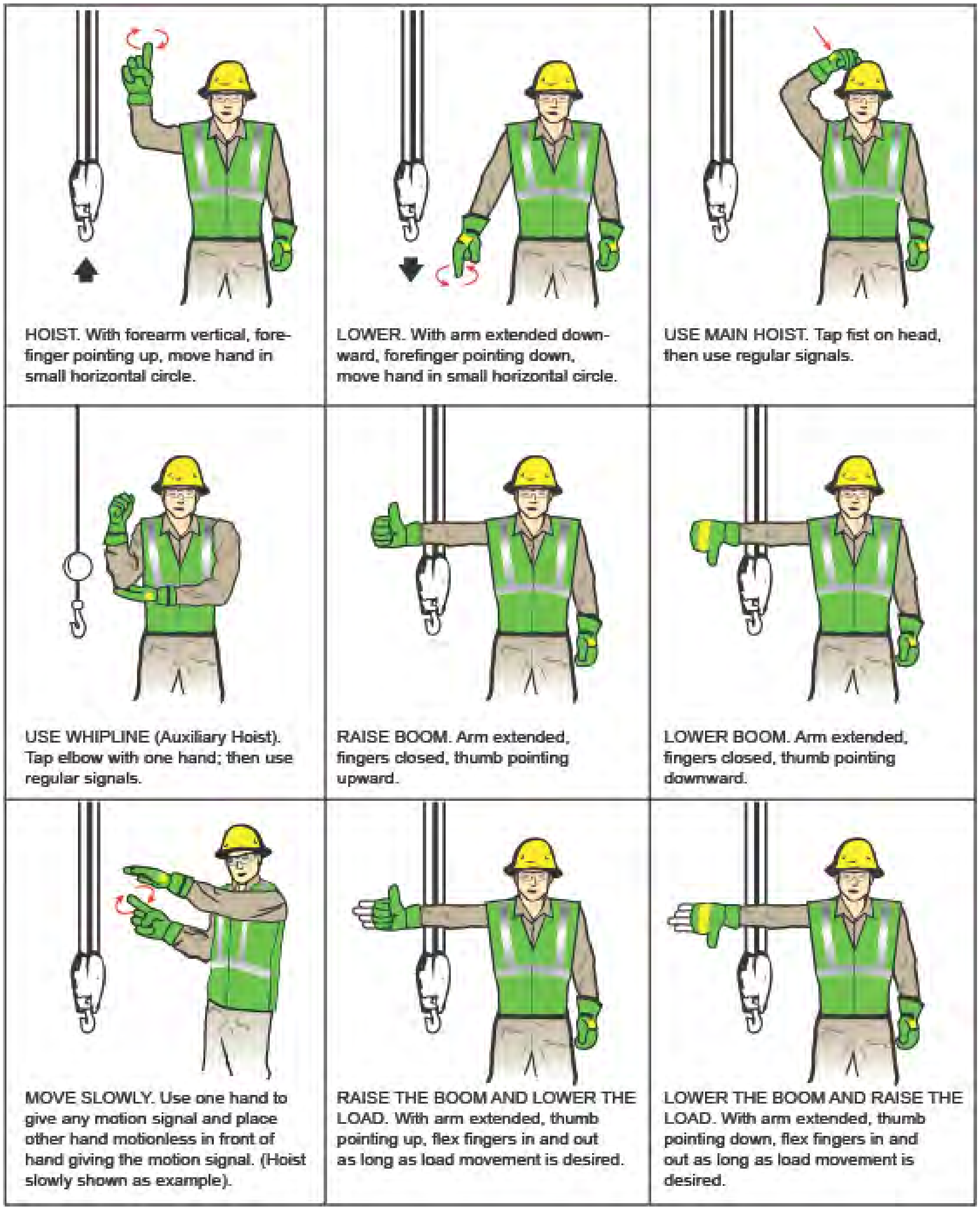
- Employees must keep all parts of their bodies inside the platform while it is being raised, lowered, and positioned, with the exception of the signal person if necessary for direct visual contact with the operator.
- Tag lines must be used to control the platform unless their use creates an unsafe condition.
- Employees being hoisted must remain in continuous sight of and in direct communication with the crane operator or signal person.
- The crane operator must remain at the controls at all times when the platform is occupied.
- Personnel lifts must be discontinued upon indication of any hazardous weather conditions, such as wind or lightning.

- Traveling is not permitted while hoisting or suspending an occupied personnel platform.
- Load and boom hoist drum brakes, swing brakes, and locking devices must be engaged when the occupied personnel platform is in a stationary working position.

References

- ANSI B30.3
- ANSI B30.5
- ANSI B30.23
- OSHA 29 CFR 1926.950 (Subpart V)
- OSHA 29 CFR 1926.1400 – 1442 (Subpart CC)
- Handbook for Riggers – 1989 edition

Figure 15-1. Crane Hand Signals



HOIST. With forearm vertical, forefinger pointing up, move hand in small horizontal circle.

LOWER. With arm extended downward, forefinger pointing down, move hand in small horizontal circle.

USE MAIN HOIST. Tap fist on head, then use regular signals.

USE WHIPLINE (Auxiliary Hoist). Tap elbow with one hand; then use regular signals.

RAISE BOOM. Arm extended, fingers closed, thumb pointing upward.

LOWER BOOM. Arm extended, fingers closed, thumb pointing downward.

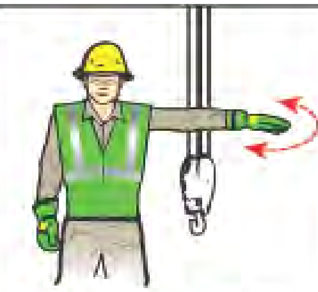
MOVE SLOWLY. Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal. (Hoist slowly shown as example).

RAISE THE BOOM AND LOWER THE LOAD. With arm extended, thumb pointing up, flex fingers in and out as long as load movement is desired.

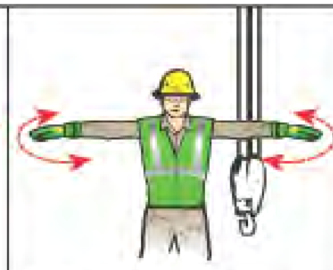
LOWER THE BOOM AND RAISE THE LOAD. With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired.

(Crane Hand Signals, Continued)

SWING. Arm extended, point with finger in direction of swing of boom.



STOP. Arm extended, palm down, move arm back and forth horizontally.



EMERGENCY STOP . Both arms extended, palms down, move arms back and forth horizontally.

TRAVEL. Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel.

DOG EVERYTHING. Clasp hands in front of body.

TRAVEL (Both Tracks). Use both fists in front of body, making a circular motion about each other, indicating direction of travel, forward or backward. (For land cranes only.)

TRAVEL (One track). Lock the track on side indicated by raised fist. Travel opposite track in direction indicated by circular motion of other fist, rotated vertically in front of body. (For land cranes only.)

EXTEND BOOM. (Telescoping Booms). Both fists in front of body with thumbs pointing outward.

RETRACT BOOM. (Telescoping Booms). Both fists in front of body with thumbs pointing toward each other..

EXTEND BOOM. (Telescoping Boom). One Hand Signal. One fist in front of chest with thumb tapping chest.

RETRACT BOOM. (Telescoping Boom). One Hand Signal. One fist in front of chest, thumb pointing outward and heel of fist tapping chest.

Sample 15-2. Monthly Crane Inspection Report

MONTHLY CRANE INSPECTION REPORT

Date: __________ Equipment No.: ______________________________ Serial No.: ________________

Equipment Type: ________________ Make/Model: ____________________ Hours: ____________

Boom Length: ____________________________ Jib Length: ______________________________

Wire Rope: Size: ________________________ Classification: ____________________________

Other Comments: ____

INSPECTION (Check if OK; detail exceptions on line 4.)

1. General:

______ Capacity Chart	______ Fire Extinguisher, Type	______ Telescoping Length Indicator
______ Controls Marked	______ Boom Angle Indicator	______ Load Indicator
______ Operator's Manual	______ Load Moment Device	______ Cab
______ Proximity Signs	______ First Aid Kit	______ Safety Glass
______ Signal Charts	______ Machinery Guards	______ Ladder or Handholds
______ Signal Horn	______ Fuel Filler (location)	______ Levels
______ Backup Alarms	______ Appearance/Housekeeping	______ Exhaust Pipes
______ Tailswing Protection	______ Instrument Check	______

2. Machinery:

______ Controls	______ Brake Locks	______ Swing Mechanism/Circle
______ Brakes and Clutches	______ Safety Brakes	______ Swing Brakes
______ Drum Guards	______ Check Valves	______ Travel Mechanism/Chains
______ Drum Rotation Indicator	______ Pressure Settings	______ Travel Brakes
______ Power Boom Hoist	______ Car Body and Carrier	______ Hydraulic Leaks
______ Boom Hoist Pawl	______ Revolving Frame	______ Air Leaks
______ Boom Hoist Kickout	______ Gantry	______
______ Power Load Lowering	______ Turntable Mounting	______

3. Boom:

______ Boom	______ Hook and Block	______ Reeving
______ Boom Stops	______ Jib Hook	______ Wire Ropes
______ Point Sheaves	______ Pendants	______ Rope Sockets
______ Sheave Guards	______ Outriggers and Controls	______ Cable Clamps
______ Jib	______ Tires and Tracks	______
______ Jib Stops	______ Counterweight	______

4. Is Anti-Two Block Installed and Functioning Properly?

____

5. Date of last annual inspection was conducted: ____________ Inspector: ________________________

6. I certify that the manufacturer's recommended daily and monthly checks and inspections have been performed. ______ Initials

7. Exceptions: ____

Inspection Conducted By: ______________________________ Date: ____________________

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Sample 15-3. Critical Lift Checklist

CRITICAL LIFT CHECKLIST			
Criteria			
	Load exceeds 75% of load chart for crane or derrick		
	Two or more cranes / booms required		
	Special hoisting / rigging equipment will be utilized		
	Other – Specify:		
Description of Object to be Raised			
		Date of lift:	
How the Weight of the Object was Obtained			
Certified scale weight:		Ticket number:	
Calculated by more than one source:			
Source:		Weight:	
Source:		Weight:	
If the lift is an existing item being removed or demolished, the weight is to be recalculated, taking into account all modifications including internal, as well as an allowance for scale, sediment, sludge, insulation, liquid, etc.			
Source:		Weight:	
Source:		Weight:	
Description and Weight of all Rigging Equipment and Crane Attachments from Load Charts			
Item:		Weight:	
Item:		Weight:	
Item:		Weight:	
Item:		Weight:	
Item:		Weight:	
Item:		Weight:	
Total Weight of Object, Rigging, and Load Chart Deductions			
Source:		Weight:	
Equipment and Lift Relationship			
Crane #1	Make		
	Model		
	Maximum operating radius		
	Planned operating radius		
	Allowable load (from Load Chart)		
	Ratio of lift to allowable load		
	Clearance between boom and lift		
	Clearance to surrounding facilities		
	Clear path for load movement checked		
Crane #2	Make		
	Model		
	Maximum operating radius		
	Planned operating radius		
	Allowable load (from Load Chart)		
	Ratio of lift to allowable load		
	Clearance between boom and lift		
	Clearance to surrounding facilities		
	Clear path for load movement checked		

(Critical Lift Checklist, Continued)

Lifting & Rigging Equipment Inspection		
Inspector:	Condition:	
Ground Stability		
Soil bearing capacity:	Source:	
Are mats required:	Size & number:	
Are any underground installations in need of special treatment?	Yes:	No:
Ratio of soil bearing capacity:		
Will a written lift plan and lift drawings be required for this lift?	Yes:	No:
Type of communications to be utilized and specific responsibilities of communicators:		
What are wind and weather restrictions?		
How will lift area be kept clear of unnecessary personnel?		
Any special conditions that lift personnel need to be aware of?		

Critical Lift Approvals	
Crane Inspector	
Rigging Inspector	
Rigging Superintendent	
Lift Supervisor	
Project Engineering	
Signalman	
Crane Operator(s)	
Final Lift Approval	
Project Manager's Signature	Date

Sample 15-4. Boom Attached Personnel Platform Lift Planning and Authorization

Boom-Attached Personnel Platform Lift Planning and Authorization

Project | Location (str #) | Date/Time

Purpose of lift

Crane Information

Manufacturer | Model | Serial Number

Annual Insp. Date | Daily Crane Inspection Complete: Yes / No

Platform Information

All weights in pounds (lbs)

Platform ID | Proof Test Date | Weight of platform

Platform Capacity* | # Occupants | Occupant weight

Tool/Equip weight

Total Lift Weight

**** Consult Operator's Manual for platform capacities when using jib and jib extension (if so equipped).***

Crane Configuration

Platform attached to main boom	Yes / No	Max boom length		
Platform attached to jib	Yes / No	Ops radius (max)	Capacity (chart)***	
Jib extension in use**	Yes / No	Op rad (work location)	Capacity (chart)***	
Separate chart for platform use	Yes / No			

***** Verify correct pin placement for attachment, consult Operator's Manual***

****** Capacity is 50% of the load chart unless the unit has a specific chart for platform operations.***

Platform Pre-Lift Inspection

	Satisfactory	Unsatisfactory
Markings		
Platform decals and placards (all information legible)	☐	☐
Platform load rating visible and posted	☐	☐
Structure		
Load supporting welds/bolts	☐	☐
Load supporting members	☐	☐
Barriers from toe board to mid rail	☐	☐
Hand rail	☐	☐
Fall protection device anchor points	☐	☐
Gate locking mechanisms	☐	☐
Platform flooring	☐	☐

	Satisfactory	Unsatisfactory
Attachment mechanisms		
Pins/Ears/Bolt-ups/Eyes (circle mechanism)	☐	☐
Basket mounting bracket	☐	☐
Special purpose items		
Basket pivot bearings	☐	☐
Hand brake operation	☐	☐
Safety harness and lanyards	☐	☐
Floor cleanliness	☐	☐

Comments

This inspection is required to be performed after each trial lift

(Boom Attached Personnel Platform Lift Planning and Authorization, Continued)

Pre-Lift Meeting

Pre-lift meeting held ☐ Yes ☐ No Date:

Anticipated Hazards (check all that apply) ☐ Wind ☐ Weather ☐ Visibility ☐ Terrain ☐ Power Lines

Comments

Attendees

Print	Signature	Responsibility

Lift completed w/out incident ☐ Yes ☐ No Comments

Perform a trial lift prior to lifting personnel on each shift the basket is used and after any change or setup location, hoist equipment configuration or operator.

I (Operator) have reviewed the lift requirements, performed a trial lift, and inspection of the equipment to be used.

I (Supervisor) have reviewed this Lift Planning and Authorization form and attest to the accuracy of information.

Operator Signature Supervisor Signature

It is Company policy to provide employees with safe hoisting equipment and procedures when personnel are required to work at heights using boom-attached personnel platforms.

Before a personnel lift is made, the jobsite supervisor shall determine that the lift is necessary and can be safely completed.

This Lift Planning and Authorization form shall be completed by the Operator and reviewed and approved by the Supervisor.

Sample 15-5. Personnel Platform Proof Test

Sample 15-6. Crane-Suspended Personnel Platform Trial Lift

CRANE-SUSPENDED PERSONNEL PLATFORM TRIAL LIFT

DATE:	TIME:	PROJECT:
JOB NUMBER:	LOCATION:	
CUSTOMER/CLIENT:		
COMPLETED BY:		SIGNATURE:

Crane Operator Is Responsible For Completing This Form. All Blanks Must Be Filled In.

Crane Configuration

RADIUS: FT.	BOOM LENGTH: FT.	
BOOM ANGLE:	COUNTERWEIGHT: LBS.	

GROSS CAPACITY (GC): **LBS.**

Crane Deductions

JIB STOWED WEIGHT: LBS.	
ATTACHED BASKET WEIGHT: LBS.	**TOTAL CRANE DEDUCTIONS (CD): LBS.**

Load Weight

	NUMBER OF EMPLOYEES: X = LBS.
WEIGHT OF PERSON + 10% LBS.	BASKET RATED CAPACITY: LBS.
TOOLS + RIGGING WT. LBS.	TOTAL LOAD WEIGHT (TLW): **LBS.**

Lift Calculations

GROSS CAPACITY [GC]: LBS.	MINUS CRANE DEDUCTIONS **[CD]**: LBS.
EQUALS NET CAPACITY [NC]: **LBS.**	
TOTAL LOAD WEIGHT (TLW): **LBS.**	DIVIDED BY NET CAPACITY **(NC)**: LBS.

EQUALS PERCENTAGE OF CRANE CAPACITY: ______________________ %

NOTE: PERCENTAGE OF CRANE NET CAPACITY SHALL NOT EXCEED 50 % PER OSHA 1926.1400

Use of crane-suspended personnel platforms - The total weight (with the platform loaded, including the hook, load line and rigging) must not exceed fifty (50) percent of the rated capacity for the radius and configuration of the equipment per the load chart (except during proof testing).

PROOF TEST - A proof test for the crane-suspended personnel platform has been completed. It was performed when the equipment was initially set up.
The date of the proof test was: ________________________________ A proof test of 125% was lifted and held for five (5) minutes
A proof test of 125% has to be done once per jobsite.

NOTE: A trial lift must be done at every set-up location. A trial lift consists of taking at least the anticipated liftweight (occupants, tools and materials) and raising the platform through the anticipated work area before work begins at each lift setup.

WIND SPEED __________ MPH (WIND SPEED NOT TO EXCEED 20 MPH)

Sample 15-7. Crane-Suspended Personnel Platform Pre-Lift Meeting Checklist

CRANE-SUSPENDED PERSONNEL PLATFORM PRE-LIFT MEETING CHECKLIST

Project ____ Location ____ Lift Number ____ Date ____ Customer/Client ____

It is Company policy to provide employees with safe hoisting equipment and procedures when personnel are required to work at heights using crane-suspended personnel platforms. These **personnel platform lifts** will be done only when no other method is available for the work to be performed.

Before a crane-suspended personnel platform lift is made, the jobsite supervisor shall determine that the lift is necessary and can be safely completed.

This checklist must be completed by jobsite supervisor for each personnel lift. After completion of the checklist, all employees involved shall acknowledge compliance with all applicable procedures by signing at the end of the checklist.

PRE-LIFT CHECKLIST

		Yes	No
Review of Standard, Procedure and Equipment Operations Manual			
1.	By supervisor		
2.	By crane operator		
Equipment			
1.	Personnel platform is of a proper design.		
2.	Personnel platform is posted with its intended maximum load capacity.		
3.	Crane is equipped with a positive acting anti-two-block system.		
Rigging			
1.	Rigging is capable of supporting five times the intended load.		
2.	Hooks are a type that can be closed and locked.		
3.	All eyes in wire rope slings have thimbles.		
4.	The load is evenly divided to prevent tilting.		
5.	Personnel basket rigging is not used for any other purpose.		
Safety Equipment			
1.	Hard hats and safety glasses are worn.		
2.	Safety harnesses with shock absorbing lanyards are worn and inspected.		
Crane Operation			
1.	Crane is in proper location and within 1 percent of level grade.		
2.	Crane outriggers are fully deployed and placed on crane mats or firm footing.		
3.	Total weight of loaded personnel platform does not exceed <u>50</u> percent of the rated capacity for the radius and configuration of the crane.		
4.	Load line is capable of supporting a minimum of seven times the intended maximum load.		
5.	No other load lines are being used while personnel are suspended on a platform.		
6.	Cranes having live booms are prohibited.		
Trial Lift, Inspection, and Proof Testing			
1.	Proof lift made with an evenly distributed deadman weight of 125 percent of maximum platform capacity attached to the hoist for a period of 5 minutes was successful.		
2.	Visual reinspection of all equipment and rigging by competent person immediately after proof lift shows equipment is stable.		
3.	Platform is lifted a few inches from the ground just before use to ensure proper balance.		
4.	Perform a trial lift consisting of intended weight of occupant(s), tools and materials.		
5.	Trial lift is repeated before lifting personnel whenever the crane is moved.		
6.	Hoist line is free of kinks and not twisted around multiple lines.		
7.	Primary attachment must be centered over the platform.		

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(Crane-Suspended Personnel Platform Pre-Lift Meeting Checklist)

Work Practices			
1.	Employees know to keep all body parts inside the personnel platform as it is raised, lowered, and positioned.		
2.	Materials and tools for use during a personnel lift are secured to prevent displacement.		
3.	The personnel platform is not being used to lift **only** material or tools.		
4.	Workers know to stand firmly on the floor of the platform and do not sit or climb on the rail or frame of the hoist. No planks, ladders, or other devices are being used for a work position.		
5.	Hoisting will be discontinued immediately upon weather or other impending conditions.		
6.	Crane operator knows to remain at controls at all times when the platform is occupied.		
7.	Operator and signal person inside the platform knows to remain in continuous sight and communication when employees are being hoisted.		
8.	Employees are fastened by a harness system to the load block or other structural member of the platform.		

Comments

Pre-Lift Meeting

All persons involved in the lift have reviewed all aspects and requirements of the lift.

Supervisor ____________________

Safety Department ____________________

Crane Operator ____________________

Signal Person ____________________

Employee ____________________

Employee ____________________

Employee ____________________

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16

Aerial Lift Operations

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

Applications

Aerial lifts include the following types of vehicle-mounted aerial devices used to elevate personnel to jobsites above ground:

- Bucket trucks
- Extensible boom platforms
- Aerial ladders
- Articulating boom platforms
- Vertical towers
- A combination of any such devices

Aerial equipment is deemed to be an aerial lift whether it is capable of rotating about a substantially vertical axis, may be powered or manually operated, and made of metal, wood, fiberglass reinforced plastic (FRP), or other material. Bucket trucks used for electrical work must have current up-to-date dielectric test data.

General Requirements

- Aerial lifts must only be operated in accordance with the manufacturer's specifications as outlined in the Operations Manual. Aerial lifts may not be modified in any way or used for other uses without prior written approval from the manufacturer.

- Operations involving aerial lifts must be performed in adherence with the general guidelines described in the following sections for the safety of the employees involved.
- All hydraulic fluids used to operate the boom and lift assembly of trucks used in electrical operations must be dielectric.
- Inspect hydraulic hoses for twisting or chafing and check the remote controls for proper operations.
- With oil lines under pressure, inspect all hydraulic fittings, pumps and cylinders for evidence of leakage.
- Check the oil level of hydraulic and remote control reservoirs.
- Check the unit for proper operating speed and rate of drift. If speed or drift is improper, the unit shall not be used until repairs are made.
- Check operations of all controls through their maximum working range.
- Check maximum allowable load operation through all positions periodically.
- Check boom and leveling wire rope cables for frayed strands, security of terminals and correct operations.
- Check limiting device on lever type leveling system for proper working range.
- Check booms for cracked welds or distorted members.
- All insulated aerial devices shall have lower controls which have an override capability for use in case of emergency. These controls shall be inspected before each day’s operation to verify that they are functional.
- The bucket and vehicle shall be kept free of accumulated trash. Any oil or grease spots should be cleaned up immediately.
- The truck shall be parked out of traffic whenever possible.
- When the vehicle is provided with outriggers, they shall be used.
- Before operating outriggers, employees shall:
  - First check to see that everyone is at a safe distance from the equipment.
  - Position the outrigger pads on firm ground.
  - Use cribbing and/or mats under the outrigger pads, when necessary, to provide a solid footing.
  - Make sure the equipment is level before operating the boom.

Audible Alarms

All aerial lifts and similar equipment, must be equipped with an audible alarm, distinguishable from the surrounding noise level, that must operated, as needed, when the machine is moving in either direction. The audible alarm must be maintained in an operative condition.

Aerial lifts that have an obstructed view to the rear may not be permitted to be used in reverse gear unless the equipment has an operating reverse signal alarm distinguishable from the surrounding noise level or an employee (acting as a spotter) signals that it is safe to do so.

Clearance from Overhead Power Lines

All aerial lifts, except those used for electrical distribution and transmission work, must maintain a minimum 10-foot clearance distance for power lines rated at 50 kV or lower. For voltages over 50 kV, refer to Table 16-1 for proper clearance distances.

Table 16-1

Voltage Range Phase-to-Phase	**Minimum Working Distances**
Up to 50kV	10 feet
Over 50 kV to 200 kV	15 feet
Over 200 kV to 350 kV	20 feet
Over 350 kV to 500 kV	25 feet
Over 500 kV to 750 kV	35 feet
Over 750 kV to 1,000 kV	45 feet
Source - Table A (1926.1408)	

Extensible and Articulating Boom Platforms

When performing aerial lifts using extensible and articulating boom platforms, observe the following safety requirements:

- Inspect extensible and articulating boom platforms before operating any aerial lift.
- Test lift controls each day before use to ensure that controls are in safe working condition.
- Permit only authorized and qualified persons to operate an aerial lift.
- Do not belt off to an adjacent pole, structure, or equipment while working from an aerial lift.
- Always stand firmly on the floor of the basket, and do not sit or climb on the edge of the basket or use planks, ladders, or other devices for a work position. Do not stand on the mid-rail.
- Do not exceed the boom and basket load limits specified by the manufacturer.
- Ensure that articulating boom and extensible boom platforms, primarily designed as personnel carriers, have both upper (platform) and lower controls. Upper controls must be in or beside the platform within easy reach of the operator. Lower controls must be capable of overriding the upper controls. Control functions must be plainly marked. Do not operate the lower level controls without permission from the employee in the lift, except in case of emergency.
- Do not wear climbers while performing work from an aerial lift basket.
- Do not alter the insulated portion of an aerial lift in any manner that might reduce its insulating value.
- Before moving an aerial lift for travel, inspect the booms to ensure that it is properly cradled and the outriggers are in the stowed position. Do not allow anyone to ride in a basket when the bucket truck is moving on the highway from job to job.

- Avoid parking aerial lifts and bucket trucks in traffic areas whenever possible.
- Exercise good housekeeping in the basket.
- Keep the operating control box clear of materials and tools. Allow only approved storage containers to hang outside of the basket when work is being performed in an energized area.
- Do not attach tools or equipment to the basket in such a manner that it becomes unstable.
- Instruct employees to position themselves below energized equipment while working on it, when practical.
- Perform work on only one energized conductor at a time.
- When performing operations around or on high voltage lines, electrically test each insulated aerial device every 12 months or when any repair is made that can alter the insulating quality of the unit. Ensure that all electrical tests conform to the requirements of ANSI A92.2.
- Each aerial lift truck shall be equipped with a first aid kit. This kit shall contain supplies for the treatment of electrical burns, and/or a water gel burn blanket, or both.
- The bursting safety factor of all non-critical components must be at least 2:1. Critical hydraulic and pneumatic components are governed by the provisions of ANSI A92.2. Critical components are those in which a failure would result in a free fall or free rotation of the boom.
- Visually inspect the bucket truck at the first job of the day during which a basket is used. With the basket empty, operate and inspect the lower controls before anyone goes aloft.
- Do not operate the lower controls to the bucket truck or basket while someone is in the basket, except in an emergency or when following the direct orders from the employee in the basket.
- Do not attempt to use the lower controls unless you can cycle the lower controls safely.
- Do not approach the bucket truck until it is determined that there is no voltage at the truck.
- On a two-basket bucket truck, do not change basket position without the knowledge of both employees, except in case of an emergency.
- Do not move an aerial lift truck when the boom is elevated in a working position with workers in the basket, except for equipment that is specifically designed for this type of operation.
- Set the brakes and use wheel chocks before setting up the bucket truck.
- Before operating outriggers and/or stabilizers, employees should:
  - First check to see that everyone is at a safe distance from the equipment.
  - Notify employees outriggers are being deployed.
  - Place outrigger pads under each outrigger and/or stabilizer.
  - Position the outrigger pads on firm ground. Use cribbing and/or mats under the outrigger pads, when necessary, to provide a solid footing.
  - Make sure the equipment is level before operating the boom.
- When working in a basket, wear an approved full body harness with a shock-absorbing lanyard properly attached to the anchor point provided by the manufacturer on the equipment.
- Do not climb into or out of the basket while the basket is elevated, except in an emergency.

Insulated Boom Aerial Lifts

- Employees shall visually check the bucket truck at the first job of the day where a basket is used. With the basket empty, the lower controls shall be operated and checked before anyone goes aloft. The basket should be operated through its full range of motion.
- No one on the ground shall operate the lower controls to the bucket truck or basket while someone is in the basket except in an emergency or when following the direct orders from the employee in the basket.
- Employees shall make sure that the brakes are set and the wheels are chocked before setting up the bucket truck.
- Employees riding in a basket shall wear an approved body harness with a shock-absorbing lanyard properly attached to the boom or factory approved attachment point.
- Employees shall not climb into or out of the basket while the basket is elevated, except in an emergency. Employees shall not belt off to a structure while working in the basket.
- The operating control box shall be kept clear of materials and tools. No objects, except approved storage containers, shall be allowed to hang on the outside of the basket when employees are working in an energized area.
- The boom shall be cradled and secured when the bucket truck is being moved. Employees shall not ride in a basket when the bucket truck is moving.
- The manufacturer's designated load limit shall not be exceeded in the loading of a basket.
- Employees shall position themselves below energized equipment when working on it, when practical. Work shall be performed only on one conductor at a time.
- Climbing hooks shall not be worn by employees who are working in a basket.
- On a bucket truck, with a two-man basket, no change in basket position shall be made without the knowledge of both employees except in case of an emergency.
- No tools or equipment shall be rigged to the basket in such a manner as to cause the basket to become unstable.
- Good housekeeping shall be exercised in the basket.
- Each aerial lift truck shall be equipped with a first aid kit. This kit shall contain supplies for the treatment of electrical burns and/or a water gel burn blanket.
- When performing work around or on high voltage lines, electrically test each insulated aerial device every 12 months or when any repair is made that can alter the insulating quality of the unit. Ensure that all electrical tests conform to the requirements of ANSI A92.2.
- Insulated booms should be inspected before use and cleaned as needed.

Ladder Trucks and Tower Trucks

Secure aerial ladders in the lower traveling position using the locking device on top of the truck cab and the manually operated device at the base of the ladder before moving the truck for highway travel.

Safeguarding Personnel on the Ground

- When the bucket is being used in any manner in which the boom, bucket, or any conductive object might come in contact with energized conductors or any energized apparatus, the vehicle shall be considered energized at line potential and the following safeguards shall be observed:
    - The vehicle shall not be touched.
    - No tools or equipment shall be passed from/to any employee on the vehicle to or from any employee on the ground.
    - Before entering or leaving the vehicle, the driver shall ensure that neither the boom nor the bucket is in contact with any energized conductor or close enough to energized apparatus to create a hazard.
    - Employees on the ground shall not stand directly below the work area of the bucket.
    - When working in areas where children or other pedestrians are present, additional precautions such as barricading around the truck may be necessary.
- Under normal operating conditions, employees shall not contact or make attempt to get on/off any piece of equipment that has the potential to become energized.
- Workers on the ground can be exposed to step and touch potentials if the utility vehicle contacts energized lines and/or devices. Workers can be exposed even when all types of protective grounding procedures are used. Ground personnel must stay a minimum of 10 ft (3.01 m) away from the utility vehicle, structure being worked on and any driven ground rod.
- There are two acceptable methods of making contact with a utility vehicle, structure or driven ground rod while it has the potential to become energized. They are:
    - The employee is wearing rubber insulating gloves and rubber insulating over shoes that are rated for the voltage of the potential exposure.
    - The employee is standing on a conductive mat that is electrically bonded to that equipment. When accessing the conductive mat, employees must first step from the earth to an insulated platform before stepping onto the conductive mat. Egress from the conductive mat shall be done in reverse order.
- In an emergency condition, employees may get on/off a piece of equipment to operate the lower controls to perform a bucket rescue provided that one of the above personal protective measures is taken.

17

Central Office Telecommunications

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes for office telecommunication workers.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

Application

This section sets forth safety and health standards that apply to the work conditions, practices, means, operations, installations, and processes performed at telecommunications centers. Work includes the installation, operation, maintenance, rearrangement, and removal of communications equipment and other associated equipment in telecommunications switching centers.

General Requirements

Buildings containing telecommunications centers must have adequate lighting so that continuing work operations, routine observations, and the passage of employees can be carried out in a safe and healthful manner. Certain tasks in centers, such as splicing cable and maintaining and repairing equipment frame lineups, might require a higher level of illumination. In such cases, increased permanent lighting or portable supplemental lighting must be used as needed to permit safe performance of the required task.

When performing work in telecommunications centers, observe the following general requirements regarding the jobsite:

- Ensure that platform work surfaces are equipped with proper guardrails and toe boards. Guardrails and toe boards may be omitted on distribution frame mezzanine platforms to permit access to equipment. This exemption applies only on the sides of the platform facing the frames and only to those portions of the platform adjacent to equipped frames.
- Keep workspaces free of traffic. Maintenance aisles or wiring aisles between equipment frame lineups are working spaces, not a means of egress.

- Ensure that dangerous components are guarded from contact with employees. When power plant machinery in telecommunications centers is operated with commutators and couplings uncovered, the adjacent housing must be clearly marked to alert personnel to the rotating machinery.
- After completion of each job, clean the location and dispose of waste in the proper containers.
- Keep all customer premises, including all associated work areas, clean and orderly.
- Maintain all tools and equipment in a safe condition in compliance with all applicable safety laws.
- Be familiar with the customer's operating and safety orders.
- Discuss corrective measures that could be taken in the event of an outage.
- Define security procedures before the start of the job.

Preventing Personal Injuries

Personal injuries can be prevented by:

- Disclosing hazards as soon as they are identified.
- Eliminating or neutralizing hazards known to exist in the building, equipment, tools, or supplies or using necessary precautions if it is not practical to eliminate or neutralize the hazards.
- Following safe practices.
- Taking precautions to avoid electrical shock.

Housekeeping

The installer should be aware of the safety and instruction of its employees, representatives, and subcontractors. All persons involved in the project should be instructed to practice good housekeeping and make an effort to:

- Keep floors and work areas free of all potential hazards. Provide caution signs when required.
- Protect floors during cable operations to prevent damage to the floor and accidental slips and falls.
- Keep all walkway, entrances, and exit routes clear of installation materials.
- Use flame-retardant fiberboard (masonite) to protect floors, walls, and equipment from physical damage.
- Identify and discuss potential hazards associated with the work operations.
- Chock or secure cable reels to prevent accidental rolling.
- Identify building conditions and equipment that might jeopardize employee safety and customer service.
- Identify the equipment route and ensure that aisles are cleared to move equipment through.
- Keep all tools and materials in their proper places when not in use.

- Keep cords and cables neatly arranged.
- Use permanent wiring, not extension cords, whenever possible.
- Keep flammable liquids in approved containers and away from ignition sources.
- Clean up spills immediately.
- Dispose of flammable scrap material in tight, closed metal containers and empty them daily.
- Remove only necessary quantities of chemicals from containers, ensure that all chemical containers are labeled, and keep all chemical containers closed when not in use.
- Check containers regularly for leaks.
- Keep food, drink, and cigarettes out of the central office equipment rooms.
- Report holes, loose boards, and other flooring problems to the supervisor.
- Throw away trash promptly.
- Dispose of hazardous wastes promptly and in accordance with legal and local practices.

Electrostatic Discharge

Electrostatic discharge (ESD) is a sudden transfer of charge between two objects. A familiar example is the “zap” that is felt after sliding across a car seat and touching the door handle. While sliding, the body becomes charged, and this charge suddenly jumps when the body encounters an uncharged or oppositely charged object (the door handle).

Dry climatic conditions aggravate the problem because dry ambient air inhibits surface charge leakage and large static potentials result. Often, the discharge cannot be felt but can still damage sensitive electronic devices.

Charged Materials and Susceptible Components

Static electricity is generated whenever two materials are rubbed together and then separated. Some materials are particularly good at storing a static charge, such as:

- Styrofoam
- Rubber
- Plastic

The human body can store a static charge of several thousand volts, which can damage circuits and electronic components if an ESD is transferred from a person to the component.

A person can feel static electricity only at approximately 1,500 to 3,500 V, but many circuits can be damaged by an ESD of fewer than 30 V. Handling sensitive equipment and components requires great care to prevent ESD damage from voltages that cannot be felt. Table 17-1 shows the average electrostatic voltage that is present in various situations.

Table 17-1. Typical Electrostatic Voltages

Situation	Average Voltage
Person walking across linoleum floor	5,000
Person walking across carpeted floor	15,000
Circuit packs in Styrofoam packing material	5,000
Circuit packs as bubble plastic is removed	5,000
Ceramic DIPs in Styrofoam material	20,000

The effects are not always immediately apparent. A device that has been exposed to ESD might:

- Not be affected.
- Function normally but for a shorter time.
- Function erratically.
- Stop functioning altogether.

Seemingly inoffensive pieces of Styrofoam cup, sandwich wrap, other plastics, or even paper can pick up static charge and cause damage.

Basic Control Rules

To control ESD and prevent damage to sensitive components, observe the following ESD protection procedures:

- Assume that all electronic (solid state) components and assemblies are sensitive to ESD damage.
- Never touch a sensitive component or assembly unless properly grounded.
- Never transport, store, or handle sensitive components or assemblies except in a static-safe environment.
- Take precautions in low relative humidity (below 20%) environments:
  - Reduce intake of outside air.
  - Install humidifiers.
  - Damp mop carpeted floors (temporary).
- Take precautions when working in carpeted areas:
  - Use carpeting only in authorized areas.
  - Work on low-static carpeting or carpet with metallic threads.
  - Use antistatic sprays.
- Take precautions when working in uncarpeted areas:
  - Use only approved floor wax or do not wax uncarpeted floors.
  - Use antistatic cleaning solutions.

    - Stand on antistatic floor mats.
    - Reduce heating.
- Use wrist straps for grounding personnel:
    - Always use an antistatic wrist strap when handling sensitive devices.
    - Attach the strap to the bare skin of your wrist.
    - Connect the clip to the bare metal of the equipment frame.
    - Attach the clip to a designated point.
    - Continue to wear the strap until you have finished the job.
    - Check the resistance of wrist straps often with a volt-ohmmeter. Resistance should be approximately one megohm.

  The sole purpose of wrist straps is to direct ESD from personnel to ground. Typically, the straps are flexible wristbands with a minimum of a 1-megohm resistor in the ground cords; wrist straps must contact the skin to be effective. Continuity from point of connection to ground must always be maintained.
- Handle sensitive devices with care:
    - Always be sure that you are properly grounded before handling a sensitive device.
    - Never hand a sensitive device to an ungrounded person.
    - Keep devices away from possible sources of static charge, such as clothing or common plastics.
    - Do not touch connectors, connector pins, or leads of any device if possible.
- Do not use uninsulated metallic ladders or scaffolding in a central telecommunications office (for additional information, see Chapter 31, “Ladders and Scaffolds”).

Service Hazards

Service interruptions are generally caused by “shorting” or “opening” live circuits. Therefore, any characteristic, operating condition, or fault present in the building, equipment, tools, or personnel that increases the risk of introducing these failures into the circuit during installing operations is a service hazard.

The principle causes of service interruptions during installation operations include:

- Lack of protection.
- Inadequate analysis.
- Deviation from operational methods.
- Communications breakdown.
- Faulty method of procedure (MOP).
- Deviation from MOP.
- Deviation from test methods.

General Protection of Wiring on Live Equipment

Protection should be restricted to bays, frames, or switchboard positions adjacent to or in the immediate vicinity of the work location or to those liable to be struck when equipment is being located or relocated.

The installer should check the general condition of existing wiring before starting any operation on live equipment. The following conditions must be corrected, whenever practical, before starting the operation:

- Insulation damaged, frayed, or pulled excessively back from the terminals
- Forms not adequately supported, permitting excessive movement of wire leads
- Loose wire ends in wiring

Preventing Service Interruptions—Precautions During Installation Operations

Before starting any work on or in the vicinity of cable racks, inspect the following items:

- Where local forms or loose wires are present, ensure that the wires are properly protected where they cross cable rack stringers.
- On additions, check that cable turnoff points have adequate protection to ensure against cable being damaged. Where protection has been omitted, apply protection in the standard manner where feasible or in the most convenient manner.
- Where switchboard cable, power cable, or wire is in close proximity of threaded rods or objects that present a potential hazard, apply adequate protection to prevent damage or service interruption.

Fire Protection

Installers working in customer buildings should protect against and be prepared for fire emergencies. Instruct installers to:

- Locate all fire exits.
- Locate local fire alarms.
- Identify the types of fire extinguishers and where they are located.
- Adhere to the No Smoking rule at all times.
- Remove all flammable materials from the building daily or more frequently if necessary.

Raised Floor Safety Considerations

Installers working in areas with raised flooring should:

- Mark the area with warning markers.
- Replace floor tiles when not in use.
- Avoid working under a raised floor if work can be accomplished from above by removing additional tiles.

Personal Protective Equipment

Anyone entering the work site must observe the requirements governing the use of PPE:

- Always wear the following PPE, when appropriate:
  - Hardhats
  - Knee pads
  - Leather gloves
  - Safety glasses
  - Long sleeves
- Ensure that employees, visitors, contractors, and all third parties wear appropriate PPE while at a work site.
- The Company will instruct employees in the proper selection, care, and use of PPE.

Head Protection

Observe the following requirements for head protection:

- Ensure that all employees, visitors, and third-party contractors wear hardhats meeting ANSI Z89.1 specifications in all required working areas.
- Do not alter hardhats by boring holes through the shell, since this weakens the hat and can reduce the protection it provides. Do not paint hardhats or clean them with solvent. They should be cleaned with soap and water only.

Eye and Face Protection

Observe the following requirements for eye and face protection:

- Implement an eye and face protection program to continue the Company objective to eliminate injuries.
- Ensure that all safety glasses, including prescription glasses, meet ANSI Z87 requirements. Wear permanently attached side shields at all times.

Respiratory Equipment

Wear respiratory equipment (positive pressure) when entering or working in an atmosphere known or suspected to contain dangerous concentrations of gas, vapor, dust, or mist or that is deficient in oxygen. This equipment is provided as needed.

See Chapter 41, "Respiratory Protection" for more information on requirements for respirators.

Hearing Protection

Hearing protection is provided and must be worn when TWA noise levels exceed 85 decibels (dBA). Warning labels identify all known hazardous areas. Supervisors must request that the safety representative inspect all suspected areas.

Safety Equipment

The supervisor must inspect first aid kits and bloodborne pathogen kits monthly and all other safety equipment assigned as needed. The equipment supervisor should report needed service or replacement items to the manager. All employees must know how to use the first aid supplies and other safety equipment.

Battery Handling

Observe the following requirements for handling batteries:

- Wear goggles or safety glasses with a full-face shield when employees are measuring storage battery specific gravity or handling electrolytes and ensure that such devices are properly used by employees.
- Ensure that acid-resistant gloves and aprons are adequate protection against splattering.
- Provide facilities for quick drenching or flushing of the eyes and body, unless the storage batteries that are being handled are enclosed and equipped with explosion-proof vents. In this case, sealed water rinse or neutralizing packs may be substituted for the quick drenching or flushing facilities.
- Instruct employees assigned to work with storage batteries in emergency procedures, such as dealing with accidental spills.
- Mix electrolytes (acid or base and distilled water) for battery cells in a well-ventilated room.
- Pour acid or base into water gradually while stirring. Never pour water into concentrated acid solutions (greater than 75%).
- Never place electrolytes in metal containers or stir electrolytes with metal objects.
- When taking specific gravity readings, cover the open end of the hydrometer with an acid-resistant material while moving it from cell to cell to avoid splashing of the electrolyte.
- Be careful to ensure that no conductive objects are placed near or across the battery terminals.

DC Voltage

Use caution when working around voltage present in a central office environment. These voltages could range from -48 to 105 VDC on distribution frames and 470 VDC or more at the breaker distribution fuse bay (BDFB) units. Although this is negative DC voltage, high amps can be associated with it.

18

Field Telecommunications

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes for field telecommunications workers.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

Definitions

Aerial lifts—Aerial lifts include the following types of vehicle-mounted aerial devices used to elevate personnel to jobsites above ground:

- Extensible boom platforms
- Aerial ladders
- Articulating boom platforms
- Vertical towers
- A combination of any of the above.

These devices are made of metal, wood, fiberglass reinforced plastic, or other material; powered or manually operated; and deemed to be aerial lifts, even if they are not capable of rotating about a substantially vertical axis.

Aerial splicing platform—This consists of a platform, approximately 3 ft (0.91 m) by 4 ft (1.22 m), used to perform aerial cable work. Aerial splicing platforms are furnished with fiber or synthetic ropes for supporting the platform from an aerial strand, detachable guy ropes for anchoring it, and a device for raising and lowering it with a handline.

Aerial tent—A small tent usually constructed of vinyl-coated canvas that is usually supported by light metal or plastic tubing. It is designed to protect employees in inclement weather while working on ladders, aerial splicing platforms, or aerial devices.

Alive or live (energized)—Condition of being electrically connected to a source of potential difference, or a source that can potentially produce an electrical charge that is significantly different from that of the earth in the vicinity. The terms "live" and "energized" are sometimes used in the place of the term "current-carrying" to avoid repeating the longer term where the meaning has been established and is clear.

Barricade—A physical obstruction such as tapes, cones, or A-frame type wood or a metal structure intended to warn and limit access to a work area.

Barrier—A physical obstruction intended to prevent contact with energized lines or equipment or prevent unauthorized access to work area.

Bond—An electrical connection from one conductive element to another for the purpose of minimizing potential differences, providing suitable conductivity for fault current or mitigation of leakage current and electrolytic action.

Cable—A conductor with insulation, a stranded conductor with or without insulation and other coverings (single-conductor cable), or a combination of conductors insulated from one another (multiple-conductor cable).

Cable sheath—A protective covering applied to cables. A cable sheath may consist of multiple conductive layers.

Circuit—A conductor or system of conductors through which an electric current is intended to flow.

Communication lines—The conductors and their supporting structures for telephone, telegraph, railroad signal, data, clock, fire, police alarm, community television antenna, and other systems used for public or private signal or communication services. These conductors operate at potentials not exceeding 400 V to ground or 750 V between any two points of the circuit and do not exceed transmitted power of 150 W. When communications lines operate at less than 150 V to ground, no limit is placed on the capacity of the system. Specifically designed communications cables can include communication circuits that do not comply with the preceding limitations. Circuits that do not comply with the previous limitations may also be used to supply power to communication equipment.

Conductor—A material, usually in the form of a wire, cable, or bus bar, suitable for carrying an electric current.

Covers—A solid barrier fastened over holes in the working surface to prevent falls.

Effectively grounded—Condition of being intentionally connected to earth through a ground connection, or a connection of sufficiently low impedance, that has sufficient current-carrying capacity to prevent the build-up of voltages. Built-up voltages can result in undue hazard to connected equipment or persons.

Equipment—A general term including materials, fittings, devices, appliances, fixtures, apparatus, and similar items used as part of, or in connection with, a supply or communications installation.

Fall Protection Equipment (FPE) – Any equipment, device or system that prevents an accidental fall from elevations or that mitigates the effect of such fall.

Ground (reference)—That conductive body, usually earth, to which an electric potential is referenced.

Ground (as a noun)—A conductive connection, whether intentional or accidental, by which an electric circuit or equipment is connected to reference ground.

Ground (as a verb)—The connecting or establishment of a connection, whether by intention or accident, of an electric circuit or equipment to reference ground.

Ground tent—A small tent usually constructed of vinyl-coated canvas supported by a metal or plastic frame. Ground tents protect employees from inclement weather while working at buried cable pedestal sites or similar locations.

Grounded conductor—A system or circuit conductor that is intentionally grounded.

Grounded systems—A system of conductors in which at least one conductor or point (usually the middle wire or the neutral point of transformer or generator windings) is intentionally grounded, either solidly or through a current-limiting device (not a current-interrupting device).

Grounding electrode conductor (grounding conductor)—A conductor used to connect equipment or the grounded circuit of a wiring system to a grounding electrode.

Guardrails—Standard guardrails consist of a top rail, located 42 inches (1.07 m) above the floor, and a midrail. Screens and mesh may be used to replace the midrail as long as they extend from the top rail to the floor.

Insulated—Separated from other conducting surfaces by a dielectric substance (including air space) offering a high resistance to current conductivity. To categorize an object as "insulated," it must be insulated in a suitable manner for the conditions to which it is subjected. Otherwise, it is, within the purpose of these rules, uninsulated. Insulating coverings of conductors is one way to make the conductor insulated.

Insulation (as applied to cable)—The material that insulates the conductor from other conductors, conducting parts, or ground.

Joint-use—The sharing of a common facility, such as a manhole, trench, or pole, by two or more different kinds of utilities (for example, power and telecommunications).

Ladder platform—A device designed to facilitate working aloft from an extension ladder. A typical device consists of a platform (approximately 9 inches (22.86 cm) by 18 inches (45.72 cm)) hinged to a welded pipe frame. The rear edge of the platform and the bottom cross-member of the frame are equipped with latches to lock the platform to ladder rungs.

Ladder seat—A removable seat on rolling ladders in telecommunication centers used to facilitate work at an elevated position.

Manhole—A subsurface enclosure that personnel can enter. Manholes are used for installing, operating, and maintaining submersible equipment and cable.

Manhole platform—A platform consisting of separate planks laid across steel platform supports. The ends of the supports are secured in the manhole cable racks, providing a firm platform on which to stand.

Microwave transmission—Communicating or signaling with a frequency between 1 GHz and 300 GHz.

Nominal voltage—The value assigned to a system or circuit of a given voltage class for the purpose of convenient designation. The actual voltage can vary above or below this value.

Personal fall arrest systems—Components of a personal fall arrest system include a full body harness, lanyard, lifeline, connector, and an anchor point capable of supporting at least 5,000 lb (2,268 kg).

Pole balcony or seat—A balcony or seat used as a support for workmen at pole-mounted equipment or terminal boxes. A typical device consists of a bolted assembly of steel details and a wooden platform. Steel braces run from the pole to the underside of the balcony. A guardrail (approximately 30 inches (76.20 cm) high) may be provided.

Pole platform—A platform intended for use by a worker in splicing and maintenance operations in an elevated position adjacent to a pole. Pole platforms are equipped at one end with a hinged chain binder for securing the platform to a pole. A brace from the pole to the underside of the platform is also provided.

Positioning device systems—A harness allowing a person to work on a vertical surface, such as a wall, with both hands free.

Qualified employee—Any worker who, by direct result of training and experience, has demonstrated the ability to safely perform required duties.

Qualified line clearance tree trimmer—A tree worker who, through related training and on-the-job experience, is familiar with the special techniques and hazards involved in line clearance.

Qualified line clearance tree trimmer trainee—Any worker regularly assigned to a line clearance tree trimming crew who is undergoing on-the-job training and who, in the course of the training, has demonstrated the ability to perform the duties required by the job.

Safety monitoring by a competent person—The system allowing a trained person to monitor others as they work on elevated surfaces with the purpose of warning them of any fall hazards.

Safety net systems—A system of nets installed as close as possible under the work area, designed to reduce or eliminate falls.

System operator or owner—The person or organization that operates or controls the electrical conductors in a system.

Telecommunications center—An installation of communication equipment under the exclusive control of an organization providing telecommunications service that is located outdoors or in a vault, chamber, or building space used primarily for such installations. Telecommunication centers are facilities established, equipped, and arranged in accordance with engineered plans for the purpose of providing telecommunications service. They may be located on premises owned or leased by the organization providing telecommunication service or others. This definition includes switch rooms (whether electromechanical, electronic, or computer controlled), terminal rooms, power rooms, repeater rooms, transmitter and receiver rooms, switchboard operating rooms, cable vaults, and miscellaneous communications equipment rooms. Simulation rooms of telecommunication centers for training or developmental purposes are also included.

Telecommunications derricks—Rotating or nonrotating derrick structures permanently mounted on vehicles for the purpose of lifting, lowering, or positioning hardware and materials used in telecommunications work.

Telecommunication line truck—A truck used to transport workers, tools, and material and serve as a traveling workshop for telecommunication installation and maintenance work. It is sometimes equipped with a boom and auxiliary equipment for setting poles, digging holes, and elevating material or workers.

Telecommunication service—The furnishing of a capability to signal or communicate at a distance by means such as telephone, telegraph, police and fire alarm, community antenna television, or similar system, using wire, conventional cable, coaxial cable, wave guides, microwave transmission, or other similar means.

Unvented vault—An enclosed vault in which the only openings are access openings.

Vault—An enclosure above or below ground that personnel can enter and is used for the purpose of installing, operating, and/or maintaining equipment and/or cable that need not be of submersible design.

Vented vault—An enclosure with provision for air changes using exhaust flue stacks and low-level air intakes. Vented vaults use pressure and temperature differentials to provide airflow.

Voltage of an effectively grounded circuit—The voltage between any conductor and ground unless otherwise indicated.

Voltage of a circuit not effectively grounded—The voltage between any two conductors. If one circuit is directly connected to and supplied from another circuit of higher voltage (as in the case of an autotransformer), both are considered to be the higher voltage, unless the circuit of lower voltage is effectively grounded. If the lower voltage circuit is effectively grounded, its voltage is not determined by the higher voltage circuit. Direct connection implies electrical connection, as opposed to electromagnetic or electrostatic induction.

Warning line systems—Warning line systems are made up of lines or ropes installed around a work area on a roof. These lines create a barrier to prevent those working on the roof from approaching roof edges.

Wood Pole Fall Restriction Device – A device that, when properly adjusted and combined with other subcomponents and elements, allows the climber to remain at his or her work position with both hands free and that performs a fall restriction function if the climber loses contact between his or her gaffs and the pole.

General Requirements

Buildings Containing Telecommunication Centers

Lighting in telecommunication centers must be bright enough to accommodate work operations, routine observations, and employee traffic in a safe and healthful manner.

Guardrails and toe boards may be omitted on distribution frame mezzanine platforms to permit access to equipment. This exemption applies only on the sides of the platform facing the frames and only on portions of the platform that are adjacent to equipped frames.

Maintenance aisles, or wiring aisles, between equipment frame lineups are working spaces. Do not use them as a means of egress.

When installing blastproof or power-actuated doors in specially designed hardsite security buildings and spaces, design and install them so that they can serve as a means of egress in emergencies.

When operating power plant machines in telecommunications centers with commutators and couplings uncovered, clearly mark the adjacent housing to alert personnel to the rotating machinery.

Battery Handling

When handling batteries, observe the following safety precautions:

- When handling electrolyte or measuring storage battery specific gravity, wear goggles or safety glasses with a full-face shield.
- Wear acid-resistant gloves and aprons for protection against spattering.
- Facilities for quick drenching or flushing of the eyes and body must be provided unless the storage batteries are of the enclosed type and are equipped with explosion-proof vents. When flushing facilities are not required, provide sealed water rinse or neutralizing packs.
- Instruct employees assigned to work with storage batteries in emergency procedures such as dealing with accidental spills.
- Mix electrolyte (acid or base and distilled water) for battery cells in a well-ventilated room.
- Pour acid or base gradually into the water, while stirring.

- Never pour water into concentrated (greater that 75%) acid solutions.
- Never place electrolyte in metal containers or stir it with metal objects.

Medical and First Aid

First aid supplies must be placed in weatherproof containers (unless stored indoors) that are easily accessible.

Inspect each first aid kit at least once a month and replace expended items.

Hazardous Materials

The total capacity of liquid propane gas (LPG) containers in a work vehicle must not exceed 100 lb (45.36 kg) of LPG.

Close all container valves when not in use.

Compressed Gas

When using or transporting nitrogen cylinders in a horizontal position, special compartments, racks, or adequate blocking must be provided and used to prevent cylinder movement.

Before transporting a cylinder, remove or guard the regulator.

Support Structures

Do not allow employees, materials, or equipment to be placed on any portion of a pole structure, platform, ladder, walkway, or other elevated structure or aerial device until the support structure has been inspected by a competent person and is determined to be adequately strong, in good working condition, and properly secured.

Approach Distances to Exposed Energized Overhead Power Lines and Equipment Parts

Employees must not approach or take a conductive object closer to any electrically energized overhead power lines and parts than prescribed in Table 18-1, unless:

- The employee is insulated or guarded from the energized parts (insulating gloves rated for the voltage involved are considered adequate insulation).
- The energized parts are insulated or guarded from the employee and any other conductive object at a different potential.
- The power conductors and equipment are de-energized and grounded.

Table 18-1. Approach Distances to Exposed Energized Overhead Power Lines and Parts for Telecommunication Workers

Voltage (kV, Phase-to-Phase)	Approach Distance Exposed Energized Line (inches)
300 V or less	Avoid Contact
Over 300 V, not over 750 V	12
Over 750 V, not over 2 kV	18
2 kV to 15 kV	24
15 kV to 37 kV	36
37 kV to 87.5 kV	42
87.5 kV to 121 kV	48
121 kV to 140 kV	54

Illumination of Field Work

Whenever natural light is insufficient to adequately illuminate the work site, ensure that artificial illumination is provided to enable the employee to perform the work safely.

Training

Training must consist of on-the-job or classroom training and include the following subjects:

- Recognition and avoidance of dangers relating to encounters with harmful substances, animals, insects, or plant life.
- Procedures to be followed in emergency situations.
- First aid training, including instruction in CPR.

Employee training must be documented, and records must be prepared at the completion of training. Records must be maintained on file for the duration of the employee's employment.

Employee Protection in Public Work Areas

Precautions must be taken to protect employees when work is conducted in areas where vehicles or pedestrians might be a hazard. Such precautions include:

- Using warning signs, warning flags, or other traffic control devices to alert and direct approaching traffic.
- Using warning lights at night.
- Placing protective barriers around excavations.
- Placing danger signs and barriers, as needed, around exposed energized or moving parts.

If an employee finds any crossed or fallen wires that can create a hazardous situation, the employee must:

- Remain on guard or adopt other means to warn other employees of the danger.
- Have the proper authority notified at the earliest practical moment.

Personal Protective Equipment and Tools (General)

The Company provides all PPE, protective devices, and special tools that employees need to complete their work and ensures that employees use the protective equipment and tools as intended.

Before each day's use, the Company must ensure that all personal protective devices, tools, and equipment are carefully inspected by a competent person to ascertain whether they are in good condition.

Appropriate head and eye protection must be provided and used 100% of the time during all work operations.

Flame-type heaters may not be used within ground tents or on platforms within aerial tents unless:

- The tent covers are constructed of fire resistant materials.
- Adequate ventilation is provided to maintain safe oxygen levels and avoid harmful buildup of combustion products and combustible gases.

Torches may be used on aerial splicing platforms or in buckets enclosed by tents if the tent material is constructed of fire-resistant material and the torch is turned off when not in actual use. Ensure that aerial tents are adequately ventilated while the torch is in operation.

Portable generators, 120 V or less, used for providing power at work locations do not require grounding if the output circuit is completely isolated from the frame or the unit.

Vehicle-mounted utility generators used for providing 240 V AC or less for powering portable tools and equipment need not be grounded to earth if all of the following conditions are met:

- One side of the voltage source is solidly strapped to the metallic structure of the vehicle.
- Grounding-type outlets are used with a "grounding" conductor between the outlet grounding terminal and the side of the voltage source that is strapped to the vehicle.
- All metal-encased tools and equipment that are powered from this system are equipped with three-wire cords and grounding-type attachment plugs.

Rubber Insulating Equipment

Rubber insulating equipment, including gloves and blankets, designed for appropriate voltage levels must be provided and used.

All insulating gloves and other equipment must be retested electrically, visually, and mechanically, following the specific retesting intervals provided in Table 18-2.

Table 18-2. Gloves, Blankets, and Other Insulating Equipment

	Natural Rubber	Synthetic Rubber
New	12 months	18 months
Re-Issued	9 months	15 months

Insulating gloves must be stored in glove bags or in their original containers when not in use. Insulating blankets must be stored in a canister or other device that offers equivalent protection.

Rubber gloves must be visually inspected and air tested before each day's use.

Climbing Wooden Poles

- Fall Protection Equipment (FPE) shall be used ascending, descending, changing position and when in the working position while on a wooden pole. Wood Pole Fall Restriction Device shall be engaged ground-to-ground when ascending, descending, changing position and when in the working position.
- Climbing equipment should be inspected prior to use. Safety straps shall be equipped with double locking snaphooks.
- Before climbing poles and structures, an inspection by a qualified person should be performed to determine if it can be climbed safely.
- An inspection should be made to determine if the poles or structures can sustain the additional or unbalanced stresses to which they will be subjected from climbing or from adding or removing conductors or equipment.

If the pole or structure cannot withstand the loads imposed, it should be braced, guyed, or otherwise supported in order to prevent failure. In all cases where load or stresses are imposed, a competent person should complete a detailed Job Hazard Analysis to determine alternative means of supporting the structure.

- When climbing poles or structures, employees should maintain three points of body contact while ascending or descending.
- Do not use pole climbers if the gaffs are less than 1.25 inches (0.64 cm) in length as measured on the underside of the gaff. Cover the gaffs of pole climbers with safety caps when they are not being used for their intended use.
- Ensure that pole climbers are inspected by a competent person for fractured or cracked gaffs or leg irons, loose or dull gaffs, and broken straps or buckles. Defects must be corrected before using the climbers.

Never wear pole climbers when:

- Working in trees (use specifically designed tree climbers for tree climbing).
- Working on ladders.
- Working in an aerial lift.
- Driving a vehicle.
- Walking on rocky, hard, frozen, brushy, or hilly terrain.

Ladders

Observe the following guidelines during operations that require the use of ladders:

- Do not allow employees, materials, or equipment to be placed on any portion of a ladder until the ladder has been inspected by a competent person and is determined to be adequately strong, in good working condition, and properly secured.

- The spacing between steps or rungs permanently installed on poles and towers must be no more than 18 inches (45.72 cm) (36 inches (91.44 cm) on any one side). This requirement also applies to fixed ladders on towers, when towers are so equipped.
- Fixed ladder rungs and step rungs for poles and towers must have a minimum diameter of 5/8 inch (1.59 cm).
- Fixed ladder rungs must have a minimum clear width of 12 inches (30.48 cm).
- Steps for poles and towers must have a minimum clear width of 4.5 inches (11.43 cm).
- The spacing between detachable steps may not exceed 30 inches (76.20 cm) on any one side, and these steps must be properly secured when in use.
- Portable wood ladders may not be painted, but it may be coated with a translucent nonconductive coating.
- Portable wood ladders may not be longitudinally reinforced with metal.
- Portable wood ladders that are not being carried on vehicles and are not in active use must be stored where they will not be exposed to the elements and where there is good ventilation.
- Ladders or stairways on scaffolds used for access and egress must be affixed or built into the scaffold by proper design and engineering. Locate ladders so that using them will not disturb the stability of the scaffold.
- When a ladder is supported by an aerial strand and ladder hooks or other supports are not being used, ensure that the ladder is extended at least 2 ft (0.61 m) above the strand. To secure the ladder adequately, lash a safety strap around the strand and ladder side rail.
- When a ladder is supported by a pole, securely lash it to the pole unless the ladder is specifically designed to prevent movement when used in this application.
- Ensure that metal manhole ladders are free of structural defects and free of hazards such as sharp edges and burrs. The metal must be protected against corrosion unless it is inherently corrosion-resistant.
- The ladders may be designed with parallel side rails, with side rails varying uniformly in separation along the length (tapered), or side rails flaring at the base to increase stability.
- Ensure that ladder rungs or steps use 12-inch (30.48-cm) centers.
- Connections between rungs or steps and side rails must be constructed to ensure rigidity and strength.
- Rungs and steps must be corrugated, knurled, dimpled, coated with skid-resistant material, or otherwise treated to minimize the possibility of slipping.

Vehicle-Mounted Material Handling Devices and Other Mechanical Equipment

Ensure that a competent person inspects all equipment daily to ensure that it is in good working condition.

Ensure that a competent person inspects the braking and operating systems of all vehicles daily to ensure proper working condition.

Ensure that the following equipment used in telecommunications work has rollover protective structures:

- Rubber-tired, self-propelled scrapers

- Rubber-tired front-end loaders
- Rubber-tired dozers
- Agricultural and industrial tractors
- Crawler tractors
- Crawler-type loaders
- Motor graders, with or without attachments

Do not operate vehicle-mounted elevating and rotating work platforms, derrick trucks, or similar equipment with any conductive parts of the equipment closer to exposed energized power lines than the clearance set forth in Table 18-1.

When using derricks to handle poles near energized power conductors, comply with the requirements of the sections in this chapter titled, “Approach Distances to Exposed Energized Overhead Power Lines and Equipment Parts” and “Overhead Lines.”

Ensure that the moving parts of equipment and machinery carried or mounted on telecommunication line trucks are guarded.

Derricks and the operation of derricks must comply with the following requirements:

- Manufacturer’s specifications, load ratings, and instructions for derrick operation must be strictly observed.
- Rated load capacities and instructions related to derrick operation must be conspicuously posted on a permanent weather-resistant sign or decal in a location on the derrick that is plainly visible to the derrick operator.
- Before derrick operation, set the parking brake and extend the stabilizers if the vehicle is so equipped. When the vehicle is situated on a grade, chock at least two wheels on the downgrade side.
- Ensure that only persons who are adequately trained operate the derrick.
- Use hand signals to communicate with derrick operators as prescribed by ANSI B30.6, “Safety Code for Derricks.”
- Ensure that a competent person inspects all derricks and their associated equipment at intervals set by the manufacturer and at least once per year. Maintain inspection records, including the date of inspection, necessary repairs made, and any corrective action that was required.
- Modifications to the derrick and its associated equipment that alter its capacity or affect its safe operation must only be made with written certification from the manufacturer or other equivalent entity, such as a nationally recognized testing laboratory. The certification must state that modifying the equipment enhances equipment safety when used as intended. After any modifications, obtain new ratings or limitations from the manufacturer or other equivalent authority. Change and post revised capacity and instruction decals or plates to reflect the new modifications.
- Wire rope used with derricks must consist of improved plow steel or equivalent. Wire rope safety factors must be in accordance with ANSI B30.6.

- Take wire rope out of service or remove the defective portion when any of the following conditions exist:
  - The rope strength has been significantly reduced due to corrosion, pitting, or excessive heat.
  - The thickness of the outer wires of the rope has been reduced to two-thirds or less of the original thickness.
  - There are more than six broken wires in any one-rope lay.
  - There is excessive permanent distortion caused by kinking, crushing, or severe twisting of the rope.

Material Handling and Storage

When working with poles in piles or stacks, work from the ends of the poles as much as possible and take precautions for the safety of employees at the other end of the pole.

During pole hauling operations, secure all loads to prevent displacement. Display lights, reflectors, and flags on the end and sides of the load as necessary.

Before unloading steel, poles, crossarms, and similar material, examine the load thoroughly to ascertain that the load has not shifted, the binders or stakes have not broken, and the load is not otherwise hazardous to employees.

The operator must not leave the controls of the hoisting machinery while a load is suspended.

Cable reels in storage must be chocked or otherwise restrained when there is a possibility that they might roll from position.

Loading and Unloading Equipment

When loading and unloading telecommunication poles and heavy equipment from a trailer, set the emergency brake and utilize wheel chocks. Wheel chocks shall be used on all vehicles parked on an incline, including trailers.

Cable Fault Locating and Testing

Employees involved in using high voltages to locate trouble or test cables must be instructed in the precautions necessary for their own safety and the safety of other employees.

Before voltage is applied, isolate cable conductors to the extent that it is practical. Warn employees to stay clear while the voltage is applied by such techniques as prejob briefing and tagging at all affected locations.

Grounding for Employee Protection—Pole Lines

Consider electric power conductors and equipment on pole lines (including nonworking open communication wires, vertical power conduit, power ground wires, and light fixtures) as energized unless the employee can visually determine that they are bonded to specific grounds.

Acceptable grounds for protective grounding are as follows:

- A vertical ground wire that has been tested, found safe, and is connected to a power system multigrounded neutral or the grounded neutral of a power secondary system when there are at least three services connected

- Communication cable sheath or shield and its supporting strand where the sheath or shield is bonded to one of the following:
  - An underground or buried cable connected to a central office ground
  - An underground metallic piping system
  - A power system multigrounded neutral or grounded neutral of a power secondary system that has at least three services connected
- Guys that are bonded to the grounds identified in the previous two requirements and have continuity uninterrupted by an insulator
- Arrays of driven ground rods where the resultant resistance to ground is low enough to eliminate danger to personnel or permit prompt operation of protective devices (if all of the preceding grounds are not available)

When attaching grounds (bonds), make the first attachment to the protective ground. When removing bonds, the connection to the line or equipment must be removed first. Wear insulating gloves during these operations.

Temporary grounding of suspension strand must comply with the following:

These requirements do not apply to the installation of insulated strand.

- The suspension strand must be grounded to the acceptable grounds listed above when being placed on jointly-used poles or during thunderstorm activity.
- Where power crossings are encountered on nonjoint lines, the strand must be bonded to an acceptable ground as close as possible to the crossing. This bonding is not required where crossings are made on a common crossing pole unless there is an upward change in grade at the pole.
- Where roller-type bonds are used, they must be restrained to avoid stressing the electrical connections.
- Bonds between the suspension strand and the existing ground must be a least #6 AWG copper.
- Temporary bonds must be left in place until the strand has been tensioned, dead-ended, and permanently grounded.

Requirements for proper grounding at antenna work-radio transmitting stations of 3 to 30 MHz include:

- Before grounding a radio-transmitting station antenna, the responsible person in charge must:
  - Prepare a danger tag including his or her signature.
  - Request the transmitting technician to shut down the transmitter and ground the antenna with the grounding switch.
  - Be notified by the transmitting technician that the transmitter has been shut down.
  - Tag an antenna ground switch personally in the presence of the transmitting technician after the antenna has been grounded by the transmitting technician.

- Do not, under any circumstances, apply power to the antenna or open the grounding switch while the tag is affixed.
- Where no grounding switches are provided, use grounding sticks, one on each side of line, and place tags on the grounding sticks, antenna switch, or plate power switch in a conspicuous place.
- All radio frequency line wires must be tested for pickup with an insulated probe before they are handled with bare hands or metal tools.
- The transmitting technician must give adequate warning about adjacent lines that are or can become energized.
- When antenna work has been completed, the person in charge of the job returns to the transmitter, notifies the transmitting technician in charge that work has been completed, and personally removes the tag from the antenna ground switch.

Overhead Lines

When installing cable suspension strand on poles carrying exposed energized power conductors, employees must wear insulating gloves and avoid body contact with the strand until after it has been tensioned, dead-ended, and permanently grounded.

The strand must be restrained against upward movement during installation:

- On joint-use poles, where there is an upward change in grade at the pole.
- On nonjoint-use poles, where the line crosses under energized power conductors.

Unless adequate railings are provided, use safety straps and body belts while working on elevated work platforms such as aerial splicing platforms, pole platforms, ladder platforms, and terminal balconies.

Wear safety straps and body belts when working at elevated positions on poles, towers, or similar structures that do not have adequately guarded work areas.

Before installing or removing wire or cable, the pole or structure must be guyed, braced, or otherwise supported, as necessary, to prevent failure of the pole or structure.

When using cranes, derricks, or other mechanized equipment for setting, moving, or removing poles, take all necessary precautions to avoid contact with energized power conductors or equipment.

The following precautions must be taken when handling poles near energized power conductors or equipment:

- Joint-use wooden poles may not be set, moved, or removed where the nominal voltage of open electrical power conductors exceed 34.5 kV phase-to-phase (20 kV to ground).
- On joint-use wooden poles, insulate the wooden poles that are being placed, moved, or removed with a rubber insulating blanket, a fiberglass box guide, or equivalent protective equipment. When possible, have the power company install insulating rubber on the conductors. The wooden poles must be guarded or otherwise prevented from direct contact with overhead energized power conductors.
- Wear appropriate rubber insulated gloves, rated for the line voltage, when handling the pole with either hands or tools when there is a possibility that the pole might contact a power conductor. The use of dielectric overshoes is also recommended.

Table 18-3. ANSI/ASTM D 120 Glove Specifications

Glove Color	Class	Maximum Use Voltage (AC rms Volts)
Red	0	1,000
White	1	7,500
Yellow	2	17,000
Green	3	26,500
Orange	4	36,000

You must know the voltage on the power line in order to select the correct PPE for proper adequate worker protection.

- The guard or insulating material used to protect the pole must meet the voltage test requirements of ANSI.
- If there is a possibility of contact between an energized power conductor and the pole or the vehicle-mounted equipment used to handle the pole, observe the following precautions:
    - When on the vehicle that carries the derrick, avoid all contact with the ground, persons standing on the ground, and all grounded objects such as guys, tree limbs, or metal signposts. To the extent feasible, remain on the vehicle as long as the possibility of contact exists.
    - When it is necessary to leave the vehicle, step onto an insulating blanket and break all contact with the vehicle before stepping off the blanket and onto the ground. As a last resort, if a blanket is not available, the employee may jump cleanly from the vehicle.
    - When it is necessary to enter the vehicle, first step onto an insulating blanket and break all contact with the ground, grounded objects, and other persons before touching the truck or derrick.

Climbing and working above the level of the lowest electric power conductor on a pole is prohibited, except:

- Where communication facilities are attached above the electric power conductors and a rigid fixed barrier is installed between the electric power facility and the communications facility.
- Where the electric power conductors are cabled secondary service drops carrying less than 300 V to ground and are attached 40 inches (1.02 m) or more below the communications conductors or cables.

Do not use metal measuring tapes, metal measuring ropes, or tapes containing conductive strands when working near exposed energized parts. Where it is necessary to measure clearances from energized parts, use only nonconductive devices.

Testing Poles

Unless temporary guys or braces are attached, the following poles must be tested and determined to be safe before permitting employees to climb them:

- Dead-end poles, except properly braced or guyed “Y” or “T” cable junction poles
- Straight line poles that are not storm guyed and where adjacent span lengths exceed 165 ft (50.29 m)
- Poles at which there is a downward change in grade and that are not guyed or braced corner poles or cable junction poles
- Poles that support only telephone drop wire
- Poles that carry less than 10 communication line wires (on joint-use poles, power line wire can be considered as two communication wires)

Refer to the “Testing of Wood Poles” section in this chapter for detailed information about testing wood poles.

One of the following methods, discussed in detail in the “Testing of Wood Poles” section in this chapter or an equivalent method must be used for testing wood poles:

- Hammer method
- Rocking test

Poles or structures determined to be unsafe by test or observation may not be climbed until made safe by guying, bracing, or other adequate means. Poles determined to be unsafe to climb must, until they are made safe, be tagged in a conspicuous place to alert and warn all employees of the unsafe condition.

Testing and Inspecting Strands

Before attaching a splicing platform to a cable suspension strand, the strand must be tested and determined to have strength sufficient to support the weight of the platform and the employee. Where the strand crosses above power wires or railroad tracks, substitute the strand test with an adequate inspection.

The following method or an equivalent method must be used for testing the strength of the strand:

1. Throw a rope, at least 3/8-inch (0.95-cm) in diameter, over the strand.
2. On joint lines, pass the rope over the strand using tree pruner handles or a wire-raising tool.
3. If two employees are present, both should grip the double rope and slowly transfer their entire weight to the rope and attempt to raise themselves off the ground.

   If only one employee is present, tie one end of the rope (which has been passed over the strand) to the bumper of the truck or other equally secure anchor. The employee can then grasp the other end of the rope and attempt to raise himself off the ground.

Where a strand passes over electric power wires or railroad tracks, inspect it from an elevated working position at each pole supporting the span in question. The strand may not be used to support any splicing platform, scaffold, or cable car if any of the following conditions exist:

- Corrosion so that no galvanizing can be detected
- One or more wires of the strand are broken
- Worn spots
- Burn marks such as those caused by contact with electric power wires

Microwave Transmission

Employees must not look into an open waveguide connected to an energized source of microwave radiation.

Accessible areas to microwave communication systems where the electromagnetic radiation level exceeds the radiation protection guide must be posted as required.

When an employee works in an area where the electromagnetic radiation exceeds the radiation protection guide, appropriate measures must be instituted that ensure that the employee’s exposure is not greater than that permitted by the radiation guide. Such measures must include, but are not limited to, those of an administrative or engineering nature or those involving PPE. For more information regarding radiation protection, see Chapter 21, “Radiation Hazards.”

Tree Trimming

When trimming trees, adhere to the following guidelines:

- When pruning, trimming, removing, or clearing trees from lines, consider all overhead and underground electrical power conductors to be energized with potential fatal voltage, never to be touched (contacted) directly or indirectly.
- Employees engaged in line-clearing operations must be instructed on the following:
  - Direct contact is made when any part of the body touches or contacts an energized conductor or other energized electrical fixture or apparatus.
  - Indirect contact is made when any part of the body touches any object in contact with an energized electrical conductor or other energized fixture or apparatus.
  - Indirect contact can be made through conductive tools, tree branches, trucks, equipment, or other objects or as a result of communications wires, cables, fences, or guy wires being accidentally energized.
  - Electric shock occurs when an employee, by either direct or indirect contact with an energized conductor, energized tree limb, tool, equipment, or other object, provides a path for the flow of electricity to a grounded object or the ground itself. Simultaneous contact with two energized conductors also causes electric shock, which can result in serious or fatal injury.
- The employee and the foreman or supervisor in charge must closely inspect the work area before climbing, entering, or working around any tree to determine whether an electrical power conductor passes through the tree or within reaching distance of an employee working in the tree. If any of these conditions exist, directly or indirectly, an electrical hazard must be considered to exist unless the lines are de-energized or protective equipment installed.
- Only qualified employees, familiar with the special techniques and hazards involved in line clearance, are permitted to perform work where electrical hazards exist.
- During all tree-working operations aloft where an electrical hazard of more than 750 V exists, there must be a second employee qualified in line clearance tree trimming who can clearly and audibly communicate with the employee aloft.
- Where tree work is performed by employees qualified in line clearance tree trimming, the clearances from energized conductors given in Table 18-1 apply.
- Branches hanging on an energized conductor may only be removed using appropriately insulated equipment.

- Rubber footwear, including lineman's overshoes, is not considered as providing any measure of safety from electrical hazards.
- Ladders, platforms, and aerial devices may not be brought in contact with an electrical conductor. Do not rely on their dielectric capabilities.
- When an aerial lift device contacts an electrical conductor, the truck supporting the aerial lift device must be considered as energized.
- Storm work and emergency conditions create special hazards. In situations where energized electrical power conductors are involved, only authorized representatives of the electric utility system operator or owner—not telecommunication workers—may perform tree work.
- When an emergency condition develops due to tree operations, work must be suspended and the system operator or owner must be notified immediately.

For more information regarding tree trimming safety guidelines, see Chapter 39, "Tree Trimming Procedures."

Telecommunication Operations

Aerial Basket Operations

When operating aerial baskets, adhere to the following guidelines:

- Visually inspect the bucket truck at the first job of the day where a basket is used. With the basket empty, the lower controls must be operated and checked before anyone goes aloft.
- No one on the ground may operate the lower controls to the bucket truck or basket while someone is in the basket, except in an emergency or when following the direct orders from the employee in the basket.
- Park the truck out of traffic whenever possible.
- Ensure that the brakes are set before setting up the bucket truck. When parking on an incline, use chocks.
- Use outriggers when the vehicle is equipped with them.
- Before operating outriggers and/or stabilizers, employees should:
  - First check to see that everyone is at a safe distance from the equipment.
  - Notify employees outriggers are being deployed.
  - Place outrigger pads under each outrigger and/or stabilizer.
  - Position the outrigger pads on firm ground. Use cribbing and/or mats under the outrigger pads, when necessary, to provide a solid footing.
  - Make sure the equipment is level before operating the boom.
- Employees riding in a basket must wear an approved full body harness with a shock-absorbing lanyard properly attached to the boom.
- Employees may not climb into or out of the basket while the basket is elevated, except in an emergency. Employees may not use safety belts to attach themselves to a structure while working in the basket.

- Keep the operating control box clear of materials and tools. No objects, except approved storage containers, are allowed to hang on the outside of the basket when working in an energized area.
- Cradle the boom when the bucket truck is being moved. Do not ride in a basket when the bucket truck is moving.
- Do not exceed the load limit designated by the basket manufacturer when loading the basket.
- Employees must position themselves below energized equipment when working on it, when practical. Work may be performed on only one conductor at a time.
- Employees who are working in a basket must not wear climbing hooks.
- On a two-basket bucket truck, no employee can change basket position without the knowledge of both employees, except in case of an emergency. No tools or equipment can be rigged to the basket if it makes the basket unstable.
- Exercise good housekeeping in the basket.
- Each insulated aerial lift device must be electrically tested every 12 months or when any repair is made that might alter the insulating quality of the unit.

Operations from Poles and Structures (under 200 ft)

When working on or around poles and structures under 200 ft (60.96 m) tall, adhere to the following guidelines:

- Before climbing poles and structures, an inspection, using an approved method, must be made to determine if the poles or structures are capable of sustaining the additional or unbalanced stresses to which they will be subjected by climbing or adding or removing coax cables, antennas, or equipment.

Before climbing any pole or structure, perform an inspection to determine if it can be climbed safely.

- If the pole or structure cannot withstand the loads that will be imposed, the pole must be braced, guyed, or otherwise supported to prevent failure.
- Before climbing a pole or structure, the employee must become acquainted with the physical layout and condition of the pole, structure, guys, and equipment on the structure on which work is to be performed.
- When climbing, employees must not stand on any foreign equipment that might be attached to the pole or structure or located near it. Employees should not trust that antennas, coax, pins, brackets, braces, guy wires, lines, or other potentially unstable equipment can support their weight.
- When climbing or working on steel poles, towers, tanks, structures 4 ft (1.22 m) or more above the ground or equipment, employees must wear an approved harnesses with shock-absorbing lanyard (fall protection system). Complete fall protection is mandatory.
- When the steel pole, tower, or structure is equipped with a ladder cage, ladder climbing safety system, or other fall protection system, the ladder must be used according to the manufacturer’s instructions.

- When the steel pole, tower, or structure is not equipped with an approved fall protection system, a qualified employee may climb the structure using a "hook over hook," "First-Man-Up," or other procedure to install vertical lifelines or other approved fall protection systems. All other employees must ascend and descend using the installed fall protection system.
- When climbing wood poles and structures, an approved climbing belt with a safety strap must be used to ascend and descend the structure.
- When climbing wooden poles, care must be exercised to set the gaff securely in the pole and to avoid weather cracks, checks, knots, holes, nails, signs, grounds, or other pole attachments. All signs not owned by the power company must be removed from wood poles before climbing.
- When using climbing belts and safety straps, employees must visually verify that their safety snap is secure in the D-ring when strapping off.
- The safety belt must not be placed above the top-most attachment of the pole, the end of an arm, crossarm braces, or in any place where it might possibly slip off. The safety belt must not be placed around pins or similar parts of the structure that might break.
- Climbers must not be worn on the ground unless the employee plans to immediately climb another pole. If there are obstructions such as fences, large rocks, or uneven terrain, remove climbers before walking from one pole to another.
- Employees must use a gaff gauge to ensure that gaffs are properly sharpened and within safe length limits (11/4 inch (3.18 cm) minimum).
- When storing climbers, cover gaffs with approved protectors.
- When two or more employees work on the same pole, one must reach the working position before the other leaves the ground. Descend the pole one at a time.
- A handline must be hung from the structure any time employees are working on the pole.
- Employees must attach a safety strap around the pole upon reaching their work locations.
- An employee who has been trained in pole top or tower rescue techniques and who has the tools and the ability to climb the structure must be on the ground whenever employees are working aloft. The ground employee must have his or her climbing tools out and ready for use.
- Each aerial lift truck shall be equipped with a first-aid kit. This kit shall contain supplies for the treatment of burns and/or a water gel burn blanket.

Operations from Steel Structures (over 200 ft)

When working on or around steel structures over 200 ft (60.96 m) tall, adhere to the following guidelines:

- Design an adequate personnel platform, based on the following:
  - ❑ The platform itself, except the guardrail system and body harness anchorage, must be capable of supporting, without failure, its own weight and at least five times the maximum intended load.
  - ❑ The platform and the suspension system must be designed by a qualified engineer or a qualified person competent in structural design.

- ❑ The platform must be conspicuously posted with a plate that indicates the weight of the platform and its rated load capacity in personnel or maximum intended load.
- ❑ The platform must be equipped with a guardrail system that meets the following requirements:
  - A standard rail must have a top rail, intermediate rail, toe board, and vertical posts approximately 42 inches (1.07 m) in length.
  - The posts must be spaced no more than 8 ft (2.44 m) apart and must be able to take a force of 200 lb (90.72 kg) in any direction.
  - The platform must be solid or constructed of mesh with holes no larger than 1/2 inch (1.27 cm).
- ❑ A grab rail must be installed inside the entire perimeter of the platform.
- ❑ Access gates, if installed, must only be able to slide or swing inward. All gates must have a latch to lock them in position to prevent accidental opening.

- Provide headroom that allows employees to stand upright in the platform.
- Ensure that the platform protects employees from overhead if there is a danger of falling objects.
- Ensure that only a welder certified in American Welding Society (AWS) procedures fabricates or modifies the platform.
- Ensure that platforms are used only for employees, their tools, and the necessary materials to do their job.
- Ensure that employees, tools, and materials are evenly distributed so that the platform remains level when hoisted.
- Ensure that platform rigging adheres to the following guidelines:
  - ❑ If the cage is being lifted by a bridled sling, it must be connected to a master sling in a manner that ensures that the load is evenly distributed among all the bridle slings. This bridle configuration must not be used for any purpose other than to lift the personnel platform.
  - ❑ Hooks on overhaul ball assemblies, lower load blocks, or other attachments must have safeties that can be locked when closed.
  - ❑ All material must be of the ferrous alloy type and specified for lifting.
  - ❑ All eyes in the wire rope must be fabricated with thimbles.
  - ❑ All rigging material used for lifting on the platform must have a safety factor of 10.
  - ❑ Rotation-resistant or fiber core wire rope must not be used.
  - ❑ Energized rigging procedures require specific parameters.

Operations from Water Towers and Other Structures

When working on water towers, chimneys, and similar structures, 100% fall protection practices are required.

Operations from Roofs

When work is performed on elevated surfaces such as roofs or in attics, protection against falls must be considered. Fall arrest systems, which include lifelines, full body harnesses, and other associated equipment, are often used when fall hazards cannot be controlled by railings, floors, nets, and other means. These systems are designed to stop a free fall of up to 6 ft (1.83 m) while limiting the forces imposed on the wearer.

Fall Protection

For additional information, see Chapter 32, "Fall Prevention and Protection Guidelines".

Scope and Application

Fall protection is required for most construction activities whenever the work is performed in an area that is 4 ft (1.83 m) higher than its surroundings. Exceptions to this rule include work done from scaffolds, ladders, stairways, derricks, cranes and work involving electrical transmission and distribution. Also excluded is the performance of inspections, investigations, or assessments of existing conditions before the beginning or after the completion of construction.

Description

Fall protection is required whenever work is performed in an area 4 ft (1.83 m) above its surroundings and can generally be provided through the use of guardrail systems, safety net systems, or personal fall arrest systems. Where it can be clearly demonstrated that the use of these systems is not feasible or creates a greater hazard, a fall protection program that provides for alternative fall protection measures may be implemented (see the “Alternative Method” section).

Conventional Fall Protection Systems

A variety of fall protection systems are available, including:

- Covers
- Guardrails
- Personal fall arrest systems
- Positioning device systems
- Safety monitoring by a competent person
- Safety net systems
- Warning line systems

Additional Precautions

Protection from falling objects should also be provided. Keep work surfaces clear of material and remove debris at regular intervals. Use toe boards to prevent objects from being inadvertently kicked to a lower level. When necessary, canopies should be provided.

Alternative Method

When conventional fall arrest systems cannot be used in attics or on roofs because they create a greater hazard or are not feasible, adhere to the following guidelines to protect employees from fall hazards:

- Only employees who have been trained in the alternative methods of fall protection are allowed in attics and on roofs and only as necessary to complete the construction of the systems being installed. Affected employees must be trained to ensure they have specific awareness of the fall hazards associated with work in attics and roofs.
- Materials and equipment for the work to be performed must be located conveniently and close to the employees.
- Materials and other objects that could pose impalement hazards must be kept out of the area beneath the employees, or they must be properly guarded.
- While attic or roof work is in progress, employees not involved must not stand or walk below or adjacent to any openings in the ceiling where they could be struck by falling objects.
- When adverse weather (such as high winds, rain, snow, or sleet) is creating a hazardous condition, roofing operations must be suspended until the hazardous condition no longer exists, unless safe footing can be ensured for workers on top of the roof.

Inspection of Poles and Structures

Before climbing poles and structures, an inspection by a qualified person shall be performed. When inspecting the pole, the following conditions must be checked.

General Condition

The pole should be inspected for buckling at the ground line and for an unusual angle with respect to the ground. Buckling and odd angles might indicate that the pole is rotten or is broken.

Cracks

The pole should be inspected for cracks. Horizontal cracks perpendicular to the grain of the wood can weaken the pole. Vertical ones, although not considered to be a sign of a defective pole, can pose a hazard to the climber, and employees should keep their gaffs away from such cracks while climbing.

Holes

Hollow spots and woodpecker holes can reduce the strength of a wood pole.

Shell Rot and Decay

Rotting and decay are cutout hazards and are possible indications of the age and internal condition of the pole.

Knots

One large knot or several smaller ones at the same height on the pole might be evidence of a weak point on the pole.

Depth of Setting

Evidence of the existence of a former ground line substantially above the existing ground level might indicate the pole is no longer buried to a sufficient extent.

Soil Conditions

Soft, wet, or loose soil might not support any changes of stress on the pole.

Burn Marks

Burning from transformer failures or conductor faults could damage the pole so that it cannot withstand mechanical stress changes.

Testing of Wood Poles

The following tests are recognized as acceptable methods of testing wood poles:

Hammer Test

Rap the pole sharply with a hammer weighing about 3 lb (1.36 kg), starting near the ground line and continuing upward circumferentially around the pole to a height of approximately 6 ft (1.83 m). The hammer will produce a clear sound and rebound sharply when striking sound wood. Decay pockets will be indicated by a dull sound or a less pronounced hammer rebound. Also, prod the pole as near the ground line as possible using a pole prod or a screwdriver with a blade at least 5 inches (12.70 cm) long. If substantial decay is encountered, the pole is considered unsafe.

Rocking Test

Apply a horizontal force to the pole and attempt to rock it back and forth in a direction perpendicular to the line. Caution must be exercised to avoid causing power lines to swing together. The force may be applied either by pushing with a pike pole or pulling with a rope. If the pole cracks during the test, it must be considered unsafe.

- If the pole or structure cannot withstand the loads that will be imposed, it must be braced, guyed, or otherwise supported so as to prevent failure.
- Before climbing a pole or structure, the employee must become acquainted with the physical layout and condition of the conductors, poles, guys, and equipment on the structure on which work is to be performed.
- When climbing, employees must avoid standing on any foreign equipment that might be attached to the pole or structure or located near it. Employees should not trust their weight to pins, braces, guy wires, lines, or other such equipment that might be unstable.
- When climbing wooden poles, care must be exercised to set the gaff securely in the pole and to avoid weather cracks, knots, holes, nails, signs, grounds, or other pole attachments. All signs not owned by the power company must be removed from wood poles before climbing above them.
- When attaching the safety strap snap to the D-ring of a body belt, employees must visually verify that the snap is attached to the D-ring before relying on the strap to support their weight.

- The safety belt must not be placed above the top-most attachment of the pole, at the end of an arm, on crossarm braces, or in any place where it can slip off. The safety belt must not be placed around pins or similar parts of the structure that might break.
- Climbers must not be worn on the ground unless the employee plans to immediately climb another pole. If there are obstructions such as fences, large rocks, or uneven terrain, climbers need not be removed before walking from one pole to another.
- Employees must use a gaff gauge to ensure gaffs are properly sharpened and within safe length (1-1/4-inch minimum) limits.
- When climbers are stored, the gaffs must be covered with approved protectors.
- When two or more employees are to work on the same pole, one must reach the working position before the other leaves the ground. Descending the pole must be done one at a time.
- A handline must be hung from the structure anytime employees are working on the pole.
- Employees must attach a safety strap around the pole upon reaching their work location.
- An employee who has been trained in pole top/tower rescue techniques and who has tools and the ability to climb the structure must be on the ground whenever employees are working aloft. The ground employee must have the climbing tools out and ready for use.
- When climbing poles that support energized parts, a water-gel burn blanket must be readily available at the work location.

Verifying Utility Locations and Potholing

The following guidelines must be followed to ensure safety during any work operations where underground utilities might be encountered:

- The location of all identified utilities must be verified using nondestructive methods of excavation.
- If any risk to the utility from the work activity is present, a “window” must be excavated at or near the utility to visually monitor the potentially hazardous situation.
- Exposed existing utilities must be adequately protected and supported.
- When crossing or running parallel to existing utilities within 3 ft (0.91 m), the utilities shall be visually confirmed by exposing the buried utility at appropriate intervals.
- Because of a high risk and hazard potential, a competent person must visually confirm the location of gas lines, electrical utilities, fiber, and communication lines within the immediate vicinity of the work taking place.
- Contract documents and state and local regulations must be checked to determine responsibility for verifying locations of unmarked utilities.
- When utilizing high-pressure water for verifying utility locations, the proper PPE shall include long-sleeved arm protection, di-electric shoes/boots or overshoes, safety glasses and face shield, and Class 3 rubber insulating gloves.

As a general guide to identifying utilities, the standard surface marking colors are shown in Table 18-4.

Table 18-4 Surface Marking Colors

Color	Utility
Red	Electric power, including street lighting
Yellow	Gas, oil, steam, and petroleum
Blue	Water and irrigation
Green	Sewer and storm drains
Orange	Fiber optic, telephone, and cable TV
Pink	Temporary survey markings
White	Proposed construction area or work limits
Purple	Reclaimed water

Underground Operations

The provisions of this section apply to guarding manholes and street openings and the ventilation and testing for gas in manholes, vaults, and other confined spaces where telecommunication work is performed on or with underground lines.

The requirements set forth under Chapter 22, “Confined Space and Vessel Entry Procedures” also apply to opening and entering manholes, vaults, and other identified confined spaces.

When covers of manholes or vaults are removed, ensure that the opening is properly guarded by a railing, temporary cover, or other suitable temporary barrier to prevent accidental falls through the opening and protect employees working in the manhole from foreign objects entering the manhole.

While work is being performed in the manhole, ensure that a person with basic first aid training is immediately available to render assistance if a potential safety hazard exists. Examples of manholes work site hazards considered to constitute a safety hazard include but are not limited to:

- Manhole work sites where safety hazards are created by traffic patterns that cannot be corrected.
- Manholes work sites that are subject to unusual water hazards that cannot be abated by conventional means.
- Manhole work sites that are occupied jointly with power utilities.

Before an employee enters a manhole:

- Test the internal atmosphere for oxygen deficiency and combustible gas.
- Ventilate and make the area safe before entry when unsafe conditions are detected by testing or other means.

Provide an adequate continuous supply of air while work is performed in manholes under any of the following conditions:

- Combustibles or explosive gas vapors have been initially detected and subsequently reduced to a safe level by ventilation
- Organic solvents are used in the work procedure
- Open flame torches are used in the work procedure
- The manhole is open to vehicular traffic or exposed to seepage of gases
- Toxic gas or oxygen deficiency is found

Use a ladder to enter and exit manholes deeper than 4 ft (1.22 m).

When open flames are used in manholes, take the following precautions to protect against the accumulation of combustible gas:

- Test for combustible gas immediately before using the open flame device and at least once per hour while using the device.
- Do not allow a fuel tank (gas cylinder) in the manhole.

Erection of Telecommunication Towers

General Requirements

All supervisors and tower crews must possess the necessary skills to install, dismantle, and rig towers safely. No one should attempt to install or dismantle any tower or tower component without the necessary skills and experience. The Company shall ensure crewmembers are physically capable of safely performing assigned tasks.

Planning

The Company shall supervise, and direct the installation, and shall be responsible for all construction means, methods, techniques, sequences, and procedures. Before beginning tower erection, the Company shall:

- Establish an emergency response plan and review it with all site personnel.
- Obtain and review tower erection drawings, installation, and erection manuals.
- Inspect tower foundation to ensure that it is installed per design. Concrete strength shall be verified to ensure that it meets or exceeds the minimum strength requirements.
- Identify any potential hazards such as overhead power lines or buildings.
- Identify the proper precautions to be followed for crane operations.
- Assess if the tower can be assembled on the ground, doing so will eliminate fall hazards associated with the task.
- Ensure that tools, cranes, rigging, and machinery brought to the site are in good condition and properly equipped with safeguards.
- Select appropriate ladders for the task. Inspect the ladders to ensure that they are in good condition.

- Ensure proper means of electrical grounding are available for the tower that meets local, state, and national codes, including if cranes need to be grounded when working near power lines.
- Conduct a JTSA to ensure that supervisors and their employees review hazards and develop appropriate control measures for each significant task.
- Develop a safe rigging plan.
- Select the most appropriate means of accessing the tower. Considerations must be given to the use of crane suspended personnel platforms or aerial lifts.
- Ensure that tower erection activities are not performed during severe weather (heavy winds, lightning, ice, and so on).
- Check condition of safety climb pegs and other structural connections to ensure safe climbing surface/anchor points.

Tower Delivery and Offloading

- Take special care during the unloading, hauling, and offloading to prevent personnel injury or damage to the tower and its component parts. Never stand under a suspended load.
- Establish and communicate laydown area boundaries to all personnel. Establish laydown areas well away from power lines.
- Use tag lines when lifting tower components by crane or other lifting devices (boom truck, gin poles, and so on).
- Do not roll or drop any sections from the truck to the ground.
- Do not drag or stack the components in such a way that personnel injury or damage may occur.
- Ensure that all tower components are present and in satisfactory condition. The manufacturer shall be contacted for any missing or damaged parts.
- The use of misused, damaged, overloaded, or used parts is prohibited.
- Place blocking/cribbing (consisting of hardwood lumber or other suitable materials) so that it will allow the removal of slings and rigging.

Erecting Towers

- Maximize ground assembly to reduce potential fall hazards.
- Install climbing pegs, step bolts, or ladder sections while the tower pieces are still on the ground.
- Check that all bolting is completed and tightened to AISC standards. Double worker verification is a good practice.
- Check material grade on structural bolts.
- Some towers supply nut-locking devices that shall be used when required.

- Before lifting the first piece of steel:

  Plan for the installation, use, and removal of temporary vertical lifelines (rope and/or retractable) used for fall protection. In most cases, excessively long sections of lifeline can be eliminated if a ground crew member attaches and detaches lifelines to each new section being raised. Rope lifelines shall be tethered to the tower or weighted to allow free travel and operation of rope grab devices.
- Install the permanent safety climb as soon as possible.
- Use tag lines when lifting tower components by crane or other lifting devices (boom truck, gin poles, and so on).
- Install antenna mounts to the maximum extent possible on the ground.
- Any temporary or permanent attachments (antennae arms/platforms) made to the tower or structure shall not interfere with the climbing ladder, step bolts, or safety climb device.
- No welding (including exothermic welds) or drilling, unless noted on the drawings of the tower structure, will be permitted at any time. Any repair or alteration shall be done per architectural and engineering drawings.
- Repair to galvanized surfaces can be typically accomplished with hot stick or zinc rich paint for galvanizing surfaces. Fumes from welding or burning galvanized surfaces are hazardous; follow the proper precautions.

Specific Towers/Poles

Monopole Slip Joints

Slip joint assemblies require the proper amount of overlap. The manufacturer's structural drawings usually list the design slip value and the allowable overlap range and target values. Inspection of the internal area of the slip joint and mating surfaces should be conducted prior to erection. A clean inside surface free of galvanizing build up of debris will save problems during the installation and ensure a proper fit.

Guyed Towers

- Cranes should be used to the maximum extent possible in guyed tower installation.
- Guyed towers are not self-supporting at any height; use of temporary steel guys may be required.
- When it is impractical to use a crane, use a tugger/winch and/or gin pole as an acceptable alternative.
- Use of tugger/winch and gin poles requires:
  - Operator training.
  - Careful planning to ensure load rating.
  - Verification of satisfactory equipment condition before use.

Critical areas of attention during installation are: Guy Radius to the distance specified, anchor elevation, anchor alignment, anchor rod slope, anchor rod alignment with guy radius, anchor head plumb ness, guy wire initial tension. All tolerances should be within manufacturer's tolerances.

- Guy wires shall be free of kinks.
- Guy wires shall be grounded by mechanical means.

Self-Supporting or Lattice Towers

- Caution must be taken when erecting pre-assembled horizontal sections from the assembly area to the vertical position. Racking may cause damage to the assembly. A second crane or tail hook may be required, depending on the size of the assembly.
- Face spread dimension center to center of anchor bolts circles should be according to manufacturer's tolerances.
- Maximum difference between any two foundation elevations should be according to manufacturer's tolerances.
- Wave guides shall not be used as personal fall protection anchorage points.
- Personnel shall not use wave guides as climbing devices.

Existing Tower

Before climbing:

- Conduct pre-climb safety meeting (JTSA).
- Inspect the tower from the ground for missing members, obvious structural damage, bent supports, excessive corrosion, insect and bird nests, ice build-up, and so on. (Use of binoculars is recommended.)
- Inspect the safety climb and ensure that it is free of obstructions and in good condition.
- Ensure that the step bolts are aligned, evenly spaced, and completely secured throughout the structure.
- Ensure that the area to be accessed is free from obstructions.
- Determine the potential exposure to RF radiation near or in front of any operating antennae.
- Identify possible anchorage points for fall protection devices.
- Identify nearby hazards (power lines, AM transmission sources, other RF generating sources, and so on).
- Develop appropriate control measures to address identified hazards adequately.

Securing Materials Safely While Working in Elevated Areas

Plan and schedule work to prevent employees from working above one another. However, if the sequence of tasks requires such work to be performed, then a JTSA shall be conducted and should focus on preventing dropped items.

- All material and equipment shall be secured, as required, to prevent falling hazards.
- At a minimum, scaffolds shall be constructed with netting to the mid-rail whenever scaffolding is directly over passageways or over personnel working below.
- At a minimum, scaffolds shall have toe boards installed on decks where personnel are working or traversing under the scaffold.
- Canvas bags or suitable and secure alternatives shall be used for raising and lowering tools/equipment.
- Barricaded areas shall be established as needed below overhead work.
- Employees should utilize the “twist method” when passing material. The “twist method” allows an employee to twist the material upon receiving, before the sender releases the material. This should ensure the receiver has control of the load before the sender releases the load.
- Material shall be raised or lowered one item at a time (if larger than bag) to prevent over-loading.
- While climbing, employees should maintain 3-point contact (hands free while climbing).
- While working overhead, employees shall secure hand tools to themselves by lanyards.
- In some cases, “Danger, Do Not Enter” barricades are necessary to protect employees and members of the public.

Safety Meetings

Safety meetings are an integral part of a proactive safety management process. There are many types of safety meetings held.

Daily, before the start of work, the crew generally should hold a documented tailgate safety meeting. The meeting should focus on safety issues relevant to the work processes to be performed that day, along with reminders regarding the safe use and inspection of the tools and equipment required for the tasks to be performed that day. The crew should also discuss any near-misses, noncompliance, or other safety issues that were encountered the previous day.

A weekly safety meeting will be held on each jobsite. The purpose is to cover subjects of great importance and relevance to the success of the job. The subjects discussed and attendance will be documented by signing a meeting roster. These meetings supplement and support the safety training provided for all employees. Weekly safety meetings will generally last between 15 and 30 minutes.

The topics may be:

- Pre-chosen and information sent to the field by the Corporate Office and/or Operating Unit.
- Pertinent to the work being performed.
- Tools and equipment being used in the field.

- Work procedures and policies of the client/customer.
- Issues related to the crew's activities.
- "Special" safety meetings, which may be called when:
  - An incident occurs on a jobsite.
  - Non-compliance was observed.
  - New work practices and/or policies are implemented.
  - New tools and/or equipment are introduced into the work area.
  - Other reasons.

Job Task Safety Analysis

Each day, before the start of each workday, the supervisor/foreman (person in charge) or their designee, should conduct a job briefing or Job Task Safety Analysis (JTSA) with the employees involved (see Chapter 29). The purpose of the JTSA is to identify the hazards associated with the scope of work, determine the safety precautions that will be implemented, and the required PPE by the crew performing the work assignment. The JTSA helps ensure that all members of the crew understand the work assignment and acknowledge that they understand and will follow the safety plan established to complete the work assignment. The JTSA should be documented and signed by all crewmembers. Refer to Sample 18-1. The following are requirements for the JTSA:

- The foreman (person in charge) should assemble the crew at the job site and explain the work to be done, and outline the steps to be followed.
- The foreman (person in charge) and the members of the crew will identify the hazards of the job. The crew should identify appropriate controls to eliminate, mitigate, control, or reduce the accident-producing potential of the hazards.
- If the hazards cannot be eliminated from the jobsite, the JTSA should list how the hazards can be mitigated, controlled, or reduced. This may be done by:
  - Dedicated assignment of work responsibilities.
  - Methods to isolate or control the hazard.
  - Other forms of protection (PPE, training, others) to reduce the hazard to the employees.
- The foreman (person in charge) must ensure that each member of the crew understands all instructions given.
- If the work or operations to be performed during the workday or shift are repetitive and similar, at least one JTSA should be conducted before the start of the first job of each day or shift. An additional JTSA should be completed and a meeting held with the members of the crew if significant changes that might affect the safety of the employees occur during the course of the work. Significant changes include changes in the scope of the work, work assignments, crew structure, crew leadership, environmental conditions, or when other hazards (not originally noted) are determined to be present in the workplace.

- The discussion should be in such detail that all employees, by virtue of training and experience, can reasonably be expected to recognize and avoid the hazards involved in the job. A more extensive discussion should be conducted if the work is complicated or particularly hazardous or if the employee cannot be expected to recognize and avoid the hazards involved in the job.
- The foreman (person in charge) is responsible for accounting for all employees after the completion of each job.

Sample 18-1. Job Task Safety Analysis—Telecommunications/Cable

Job Task Safety Analysis - Telecommunications/Cable

Company Name:	**Date:**	**Time:**	**Job #:**
Location:		**City:**	**State:**
Describe job task:			
Competent Person Trenching / Excavation:		**Soil Classification:**	
Person responsible for First Aid / CPR:			
Name and Location of Emergency Medical Facility:			
Location of the AED:		**Emergency Contact Number: 911**	

PPE Required (Yes / N/A)
- Hardhat
- Safety Glasses/Goggles
- Hearing Protection
- Leather Gloves
- Boots/Foot Protection
- Face Shield
- Welding Hood
- Chemicla Gloves
- Di-electric Gloves
- Air Test (Electrical PPE)
- Reflective Vest
- Respirators
- Fire Retardent Clothing
- Personal Flotation Device
- Chainsaw chaps

Fall Protection
- "Buck Squeeze"
- Full Body Harness/Lanyard
- Climbing Belt
- Qualified Climber
- Warning Line[illegible]
- Safety Mon[illegible]
- Barricade[illegible]ol Zo[illegible]
- Falling [illegible]rotection
- Daily In[illegible]

Aerial Lift[illegible]
- Qualified [illegible]
- Wheels Chocked
- Lower Control[illegible] Operati[illegible]
- Warni[illegible]
- Control[illegible]
- Outrigge[illegible]

Ladders
- Daily Inspection
- Warn./Usage Labels Affixed
- 3 Feet Above Landing
- Ladder Secured

Confined Space (Yes / N/A)
- Competent Person
- Permitted/Non-Permitted
- Calibrated Monitor
- Continous Monitoring
- Hole Watch
- Man Hole Guard
- Forced Ventilation
- Rescue Equipment
- Resc. Team/Serv. Identified
- Hot Work Permit
- Warning Signs
- Written Program on Hand
- Contractors Notified
- Confined Space Log Book

Excavations
- Competent Person
- Utilities Located
- [illegible]ity of Adj. St[illegible]
- [illegible]assification
- [illegible] of Spoil [illegible]
- [illegible]d Load Pr[illegible]
- W[illegible] Trench
- La[illegible]mps ([illegible])
- La[illegible]cured
- Sto[illegible]ching
- [illegible]m
- [illegible]
- Atmo[illegible]ted
- Daily/[illegible] Inspection
- Warning System
- Emergency/Rescue Equip.
- Log Book

Sanitation
- Water (Marked as Potable)
- Single Use Cups
- Clean Restrooms
- Hand Wash Station

Traffic Control (Yes / N/A)
- Traffic Control Plan
- Right/Left Lane Closed
- Sign - Flagman Ahead
- Sign - Construction Ahead
- Arrow Board
- Message Board
- Traffic Control Zone
- Advance Warning Area
- Transition Area
- Buffer Space
- Work Area
- Termination Ar[illegible]
- Barric[illegible]
- [illegible]top/S[illegible]

[illegible]nes/D[illegible]errick[illegible]
- [illegible]ualif[illegible]ator
- [illegible]nnua[illegible]ion
- [illegible]aily [illegible]
- [illegible]ire E[illegible]
- [illegible]edic[illegible]al Person
- [illegible]ualif[illegible]al Person
- [illegible]iggin[illegible]ment Inspected
- [illegible]heel[illegible]
- [illegible]arni[illegible]Light
- [illegible] and Charts
- Protec. from Susp. Loads
- Qualified Riggers
- Outrigger Pads
- Crane Signals Posted

Medical
- First Aid Kit
- Bloodborne Pathogen Kit

HDD
- Dielectric Boots
- Dielectric Gloves
- 2-way Radio Communication
- SLD
- Strike Alert Operational

Electrical (Yes / N/A)
- Daily Inspection of Tools/Cords
- GFCI/Assured Grounding
- Hot Work-Authorized Person
- Survey of Daily Conditions
- Operating Voltage
- Elevated Structures Inspected
- Minimum Safe Di[illegible]
- Energi[illegible]

Lockout/[illegible]
- Comp[illegible]on
- Locko[illegible]dure
- Volta[illegible]
- Groun[illegible]
- Electri[illegible]ester

Gas Cyli[illegible]
- Stored[illegible]
- Valve[illegible]
- [illegible]yge[illegible]
- [illegible]ntai[illegible]y Labeled
- [illegible]cured to Prevent Falling
- Inspections/Certificates
- Stored Away from Heat
- Proper Ventilation
- Warning Signs

Miscellaneous
- Fire Extinguisher
- RF Exposure
- Laser Exposure
- Daily AED Check

Power Lines
Power Company must be notified when work is conducted near ANY electrical power line. (Yes / N/A)

SAMPLE

Work assignments not addressed above shall be outlined below

All employees must print and sign their names below

Printed Name	Signature	Printed Name	Signature
1.		5.	
2.		6.	
3.		7.	
4.		8.	

Foreman Signature ____________ **Safety Rep. Signature** ____________

NOTE: Additional Job Briefing will be required when scope of work changes and/or conditions change

1. Have overhead lines been located and have proper precautions been identified?
2. Have all employees received training and are qualified to perform the tasks to which they have been assigned?
3. List injuries, incidents, first aid and near miss cases that occur at the job site during the course of the day:

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Pipeline Safety

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes for work on gas distribution systems, gas transmission systems, and liquid gas or oil pipelines.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

General Requirements

These policies and procedures address specific hazards associated with performing work on any pipeline system. Before performing work on any pipeline system, employees must be trained in the operating procedures for the utility and/or pipeline operator. Employees must also be trained and certified in each task associated with performing the work (per the requirements of the Company Operator Qualification Program). These rules apply to work on gas distribution systems, gas transmission systems, and liquid gas or oil pipelines.

Personal Protective Equipment

When working with pipeline systems, observe the following guidelines regarding PPE:

- Wear clothing on the job that is suited for the conditions surrounding and type of work being performed and the weather encountered.
- Wear clothing made from natural fibers, such as cotton or wool. Do not wear synthetic materials, such as polyester and nylon. Many jobs and clients require fire retardant (FR) clothing.
- Do not wear loose clothing when working around liquids, burning or blowing gas, or moving equipment.
- Wear safety glasses at all times and any additional eye protection required for safety-sensitive tasks.

- Wear sturdy, leather footwear on the job. Footwear that rises above the ankle provides the best ankle support. Puncture-resistant soles with oil, chemical, and slip resistance are recommended. Safety-toed shoes and boots are recommended and might be required on certain projects or by the policy of the utility and/or pipeline operator.
- Wear hand protection appropriate for the job being performed. Follow these rules for hand protection:
  - Wear gloves appropriate for the situation when handling materials or when using tools that can cause blisters, burns, cuts, or other injuries to the hands.
  - Wear gauntlet-type, heat-resistant gloves during all “hot” work.
- Wear hardhats on the jobsite.
- Wear hearing protection in all designated areas and when working on or around many pieces of equipment (see Chapter 37, “Hearing Conservation Policy”).
- Use an air-supplied breathing apparatus in any atmosphere with an oxygen level of less than 19.5% or greater than 23.5% or in any other hazardous atmospheres (see Chapter 22, “Confined Space and Vessel Entry Procedures”).
- Use any other appropriate specialized PPE when necessary to minimize hazards.

Fire Extinguishing Procedures

Fires involving natural gas, flammable liquids, and any other gases are considered Class B fires. When dealing with these fires, observe the following guidelines:

- Stop the flow of gas before extinguishing the fire. Burning gas will not explode, but escaping gas can ignite at any time.
- Extinguish Class B fires with dry-chemical extinguishing agents.
- Ensure that all extinguishers are properly maintained and display an up-to-date inspection tag.
- Know the location of fire extinguishers and ensure they are present in the work area.

Fire Prevention

Good housekeeping and common sense are the keys to fire prevention. Follow these guidelines for fire prevention:

- Do not allow ignition sources, which include sparks from torches and electrical arcs, where flammable liquids, gases, or escaping gas might be present.
- Do not smoke where “No Smoking” signs are displayed, flammable or combustible materials are present, or there is a possibility of escaping gas.
- Ensure that an employee trained in the use of a dry-chemical fire extinguisher is present if there is a potential for escaping gas.

Properties of Natural Gas

Natural gas is a naturally-occurring substance, which consists of approximately 93% methane. The health hazard associated with natural gas is asphyxiation, as natural gas replaces the oxygen in the air. Natural gas is:

- A simple asphyxiant.
- A nontoxic substance.
- A nonpoisonous substance.
- Colorless.
- Odorless, in its natural state.
- Lighter than air and rises when released.
- Flammable only when the correct fuel to air mixture and a suitable ignition source are present. Those parameters are:
  - Explosive range—5 to 15% of gas to air
  - Ignition temperature—1,100 to 1,200 ° F (593.33 to 648.89° C)

To accurately detect the level of airborne natural gas, a combustible gas monitor (calibrated for methane) is required when performing work.

Ignition Sources

Natural gas can be ignited by some common sources, such as:

- Electrical components found on vehicles
- Diesel or gasoline powered vehicles, construction equipment, and machinery
- Electrical equipment that is neither intrinsically safe nor explosion proof (telephones, pagers, doorbells, appliances, radios, and flashlights)
- Open flames
- Static sparks
- Smoking materials
- Overhead power lines

Never use an open flame to check for the presence of natural gas or locate a gas leak.

Controlling Natural Gas

Natural gas is safe when controlled. In the event a gas main or service line is damaged, the escaping gas can be released from pressures up to 300 psi. As a general rule, in any gas emergency:

- Do not turn off any main valves unless instructed to do so by the gas company.
- Do not cut any locks off equipment.
- Do not attempt to stop the flow of gas unless trained and instructed to do so.
- Do not force plugs into damaged piping.

- Do not backfill an excavation where gas is escaping.
- Do not attempt to enter any excavation where gas is escaping.
- Make any admissions, statements, or responses to questions from the press.

Open-Air Leak

When natural gas is released into the atmosphere, it rises and diffuses rapidly. Stay upwind of the leak and:

- Call the gas company immediately.
- Call the Fire Department.
- Clear the area and keep unauthorized people away from the area.
- Do not attempt to stop the gas flow by burying it because underground migration will occur.
- Eliminate all ignition sources.
- Shut down all vehicles, machinery, and equipment.
- Monitor the blowing gas with an attended dry-chemical fire extinguisher.

Underground Leak

Natural gas escaping underground is under pressure and follows the path of least resistance. It might rise through the soil in another location, follow the path of previously disturbed soil, or enter a building through a foundation, sump, or drain. Gas can enter sewers in the same manner. When natural gas is escaping underground:

- Call the gas company immediately.
- Eliminate all ignition sources.
- Check the building closest to the leak, and all buildings in the immediate vicinity of the leak.
- Evacuate any building where gas is detected.
- Monitor the leak site with an attended dry-chemical fire extinguisher.

If an underground gas main or service line has been pulled or snagged, assume that there might be an underground leak and follow the preceding steps.

Leak With Fire or Explosion

Under certain conditions, escaping gas can cause a fire or explosion. Prompt action must be taken to avoid injury or loss of life. If a fire or explosion occurs:

- Call the fire department immediately.
- Call the gas company.
- Check adjacent buildings for the presence of gas.
- Evacuate any building where gas is detected.

- Shut off the service valve on the meter riser if gas is detected in a residence.
- Keep unauthorized people away.
- Do not attempt to extinguish the fire.

Burning gas will not explode, but after the initial fire is extinguished, leaking gas can ignite, which usually results in an explosion. Never assume that all of the leaking gas is being consumed by the fire. There can be multiple sources of leaking gas.

Operating Safety Procedures

Bonding

Install approved bonding wire before disassembling, joining, or grinding any gas main, service line, or fuel line, whether the gas main, service line, or fuel line is live or retired. Do not remove the bonding wire until the piping is connected or capped.

Chains

Use chains to secure equipment on all trailers. Chains must be used safely and comply with all regulations and manufacturer's specifications. Follow these rules for chain use:

- Tie down equipment on trucks with a minimum of four attachment pins.
- Follow the recommended working load limits for alloy steel chain.
- Ensure that all mechanically assembled hooks, rings, or couplings meet or exceed chain working load limits. Do not overload attachments. Replace damaged attachments immediately.
- Inspect chains before each use.
- Ensure that the chain has an ID tag, attached by the manufacturer, stating its capacity and other important information. Never use a chain with a missing tag.
- Use only alloy steel hooks that are the proper rating for the attached chain.
- Properly set the load into the bowl (throat) of the hook.

Excavations

If natural gas is suspected in an excavation, test the atmosphere for the presence of gas using a combustible gas monitor before entering.

Always provide proper work area protection. Never leave the area when an excavation is open without protecting the area and ensuring public safety. For additional information, see Chapter 23, "Trenching and Excavation."

Ladders

A ladder or ramp should be provided for access to any excavation with a depth of 4 ft (1.52 m) or greater. Set ladders on stable surfaces. Ramps should be constructed at a 30-degree slope. For additional information on ladders, see Chapter 31, "Ladders and Scaffolds."

Loading and Unloading Equipment

When loading and/or unloading pipe and equipment (dozers, backhoes, trackhoes, plows, bore rigs, etc.) from a trailer, set the parking brake on the truck and chock the wheels. When parked on an incline, chock the trailer tires, also.

Lifting Pipe and Other Equipment

When lifting piping or equipment, observe the following guidelines:

- Follow all manufacturer recommendations for crane lifting and rigging.
- Do not use welded or flange-mounted hooks.
- Use inspected, tagged lifting chains or slings that are properly rated for the load being lifted.
- Use tag lines to steady and position the load.
- Do not suspend piping or equipment above any person.
- Move the load slowly.

Synthetic Web Slings

When using synthetic web slings to move piping or other objects, observe the following guidelines:

- Use only approved and tagged synthetic web slings.
- Inspect each synthetic sling before each use. Replace worn or damaged slings immediately. Remove from service, cut up, and discard any defective synthetic web slings.
- Ensure that slings are of an adequate width to prevent slippage or damage to the object being lifted.
- Do not load slings beyond the marked load capacity.

Grinding

- Always wear eye protection and a face shield.
- Never use any portable grinder without all grinder guards in place and fully operable.
- Use grinders and grinding wheels only within the maximum safe operating speed of the grinder or wheel being used.

Machine Wire Brushing

When performing wire brushing operations, observe the following guidelines:

- Always wear eye protection and a face shield.
- Never use wire brush wheels in an explosive atmosphere.
- Do not use wire brush wheels where flying particles can contaminate or damage equipment.
- Wear long sleeves when machine wire brushing.

- When using a portable grinder for machine wire brushing, make sure all guards are in place and fully operable.

Manholes and Confined Spaces

Manholes must be properly tested for oxygen content (O_2), presence of carbon monoxide (CO), flammability (lower explosive limit (LEL)), and hydrogen sulfide (H_2S) before entry.

When entering manholes or confined spaces, wear a full-body harness and lanyard attached to and in the control of a trained attendant. A retrieval system must be in place for emergency removal. For additional information, see Chapter 22, "Confined Space and Vessel Entry Procedures."

Safe Pipe Entry

At times, it might be necessary to enter a pipe to perform some needed work. This section describes the hazards associated with open pipe and outlines the precautions that must be followed to ensure safe entry and exit from the pipe. Typical pipe hazards include:

- Exposure to toxic, corrosive, or flammable chemicals
- The presence of or the potential release into the pipe of gases or liquids that are dangerous, could displace the oxygen, or engulf the entrant
- Oxygen levels insufficient to support life

Because a pipe might have the potential to contain a hazardous atmosphere, before entering any pipe, a competent person must determine if a hazardous atmosphere exists. For additional information, see Chapter 22, "Confined Space and Vessel Entry Procedures."

Safety Restrictions

Do not enter a pipe if it is being moved or worked on, i.e. welding, grinding, electrical coating inspection or recoating.

Only one individual shall enter a pipe at one time.

If any of the following conditions exist, a permit is required to enter a pipe and the procedures outlined in the Confined Space Entry program must be followed.

- The pipe line has been in service, has carried product, or is filled with water
- Gases or liquids could be released into the pipe by way of an attached pipe, hose, storage container, or tank.

Supervised Entry

If any of the following conditions exist, the atmosphere in the pipe shall be tested and acceptable and a pipe-entry attendant shall be standing by.

- One end has a nonremovable cap
- The pipe was filled with a shielding or purge gas, i.e. argon or nitrogen
- Welding has taken place and the pipe has not been ventilated.

The entrant shall wear an extraction harness or utilize a wheeled frame; i.e. a creeper or scooter and a lifeline shall be attached and secured outside the pipe.

Unsupervised Entry

Under the following conditions atmospheric testing and a pipe-entry attendant are not required to enter a pipe:

- There is an unobstructed line of sight from one pipe end to the other pipe end;
- Both pipe ends are open and the pipe has been ventilating for at least one hour;

If the pipe diameter is less than 36 inches (91.44 cm) or tapers down to less than 36 inches, or if the pipe is sloped at such an angle that an incapacitated entrant could not be removed by normal means, then the entrant shall:

- Wear an extraction harness
- Utilize a wheeled frame, (i.e. a creeper or scooter)

When a harness is worn or a creeper is utilized, a lifeline shall be attached and extended outside the pipe

Atmospheric Testing

A trained individual, as determined by the Company, shall make appropriate tests of the pipe atmosphere to ensure the atmosphere is safe to enter and remain in. Continuous monitoring of the atmosphere is required if there is a potential for harmful air contaminants to be introduced into the pipe. If ventilation with a positive mechanical exhaust is used, it must not recirculate contaminated air and the rate should be a minimum of twelve air changes per hour.

Entrant

An individual authorized to enter a pipe under supervised or unsupervised conditions. The entrant shall:

- Know the hazards that might be faced during entry including information on the mode, signs or symptoms, and consequences of exposure or oxygen deficiency.
- Communicate with the pipe-entry attendant, as necessary, to enable the attendant to monitor entrant status and to alert the entrant of the need to evacuate the pipe.
- Alert the pipe-entry attendant and exit from the pipe as quickly as possible whenever the entrant recognizes any warning sign or symptom of exposure or oxygen deficiency or detects a prohibited condition.
- Exit from the pipe as quickly as possible whenever an order to evacuate is given by the pipe-entry attendant.

Entry Attendant

An individual stationed outside the pipe who monitors the entrant and who performs all the following pipe-entry attendant's duties. A pipe-entry attendant shall:

- Know the hazards that may be faced during entry, including information on the signs or symptoms and consequences of exposure or oxygen deficiency.
- Remain outside the pipe during operations until relieved by another attendant.

- Monitor activities inside and outside the pipe to determine if it is safe for the entrant to remain in the pipe and order the entrant to evacuate the pipe immediately under any of the following conditions:
    - If the pipe-entry attendant detects a prohibited condition or cannot effectively and safely perform the duties required.
    - If the pipe-entry attendant detects the behavioral effects of exposure or oxygen deficiency in the entrant.
    - If the pipe-entry attendant detects a situation outside the space that could endanger the entrant.
- Warn any unauthorized persons that they must stay away from the pipe or inform the entrant that unauthorized persons have entered the pipe.
- Perform no other duties that might interfere with the primary duty to monitor and protect the authorized entrant.

Preparation of the Pipe

All covers or temporary caps shall be removed and secured to prevent them from closing while occupied. The openings shall be kept clear of any obstructions which could hinder egress. Debris, tools, or other material should be kept away from the opening where there is a danger of the material falling into the pipe.

Lighting Equipment

Portable lights may be operated by battery or by a transformer, which is powered by 24 V or less. Portable lights or other equipment powered by standard voltage must be protected by a Ground Fault Circuit Interrupter (GFCI).

Emergency Retrieval

An approved full body harness shall be worn by pipe entrants so that the entrant can be removed if an emergency situation arises. The harness shall have ring attachments on the back and hips. At a minimum, a lifeline shall be 1/2-inch diameter rope with a snap-hook or other locking safety hook spliced onto one end as a harness attachment. Other attachment devices can be used according to the situation.

Pipe Coating

Follow these recommendations when applying pipe coating:

- Wear appropriate eye protection.
- Wear cotton gloves and a long-sleeved shirt while coating pipe.
- Wear cotton work gloves when using Wax Wrap.
- When using propane, anchor or otherwise support the tank to prevent it from falling or being pulled into the trench.
- Do not use hot applied coating materials on or adjacent to plastic piping materials.
- Apply in an open or well-ventilated area.

When applying any pipe coating, always refer to the Safety Data Sheets (SDS). The SDS lists the hazards associated with the application of the product and all necessary precautions that must be taken to apply the product safely. When questions arise, contact the Safety Department.

Plastic Pipe

When working with plastic piping, observe the following guidelines:

- Never enter an excavation where gas is escaping from plastic pipe.
- When working on plastic pipe in a potential gaseous atmosphere, prevent static discharge by keeping the plastic pipe wet with an approved antistatic solution, either wiped or sprayed on.

  The utility provider might also require burlap to be wrapped around the pipe, keeping it moist and lowering the static potential.
- Do not expose plastic pipe to external heat sources, including torch flames, except when performing approved joining methods.

Safe Procedure For Joining Polyethylene Pipe

The personal safety of the public and employees must always be of prime importance when joining or installing polyethylene (PE) pipe. It is everyone's responsibility to know and practice all safety rules.

Safety Rules

A minimum of a 20-lb. dry chemical fire extinguisher must be immediately available upwind at the jobsite when fusing on a live gas main. To allow the gas to be controlled on a PE facility, squeeze-off tools with ground must be readily available at the jobsite.

If gas might be expected or does escape during the fusing operation, the concentration must be determined and the required safety precautions taken.

Do not fuse service saddle tees into PE pipe that is pressurized over 60 PSIG.

Static Electricity

Static electricity might be generated on both the inside and outside of PE pipe. This static charge, when accumulated and discharged as an arc, can produce enough energy to ignite a combustible gas/air mixture or cause an unexpected shock.

Most Natural Gas Utilities have a procedure for the control of static electricity when working on their system. Be sure that you are aware of the correct procedure. Always follow the procedure of the utility when working on their system.

When a PE pipe has been damaged and there is gas leakage, the facility should be shut off or squeezed off at a location other than where the gas is leaking whenever possible. If this is not possible, proper grounding by wetting the exposed pipe shall be done to prevent a static discharge when squeezing off to stop the gas flow.

Before entering an excavation in which natural gas is escaping through an exposed PE pipe:

1. Have an attended, fully charged 20-lb. fire extinguisher upwind of the excavation.
2. Wear a proper flame retardant suit and breathing equipment whenever over 1% gas/air mixture exists or could possibly occur and cannot be vented.
3. Wet the entire exposed length of PE pipe with a dilute detergent. When the temperature is below 32° F (0° C) ethylene glycol (antifreeze) should be added to the water to keep it from freezing.
4. Immediately upon entering the excavation, wrap a grounded wet tape conductor around the PE pipe or place the conductor in contact with the PE pipe. Do not exceed 8 inches between wraps on the pipe. If wet rags are used, they must be grounded.

Polyethylene Pipe Joiner Qualifications

Only trained and certified employees shall join polyethylene pipe. The certification must be in accordance with DOT OQ (Operator Qualification) and Owner/Client procedures.

Transite Pipe

Transite pipe is a mixture of cement and asbestos. It was used for gas piping because it is nonmetallic, flame retardant, and resistant to moisture and corrosive agents. When transite pipe is encountered in the field, only trained and qualified personnel should perform any work on the pipe. Only trained and qualified personnel may remove, replace, and dispose of transite pipe.

Purging

When purging lines of natural gas, observe these guidelines:

- Have an attended dry-chemical fire extinguisher standing by at the work area at all times. The attendant should be positioned upwind of the work or in an otherwise safe location.
- Eliminate all ignition sources. No smoking is allowed, and the purge riser must be grounded.
- Vent gas away from people, equipment, and electric lines.
- Wear hearing protection when purging lines.

Hot Work

Hot work is defined as any welding, cutting, grinding, or the use of portable heaters/steamers, hot oil trucks or arching electric tools in a hazardous area.

A hazardous are is defined as:

- Any area where there is potential flammable vapor or gas source.
- Any area inside of, on the surface of, next to or in close proximity to any natural gas/crude oil production, compression, pipeline and processing equipment.

All hot work shall be authorized by a company representative before proceeding. Any person may stop the work when conditions or the situation become unsafe.

Preparations for Hot Work

When work is to be performed on a specific piece of equipment, vessel or container (tasks, GPUs, treaters, etc.), the following precautions should be taken:

- Isolate the equipment by disconnecting lines, blinding or double-block and bleed (Refer to Chapter 12 Logout and Tagout)
- Purge, clean or ventilate to clear the equipment and the area of all flammable vapors and gases.
- Use a calibrated combustible gas detector to test for LEL (Lower Explosive Limit)
- The LEL must be less than 10% before the hot work can proceed.

Hot Work Permit

A hot work permit must be completed and approved before the work can begin. (See Sample 19-1 Hot Work Permit)

Fire Watch

A person(s) must be assigned the duties of a fire watch during any hot work. The duties of a fire watch are:

- Know how to properly use a fire extinguisher.
- Know the operation being performed and its hazards.
- Never leave the site while hot work is being performed.
- Test the area as needed for the presence of flammable vapors and gases and other potential hazards.
- Stop the work if necessary.

Welding and Cutting Operations

Follow these guidelines when performing hot work, such as welding and cutting:

- Allow only qualified and certified welders, properly trained to perform welding on a gas system, to perform welding work on gas systems. Obtain a hot work permit before any work is begun. Refer to the permit located at the end of this chapter.
- Do not perform welding or flame cutting on any capped or retired gas main or any containers that have held flammable materials.
- Do not weld or cut so that sparks fall onto flammable material, the unprotected head of a compressed gas cylinder, or persons who might be working below. Use protective covers or shields as needed. A fire watch or monitor may be used below the work area to keep other personnel out of the area while sparks are falling.
- Prevent oxygen from coming in contact with oil or grease because high-pressure oxygen can react violently with either substance. Keep oxygen cylinders and other attached apparatus and fittings free of oil and grease.
- Check for leaks on all threaded connections (regulators, hoses, and blowpipes) with a soap and water solution. Wipe the soap residue away after leak testing is completed.
- Use appropriate pressure regulators and gauges on all pressurized cylinders.

- Close the cylinder valve and release gas from the regulator and hoses before removing the regulator from a cylinder valve.
- Use flashback arrestors.
- Do not transfer gases between or mix them in cylinders.
- Never use compressed gas cylinders to support any material.
- Keep cylinders in a secured and upright position.
- Whenever hot work is performed, follow the customer/client rules and safety procedures concerning hot work methods.
- Do not use oxygen or acetylene to purge or pressure-test gas piping.
- When performing welding and cutting procedures, observe the following guidelines concerning PPE:

Welding Hoods and Eye Protection

- Do not use nonstandard welding hoods, such as pancake shields.
- Wear safety glasses marked ANSI Z87.1 or goggles with mandatory side shields at all times, especially when the welding hood is up.
- Wear burning goggles with no less than a #3 density lens with plastic cover plates on each side for all gas welding and burning. Burning goggles are worn over approved safety glasses.

Refer to OSHA 29 CFR 1926.102 for minimum guidelines for lens shades for eye protection utilized during all welding and cutting operations.

- Ensure that prescription safety glasses meet ANSI requirements. Employees must wear safety goggles or cover safety glasses over prescription glasses that do not meet these requirements. Side shields are required on all prescription safety glasses.
- Wear a face shield over approved safety glasses or goggles when cutting, chipping, grinding, or buffing.

Protective Clothing

- Wear only 100% cotton or fire retardant (FR) long-sleeved shirts while performing welding and cutting.
- When welding overhead, wear a protective leather jacket and sleeves along with welding gloves for protection.

For additional information, see Chapter 20, “Welding and Cutting Procedures.”

Hot Tap Procedure

Hot tap welding, cutting or fitting on the operating pipeline can only proceed after a job plan has been completed, reviewed by site supervision and approved by the pipeline operator.

Hot Tap Welding

- Ensure the excavation or trench is safe for personnel to enter or work (Refer to Chapter 23, Trenches and Excavations)
- Before entering the pipeline, trench, or bell hole, the area should be checked with a calibrated combustible gas detector.
- Precautions should be taken to prevent blowthrough during this process.
  - Check the pipe wall thickness
  - Lower the pipeline operating pressure
  - Check with Engineering to help determine the minimum wall thickness and pressure.
- The flow of gas should be maintained to help carry the welding heat away.
- The welder's helper should not be in the bell hole during the welding operation.

Hot Tapping

- Valves to be used should be tested before making the tap.
- Check to see that a fully opening valve is being used and that the opening is large enough for the mill to pass through.
- Check measurements to be sure the milling tool can be pulled out of the hot tap fitting and the valve.
- Inspect the packing and all working parts of the tapping machine before starting the tap.
- Make sure a bleeder valve is installed in the tapping machine.
- The bleeder valve should be open until the bit drills through the line and air is flushed from the tapping machine.

Anode Installation

Preparations

- Ensure the excavation or trench is safe for personnel to enter or work (Refer to Chapter 23 Trenches and Excavations)
- Before entering the pipeline, trench or bell hole, the area should be checked with a calibrated combustible gas detector.
- Before installing an anode, the pipe wall thickness should be checked.
- Consult with Engineering and/or Pipeline Operator to ensure pipe wall thickness is adequate before installing anode.
- Fire extinguisher should be immediately available during anode installation.

- A person(s) must be assigned the duties of fire watch during any anode installations.

Installation

- The anode should be placed three feet and six feet to the side of the pipe for better cathodic protection coverage.
- The anode lead wire should be secured to the pipe by wrapping it around the pipe and then tying it off.
- Be sure the furnace opening is turned away from you and the other employees.
- If the powder does not ignite, empty the powder from the furnace, clean the furnace and start over. **Never lift the lid to ignite the powder.**

Grounding of Pipe

There can be several acceptable methods for grounding of the pipe. Please consult with the customer/client, your supervisor or the Safety Department to determine the best grounding method for your situation.

When welding on steel pipe, the pipe must be grounded. The ground is necessary for two reasons:

1. To prevent build-up of a static charge from gas flowing in the pipe
2. To discharge static electricity that might be picked up when pipe is being worked underneath or near high voltage lines

The following figures are examples of methods for grounding pipe. There can be other acceptable methods. Please consult your supervisor or the Safety Department to determine the best grounding method for your situation.

Figure 19-1. Pipe Grounding Arrangement

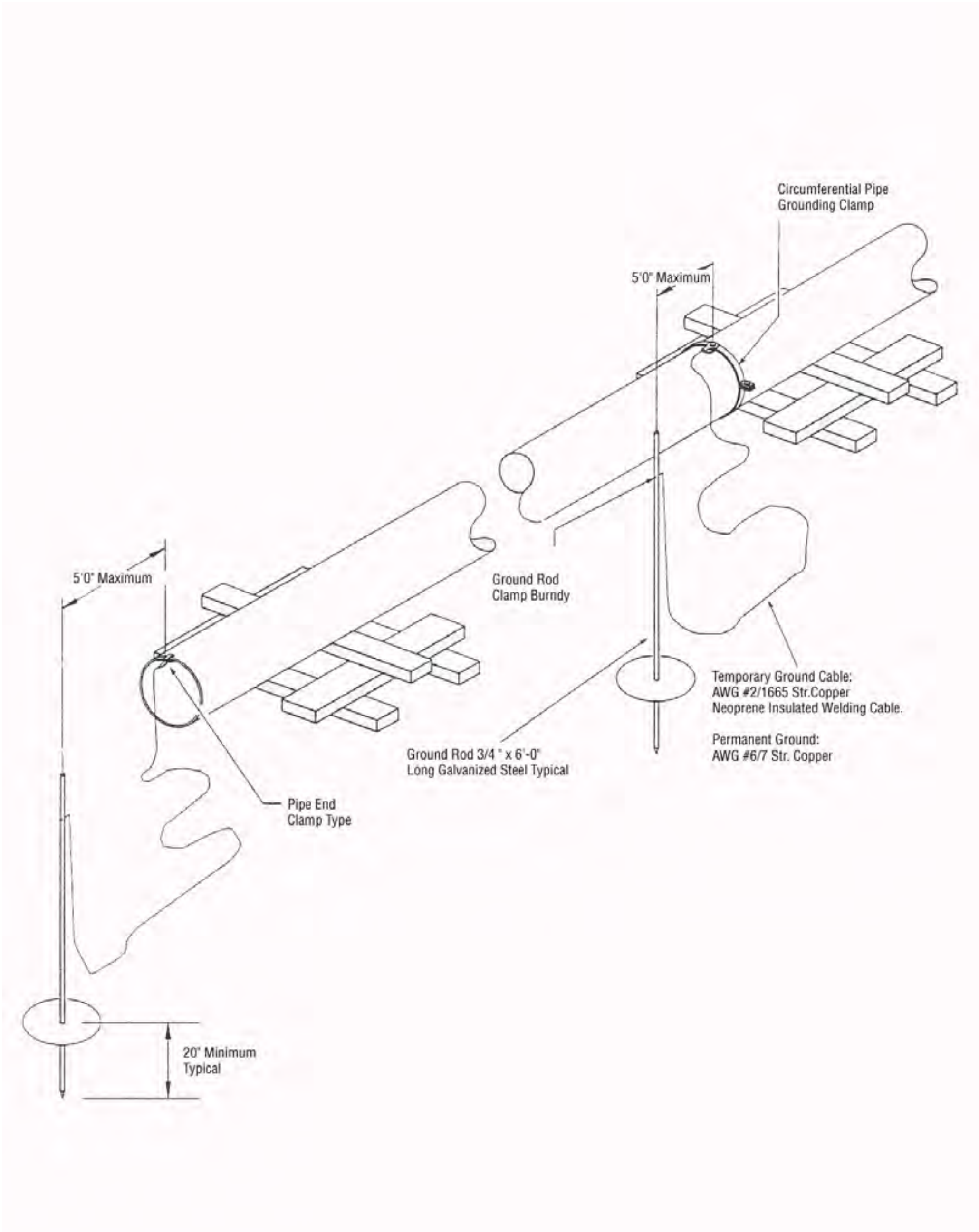


Figure 19-2. Circular Pipe Grounding Clamp

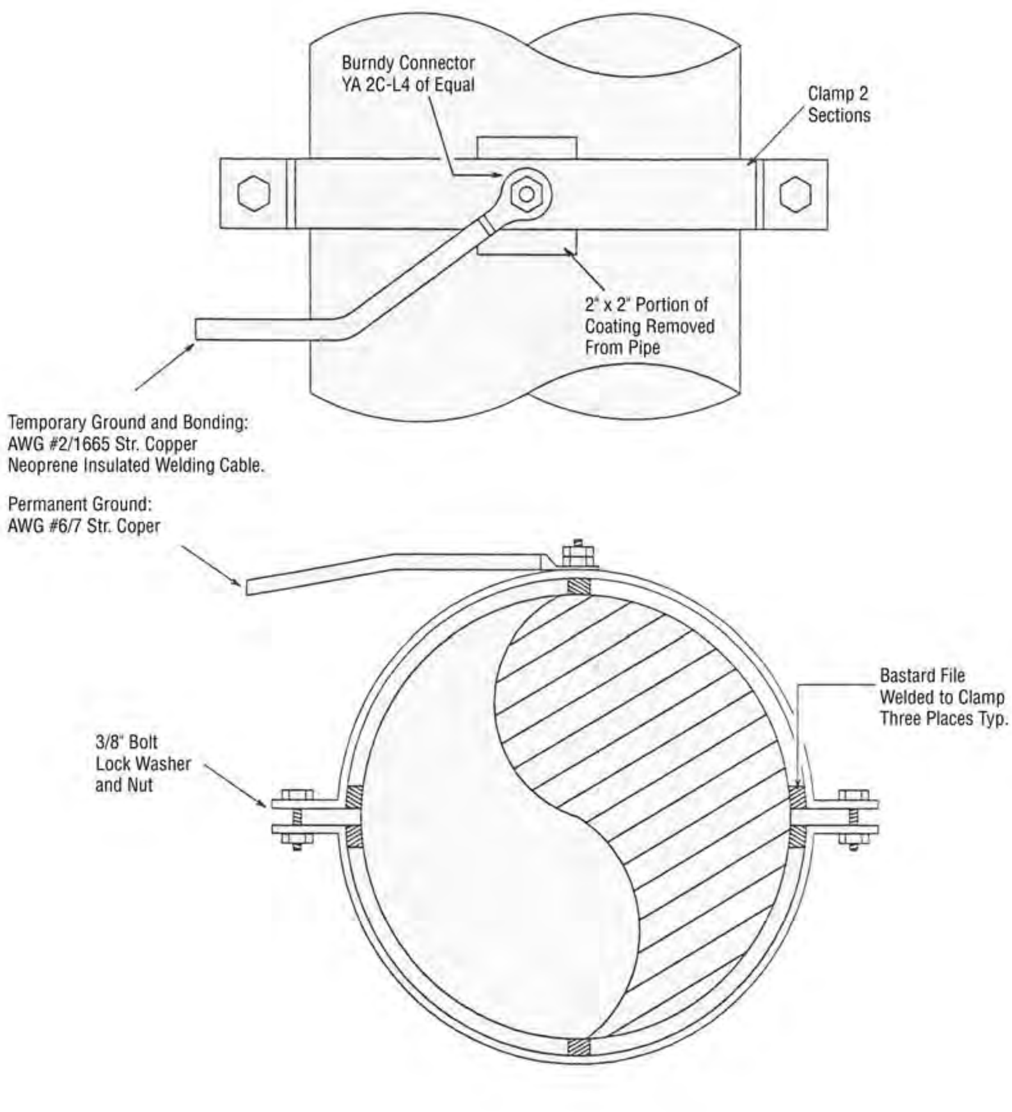
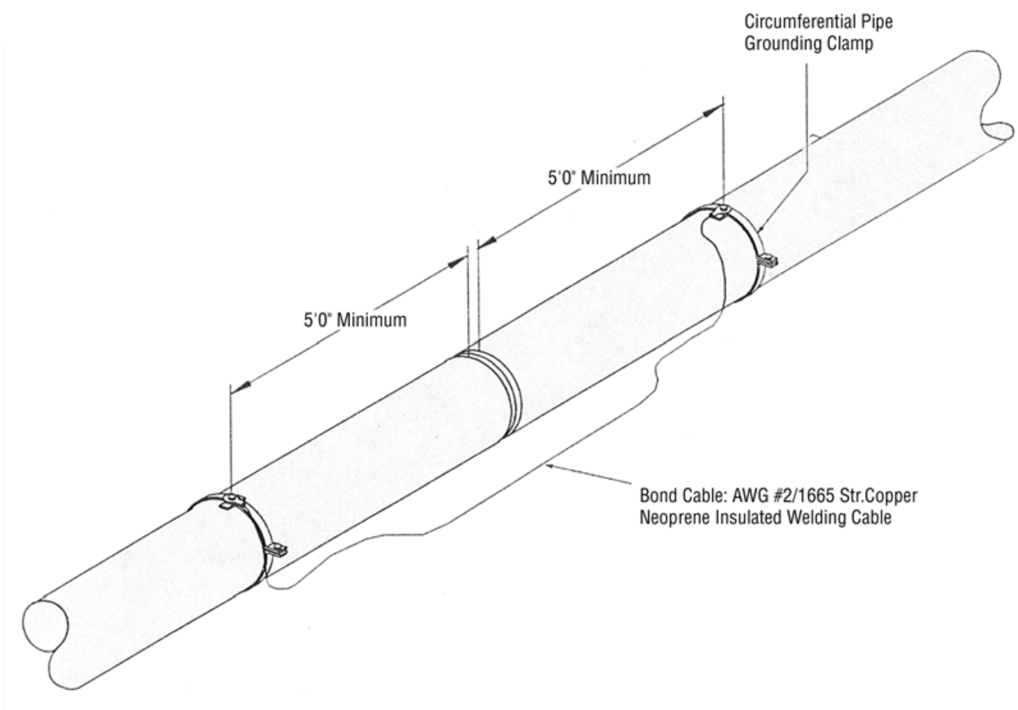


Figure 19-3. Pipe Bonding Arrangement at Tie-in



Emergency Response

Gas

Field personnel must be prepared to work safely when repairing broken or leaking gas facilities. Emergency response necessitates the use of specialized safety equipment. Supplied-air respirators, hoods, and flash suits must be used in certain situations. The following circumstances require the use of this equipment:

- Breaks on 4-inch (10.16-cm) and larger gas lines, regardless of pressure
- Breaks on any high-pressure gas lines greater than 60 psi, regardless of pipe diameter
- Whenever it is deemed necessary by the emergency response team
- Gas blowing in the hole or in the path of work
- Weather or other obstructions preventing gas from dispersing into the atmosphere
- Gas blowing in confined spaces (vaults, underground service pits, excavations, and so on)
- Bad visibility
- No breathable air
- Contaminated dirt blown into the air by gas

When performing emergency response activities, the following requirements apply when using the flash suit or the supplied-air respirator system:

- At least four people, all wearing flash suits, must be present when using the flash suit or supplied-air system.
- At least two people must be using supplied-air gear while work is being performed, even if only one person is performing work at the time.
- The third person must attend the dry-chemical fire extinguisher. When repairing breaks or leaks on gas lines larger than 2 inches (5.08 cm), an attended fire hose on the fogger setting must be used instead of a fire extinguisher.
- The fourth person must monitor the breathing air bottles and attend the lifeline attached to the workers performing the work. This person must have supplied-air breathing apparatus standing by and act as the primary rescue person should an emergency arise with the other workers.

Only trained personnel are allowed to use the emergency units and perform emergency response work.

Emergency responders must wear a full body harness with an attached lifeline. The attendant maintains the other end of the lifeline outside of the work area.

Liquid Pipeline

- When a leak occurs in a liquid pipeline, notify your supervisor immediately.
- The Supervisor then needs to notify the pipeline operator according to a predetermined project plan.
- If the leak is minimal, employees should take all necessary steps to mitigate the situation.
- If a major leak occurs, employees shall evacuate the area immediately.
- Only trained personnel are allowed to perform emergency response work. Employees engaged in emergency response work shall have received 24-hour Haz Wopper training.

Safety Meetings

Safety meetings are an integral part of a proactive safety management process. There are many types of safety meetings held.

Daily, before the start of work, the crew generally should hold a documented tailgate safety meeting. The meeting should focus on safety issues relevant to the work processes to be performed that day, along with reminders regarding the safe use and inspection of the tools and equipment required for the tasks to be performed that day. The crew should also discuss any near-misses, noncompliance, or other safety issues that were encountered the previous day.

A weekly safety meeting will be held on each jobsite. The purpose is to cover subjects of great importance and relevance to the success of the job. The subjects discussed and attendance will be documented by signing a meeting roster. These meetings supplement and support the safety training provided for all employees. Weekly safety meetings will generally last between 15 and 30 minutes.

The topics may be:

- Pre-chosen and information sent to the field by the Corporate Office and/or Operating Unit.
- Pertinent to the work being performed.
- Tools and equipment being used in the field.
- Work procedures and policies of the client/customer.
- Issues related to the crew’s activities.
- “Special” safety meetings, which may be called when:
    - An incident occurs on a jobsite.
    - Non-compliance was observed.
    - New work practices and/or policies are implemented.
    - New tools and/or equipment are introduced into the work area.
    - Other reasons.

Job Task Safety Analysis

Each day, before the start of each workday, the supervisor/foreman (person in charge) or their designee, should conduct a job briefing or Job Task Safety Analysis (JTSA) with the employees involved (see Chapter 29). The purpose of the JTSA is to identify the hazards associated with the scope of work, determine the safety precautions that will be implemented, and the required PPE by the crew performing the work assignment. The JTSA helps ensure that all members of the crew understand the work assignment and acknowledge that they understand and will follow the safety plan established to complete the work assignment. The JTSA should be documented and signed by all crewmembers. Refer to Sample 19-2. The following are requirements for the JTSA:

- The foreman (person in charge) should assemble the crew at the job site and explain the work to be done, and outline the steps to be followed.
- The foreman (person in charge) and the members of the crew will identify the hazards of the job. The crew should identify appropriate controls to eliminate, mitigate, control, or reduce the accident-producing potential of the hazards.
- If the hazards cannot be eliminated from the jobsite, the JTSA should list how the hazards can be mitigated, controlled, or reduced. This may be done by:
    - Dedicated assignment of work responsibilities.
    - Methods to isolate or control the hazard.
    - Other forms of protection (PPE, training, others) to reduce the hazard to the employees.
- The foreman (person in charge) must ensure that each member of the crew understands all instructions given.
- If the work or operations to be performed during the workday or shift are repetitive and similar, at least one JTSA should be conducted before the start of the first job of each day or shift. An additional JTSA should be completed and a meeting held with the members of the crew if significant changes that might affect the safety of the employees occur during the course of the work. Significant changes include changes in the scope of the work, work assignments, crew structure, crew leadership, environmental conditions or when other hazards (not originally noted) are determined to be present in the workplace.
- The discussion should be in such detail that all employees, by virtue of training and experience, can reasonably be expected to recognize and avoid the hazards involved in the job. A more extensive discussion should be conducted if the work is complicated or particularly hazardous or if the employee cannot be expected to recognize and avoid the hazards involved in the job.
- The foreman (person in charge) is responsible for accounting for all employees after the completion of each job.

Hydrogen Sulfide

The supervisor is responsible for completing a hazard assessment on all jobs for presence of hydrogen sulfide (H_2S). All personnel are responsible for reporting to their supervisor if H_2S could be present in the work area.

Employees should not come into direct contact with H_2S. Employees must never enter a tank or vessel containing H_2S. If the Company works in an area where H_2S has been detected or where the presence of H_2S is suspected, employees must follow the site-specific contingency plan provided by the company for which the work is being done. The following guidelines are designed to educate employees as to what H_2S is and how it might affect employees who are exposed to it.

Description

H_2S is a colorless, flammable gas that occurs in natural gas and oil as a product of the decomposition of sulfur-containing organic matter. H_2S can be present in oil refineries, gas plants, oil and gas wells, pumping stations, tankers, sewers, underground mines, asphalt plants and terminals, chemical plants, and other areas.

Hydrogen sulfide:

- **Is toxic**—The lethal concentration of H_2S is 600–700 ppm for a short-term exposure. See Table 19-1for H_2S toxicity levels and expected effects.
- **Is heavier than air**—H_2S is approximately 19% heavier than air (vapor density=1.19). H_2S tends to accumulate in low places such as pits, trenches, well cellars, and sumps.
- **Is soluble in liquids**—High concentrations of H_2S can be present in pools of water or in sludge at the bottom of crude oil storage tanks. If this liquid is heated or agitated, H_2S can be released.
- **Has the odor of rotten eggs**—The sense of smell is rapidly deadened by concentrations exceeding 100 ppm and is not dependable as a means of detection. This loss of smell can create a false sense of security, leading a person to believe that no H_2S is present. When H_2S is combined with hot asphalt, the rotten egg odor is masked by the asphalt odor at all concentrations of H_2S.
- **Is highly corrosive**—In the presence of moisture, H_2S attacks many metals, resulting in the formation of sulfides. In addition to creating general loss of metal material and strength, H_2S corrosion can produce stresses that cause deformation and cracks.
- **Is flammable**—H_2S has a wide flammability range (4.3 to 45.5% volume in air). When H_2S is burned (flared), sulfur dioxide (SO_2) is being formed. SO_2 is a toxic, colorless gas with a very pungent odor.

Training and Treatment of H_2S Poisoning

If a person is overcome by hydrogen sulfide, move the person to fresh air only if there is no possibility of rescuers being overcome, also. If the victim is not breathing or breathing is labored, begin artificial respiration immediately. Keep the affected person warm and at rest and obtain medical treatment as soon as possible. The employee must be seen by a physician before returning to work. There are no exceptions to this regulation.

Do not attempt to rescue anyone without wearing SCBA or a supplied-air respirator. The rescue might need to be performed by an outside emergency service.

Personnel must stay upwind of any gas source. A windsock is present on all locations that have or have been known to have H_2S present. Personnel must work in pairs in areas where H_2S is suspected.

Hydrogen Sulfide and Carbon Dioxide Safety Guidelines

In situations where H_2S or CO_2 might be present, observe the following safety guidelines:

- Do not enter an exposed area.
- In case of exposure to CO_2, stimulate respiration to increase the heart rate. Prolonged exposure to gaseous CO_2 hinders the body's ability to absorb oxygen. See Table 19-2. for CO_2 exposure times and percentages and their expected effects. Use only SCBAs in hazardous environments.
- Practice awareness to safely avoid CO_2 and H_2S. Do not enter closed structures without taking necessary precautions to ensure that there is adequate ventilation. Check for oxygen concentration (see Chapter 22, "Confined Space and Vessel Entry Procedures").
- Do not remain in low-lying areas or areas without adequate ventilation if CO_2 or H_2S is being emitted from a line leak, production, or injection well or vent line.

Physiological Response

H_2S is irritating and toxic when inhaled. The gas is drawn into the lungs and transferred into the bloodstream. Small amounts of the gas are readily oxidized into harmless sulfates. However, at concentrations greater than 300 ppm, the free H_2S causes systemic poisoning. Sufficiently high concentrations can result in immediate collapse and death caused by respiratory failure and asphyxiation.

Toxicity Tables

The following tables summarize the current recommended exposure levels and regulatory standards for H_2S and its effect on the body at different concentrations.

Table 19-1. H_2S Toxicity

H_2S Air by Volume	Remarks
1 ppm	Minimal perceptible odor.
10 ppm	Threshold Limit Value (TLV) for an eight-hour Time Weighted Average (TWA) recommended by the American Conference of Governmental Hygienists (ACGH). Small percentage of workers can experience eye irritation.
15 ppm	Short Term Exposure Limit (STEL) for a 15-minute TWA recommended by the ACGH.
20 ppm	Current OSHA ceiling exposure standard.
50 ppm	OSHA allows a single peak concentration not exceeding 50 ppm for a maximum of 10 minutes provided no other measurable exposure occurs.
100 ppm	Deadens sense of smell in 3 to 15 minutes. Can cause coughing and burning of the eyes and respiratory tract.
200 ppm 500 ppm	Immediate loss of sense of smell. Marked eye and respiratory irritation. Respiratory disturbances in 2 to 15 minutes. Dizziness, collapse, and unconsciousness.
700 ppm	Loss of consciousness. Breathing stops and death results if not rescued promptly.
1,000 ppm	Immediate unconsciousness after a single breath. Brain damage can result unless rescued promptly. Death occurs in 3 to 15 minutes.

Table 19-2. CO_2 Toxicity

Exposure	Effect
Less than 0.03%	No effect.
3% to 5% for less than 1 hour	Deeper, faster breathing and lightheadedness.
3% to 5% for more than 1 hour	Discomfort and nausea.
5% to 9%	Very deep, fast, and labored breathing; maximum exertion; nausea.
Greater than 9% for 5-10 minutes	Unconsciousness.
Greater than 20% for 0-30 minutes	Death.

Emergency Plan for All Natural Gas Emergencies

Call 911 immediately whenever any natural gas line is damaged and is leaking gas.

- Call 911 immediately. (It is the law.)
- Call the gas company immediately.
- Clear and secure the area.
- In imminent danger situations, evacuate the affected buildings and/or homes immediately. When 911 Emergency Response personnel arrive on-site, they will assume responsibility for making evacuation decisions and notifying affected parties. When it becomes necessary for crews to evacuate people from buildings and homes, prior to the arrival of 911 emergency response personnel, attempt to leave one person close to the leak area to be present when 911 emergency response personnel arrive on-site. That person is responsible for ensuring that 911 emergency response personnel know the situation and the response procedures already initiated by the crew.
- Shut down all vehicles, machinery, and equipment.
- Eliminate all ignition sources, which include:
    - Electrical components on vehicles and machinery
    - Cell phones
    - Doorbells
    - Generators
    - Flashlights
    - Open flame
    - Smoking materials
    - Pagers
    - Telephones
    - Appliances
    - Radios
    - Light switches
    - Static sparks
    - Overhead power lines

Blowing Gas

Blowing gas will rise and diffuse rapidly.

- Monitor blowing gas with an attended dry-chemical fire extinguisher.
- Stay upward of the leak.
- Do not bury the leak.

Underground Gas

Underground gas is under pressure and will follow the path of least resistance.

- Shut off gas to residences by closing the service valve at the meter.
- Do not bury the leak because gas will migrate underground.

Explosion or Fire

In the event of fire or explosion associated with a gas leak:

- Call the local fire department.
- Call the gas company.
- Check adjacent buildings for the presence of gas.
- Evacuate and ventilate any buildings where gas is detected.
- Shut off the service valve on the meter riser if gas is detected in a residence.

Gas Emergency “Don’ts”

In the event of a gas emergency, do not:

- Turn any main valves unless instructed to do so by gas company personnel.
- Cut locks off any gas company equipment.
- Attempt to stop the flow of gas unless trained by the gas company.
- Pound plugs into damaged piping.
- Backfill an excavation where gas is escaping.
- Enter any excavation where gas is escaping.
- Attempt to extinguish the fire.
- Make any admissions, statements, or responses to questions from the press.

Verifying Utility Locations and Potholing

The following guidelines must be followed to ensure safety during any work operations where underground utilities might be encountered:

- The location of all identified utilities must be verified using nondestructive methods of excavation.
- If any risk to the utility from the work activity is present, a “window” must be excavated at or near the utility to visually monitor the potentially hazardous situation.
- Exposed existing utilities must be adequately protected and supported.
- When crossing or running parallel to existing utilities within 3 ft (0.91 m), the utilities shall be visually confirmed by exposing the buried utility at appropriate intervals.
- Because of a high risk and hazard potential, a competent person must visually confirm the location of gas lines, electrical utilities, fiber, and communication lines within the immediate vicinity of the work taking place.
- Contract documents and state and local regulations must be checked to determine responsibility for verifying locations of unmarked utilities.
- When utilizing high-pressure water for verifying utility locations, the proper PPE shall include long-sleeved arm protection, di-electric shoes/boots or overshoes, safety glasses and face shield, and Class 3 rubber insulating gloves.

As a general guide to identifying utilities, the standard surface marking colors are shown in Table 19-3.

Table 19-3. Surface Marking Colors

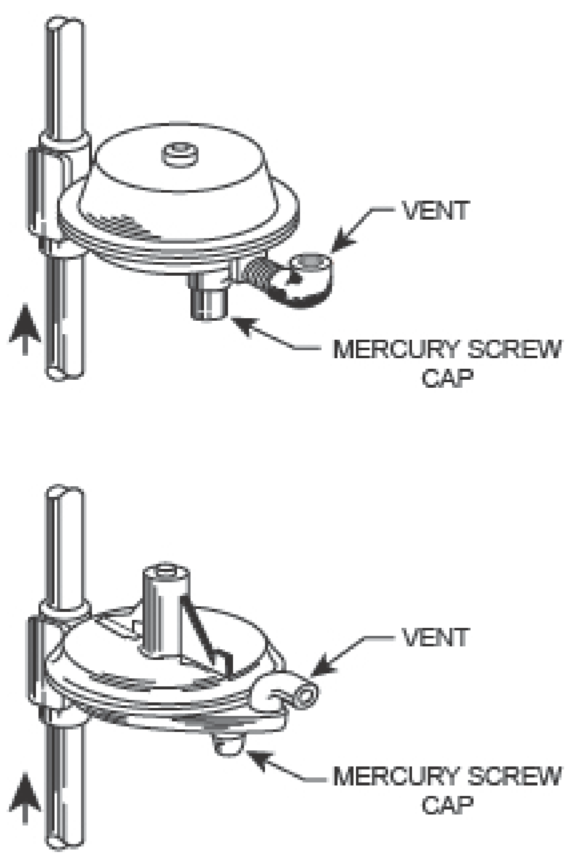
Color	Utility
Red	Electric power, including street lighting
Yellow	Gas, oil, steam, and petroleum
Blue	Water and irrigation
Green	Sewer and storm drains
Orange	Fiber optic, telephone, and cable TV
Pink	Temporary survey markings
White	Proposed construction area or work limits
Purple	Reclaimed water

Safe Removal and Handling of Mercury Seal Residental Regulators

Regulator Removal

Mercury seal regulators are identifiable by a characteristic cup that is located on the underside of the regulator. If you have any questions about this procedure or if you have questions during the removal procedure, contact your supervisor immediately.

TYPICAL MERCURY SEAL REGULATORS



- Ensure the following equipment/appliances are shut off:
  - All appliances
  - Gas service at the high pressure side of the meter set

ALL GAS PRESSURE MUST BE RELIEVED BEFORE ANY PIPE IS REMOVED.

- Wear appropriate personal protective equipment (at the meter set).
- Check meter capacity in accordance with Gas Construction Standards.
- Examine the regulator set and the position of surrounding structures. If the working space is small or when the surroundings would make work difficult and a spill of mercury probable, contact your supervisor and request additional help for the regulator removal.
- Gather materials necessary before removing the regulator:
  - Prepare two plastic containment bags, doubled-up, one inside the other (total of four bags needed).
  - Two plastic five-gallon pails (one for regulator, one for contaminated clothing if needed).
  - Small plastic cup
  - Duct tape
  - Rubber-backed carpeting or mats

  If carpeting or mats come in contact with mercury, they shall be treated as mercury contaminated objects. Carefully place the mats or carpeting inside containment bags. Close, twist, and seal the bag using twist-ties and affix a "mercury contaminated" tag. Place the containment bag in a pail, affix the lid and seal, and affix a "mercury contaminated" label to the pail.
- Shut off the service valve.
- Seal all openings (e.g. drains, sump pumps, cracks, etc.) with tape, duct seal, or absorbent mats. Place carpeting or mat on the floor area of the regulator.
- Shut off all air handling equipment in the basement (e.g., furnace, humidifier, dehumidifier, or other fan type equipment).
- Open plastic bags, insert the bags into a pail, and fold bag back outside the pail. The purpose of this measure is to prevent mercury from contacting the customer's residence.
- Position containment bags and pail under the regulator and vent line to catch an inadvertent spill.
- If the pail will not fit under the regulator and vent lines, remove the bags from the pail and place the bags under the regulator and vent line (carpeting or mats will be underneath the bags).

- Tap the regulator vent line with a wrench to dislodge any mercury in the line. While holding the small plastic cup under the fitting, disconnect the vent line at or near the regulator. Install a plug or cap in the opening. All open ends of the pipe or fittings shall be plugged or capped and taped prior to removal. The entire vent line must be replaced. All piping shall be 1 inch to the section of ¾-inch pipe running through the wall, which also must be replaced with the same size. All newly installed vent lines shall be a minimum of 1-inch piping and shall not be decreased to a size smaller than the vent connection in the upper diaphragm case of the regulator.
  - Any mercury residue falling into the cup from the vent line shall be carefully placed in the bottom of the plastic bag in the pail.
  - If mercury is visible in the vent pipe, ensure the pipe is bagged, sealed, and tagged as "mercury contaminated," and place the residue in a pail if possible. If unable to place in pail, plug or cap, tape, bag, seal, and tag.
  - If no mercury is visible in the pipe, dispose of the pipe as scrap.
- Ensure the containment bags and pail are positioned directly underneath the regulator installation (including open vent line).
- Remove the outlet piping and plug the regulator's outlet connection.
- Carefully remove the regulator from the inlet piping and place a plug in the regulator's inlet connection.
- If the regulator must be removed by sawing, plug and tape all pipe attached to the regulator using a ¾-inch plastic plug, 1-1/4-inch plastic plug, and duct tape.
- Carefully place the regulator inside the containment bags. Close, twist, and seal the bag using twist-ties and affix a "mercury contaminated" tag. Place lid on the pail and seal. Affix a "mercury contaminated" label.
- Place any mercury contaminated items (e.g., gloves) in a separate plastic bag (double bag, one inside the other) for mercury debris. Close, twist, and seal the bag using twist-ties and affix a "mercury contaminated" tag.
- Before transporting the regulator from the work area, ensure all three openings are plugged, i.e., inlet, outlet, and vent.
- Remove protective clothing in the work area.
  - If clothing is contaminated with mercury, place in a plastic bag, close, twist, and seal the bag using twist-ties and affix a "mercury contaminated" tag.
  - If clothing is not contaminated, it may be used again.
  - Check footwear for contamination
- Only one regulator is permitted in each plastic pail. Fittings that show visible signs of contamination from mercury and are too long to fit into the pail should be capped or plugged, taped, sealed, double bagged, and taped. These items will be transported to a mercury storage area.

- Mercury containing items shall not stay in a vehicle beyond one shift without permission from the supervisor.
- If tools are contaminated with mercury, place in a plastic bag, close, twist, and seal the bag using twist-ties and affix a “mercury contaminated” tag. Place the residue in another pail, seal with lid, and affix a “mercury contaminated” label. Notify your supervisor. Your supervisor will make arrangements for decontamination/disposal.

Spill Measures

Inside building:

- Immediately contact your supervisor
- Notify the customer and advise them to avoid the area and keep their children and pets out of the spill area.
- Do not attempt to move objects in the immediate area of the spill.
- Wait for the spill response personnel. If possible, cover the spill site with approved absorbent mats.
- If possible, close the door to the living area. Employees shall stay out of the basement until the spill team arrives.

DO NOT ATTEMPT TO PICK UP THE MERCURY.

Transfer of Regulators to Storage

Regulators and associated piping shall be transferred on a daily basis to approved storage areas. Your supervisor will advise you of the storage locations and any local, state, and Federal DOT labeling and transportation requirements.

1. At the storage facility, carefully remove the plastic pail containing the bagged mercury regulator and any small fittings and place them near the mercury collection container.
2. Remove the bagged regulator and small fittings and place them inside the storage drums.
   a. If the containment pail is not visually contaminated with mercury residue, the pail may be reused.
   b. If mercury is visible in the pail, place a sheet of plastic under the bag containing the regulator, open the bag containing the regulator and carefully pour the mercury in with the regulator.
3. Reseal both the inside and outside bag.
4. Replace the cover of the pail and turn upside down.
5. Knock holes in the bottom of the pail to prevent future use.
6. Discard the pail in the trash.

Loading and Unloading Pipe

Truck/Trailer

- Trucks will enter the loading area and stop; the driver will exit the truck and proceed to the safety zone before loading begins.
- If the driver is required to reverse the trailer into position, a ground guide (flagger) will be used.
- Cones with warning signs will be placed around the trailer and loader. Ground personnel should ensure that no one approaches the loading area in the danger zone.
- The pipe will be placed on the trailer starting by placing the bottom roll flat on the trailer first. The pipe will be adequately secured before proceeding with loading another roll of pipe.
- Pipe should be adequately secured to the trailer.
- Install proper warning lights (beacons), flags and/or warning signs on the rear of the pole trailer as required by DOT regulations, state and/or local municipalities. It may also become necessary at times to use flaggers for the safe entrance or exit of trucks onto or public roads (blind corners, high speed roads).

Railroad Sidings

- Trucks will enter the loading area and stop; the driver will exit the truck and proceed to the safety zone before loading begins.
- Rail cars are positioned at the site by the railroad company.
- Trucks are positioned by the truck drivers.
- Unloading equipment is positioned and set up by the equipment operator.
- Ground personnel will place cones with warning signs to keep anyone from approaching the loading area in the danger zone.
- Load restraint bands are cut by the employee from a position adjacent to the load.
- Bands will be cut from end to end, with outside bands being cut last.
- Ground employees shall stand clear of the load during the unloading process.
- Ground employees are not permitted to work under or near any suspended load or between the load and fixed objects.
- Debris such as cut banding and dunnage should be removed from the unloading site as soon as it is safe to proceed.

Pipe Storage Yards

- Trucks will enter the loading area and stop; the driver will exit the truck and proceed to the safety zone before loading begins.
- Trucks are positioned by the truck drivers.
- Unloading equipment is positioned and setup by the equipment operator.

- Cones with warning signs will be placed around the trailer and loader. Ground personnel should ensure that no one approaches the loading area in the danger zone.
- Truck driver will remove the straps once the load is inspected for stability.
- Specialized lifting attachments (magnets) are used to unload the pipe from the truck and place it in the storage rack area.
- Ground personnel shall stand clear of the load during the unloading operation.
- Ground employees are not permitted to work under or near any suspended load or between the load and fixed objects.
- Debris such as cut banding and dunnage should be removed from the unloading site as soon as it is safe to proceed.

Pipe Racking

- Ground employees shall place and secure chocks to hold the pipe in place.
- Pipe will be held in process during the chocking process by the loading equipment.
- Pipe pins will be placed in the ends of the last three pipe joints to keep pipe from breaking out.
- Employees are not permitted to walk or stand on pipe during this process.

Sample 19-1. Hot Work Permit

HOT WORK PERMIT

Work Location ____ Specific Location ____ Date ____

Contact For Hot Work ____

Person Performing Hot Work ____

Time Limits	
Issued	AM/PM
Expires	AM/PM

HOT WORK PERMITS LIMITED TO 1 SHIFT

Specifically describe hot work to be done and object being worked on:

Calibration Data ____ Model ____ Serial No. ____

SURVEY RESULTS: ________ % LEL (10% Maximum Allowable) _____ Initials of person conducting survey

The representative must initial the following items, indicating that precautions were taken to prevent accidental ignition if acceptable for hot work and note any additional conditions in the comments section.

ITEMS COMPLETED BEFORE HOT WORK TAILGATE SAFETY TRAINING FLAMMABLE/COMBUSTIBLE MATERIAL:	**COMPLETED**	**NA**
1. Surveyed the area including floor cracks and openings, walls, partitions, ceilings, and roofs for the presence of combustible material and for a flammable/combustible atmosphere		
2. Shut down conveyors and air ducts that could convey sparks		
3. Taken precautions for heat transmission		
4. Relocated or protected combustible materials		
5. Deactivated fire-eye monitors and notified control room		
6. Assigned fire watch		
7. Appropriate fire extinguisher on site		
8. Energy isolation		

ITEMS COMPLETED AFTER EXPIRATION OF HOT WORK:		
1. SURVEYED AREA FOR HAZARDS		
2. ACTIVATED FIRE-EYE MONITORS AND NOTIFIED CONTROL ROOM		

Continuous monitoring should be provided in areas where changing conditions are likely or in high risk areas such as in tanks or in the process areas of plants.

If continuous monitoring is not performed, the work area should be resurveyed following breaks in the job.

Comments: ____

____ Date: ____ Time: ____ AM/PM ____

Name Of Area Foreman Verbally Notified

The signatures below indicate that the above information has been reviewed and that all conditions set will be complied with. It is understood that this permit is void if the conditions change.

____ Date: ____ Time: ____ AM/PM ____

Signature Of Employee Approving Hot Work

____ Date: ____ Time: ____ AM/PM ____

Signature Of Person Performing Hot Work

Distribution: Original - Corporate Office File Copy - Field Office File

Version1, 09/01

Sample 19-2. Job Task Safety Analysis—Gas/Pipeline

Job Briefing - Gas/Pipeline

Company Name:	**Date:**	**Time:**	**Job #:**
Location:		**City:**	**State:**
Describe job task:			
Competent Person Trenching / Excavation:			**Soil Classification:**
Person responsible for First Aid / CPR:			
Name and Location of Emergency Medical Facility:			
Location of the AED:			**Emergency Contact Number: 911**

PPE Required (Yes / N/A)
- Hardhat
- Safety Footwear
- Natural Fiber Clothing
- Leather Work Gloves
- Safety Glasses
- Face Shield
- Welding Hood
- Goggles
- Hearing Protection
- FR Flash Suit
- Air-supplied Hood
- Full-face Respirator
- Half-mask Respirator
- Disposable coveralls
- FR Coveralls
- Chemical Resistant Suit
- Full Body Harness
- Lifeline/Lifting Equipment
- Personal Flotation Device
- Class 2 Reflective Vest
- Class 3 Reflective Vest
- Pipe Bonding/Grounding
- Fire Extinguishers
- Fog Nozzle
- Rain Gear
- Abrasive Blasting Hood
- Rubber Boots
- Equipment Guards
- Metatarsal Covers

H2S
- Residual Liquid Present
- Air Check for H2S

Ladders
- Daily Inspection
- Warn./Usage Labels Affixed
- 3 Feet Above Landing
- Ladder Secured

Confined Space (Yes / N/A)
- Competent Person
- Permitted/Non-Permitted
- Calibrated Monitor
- Continous Monitoring
- Hole Watch
- Man Hole Guard
- Forced Ventilation
- Rescue Equipment
- Resc. Team/Serv. Identified
- Hot Work Permit
- Warning Signs
- Written Program on Hand
- Contractors Notified
- Confined Space Log Book

Excavations
- Competent Person
- Utilities Located
- Integrity of Adj. Structures
- Soil Classification
- Location of Spoil Bank
- Overhead Load Protection
- Water in Trench
- Ladders/Ramps (Circle 1)
- Ladders Secured
- Sloping/Benching
- Shoring System
- Tabulated Data
- Atmosphere Tested
- Daily/Periodic Inspection
- Warning System
- Emergency/Rescue Equip.
- Log Book

Sanitation
- Water (Marked as Potable)
- Single Use Cups
- Clean Restrooms
- Hand Wash Station

Traffic Control (Yes / N/A)
- Traffic Control Plan
- Right/Left Lane Closed
- Sign - Flagman Ahead
- Sign - Construction Ahead
- Arrow Board
- Message Board
- Traffic Control Zone
- Advance Warning Area
- Transition Area
- Buffer Space
- Work Area
- Termination Area
- Barricades/Cones
- Stop/Slow Paddles

Cranes/Digger Derricks
- Qualified Operator
- Annual Inspection
- Daily Inspections
- Fire Extinguisher
- Qualified Signal Person
- Qualified Riggers
- Rigging Equipment Inspected
- Crane Signals Posted
- Warning Signal/Light
- Load Charts
- Protection from Susp. Loads

Medical
- Trained CPR/FA Employees
- First Aid Kit
- Bloodborne Pathogen Kit
- Hospital Location
- Daily AED Check

HDD
- Dielectric Boots
- Dielectric Gloves
- 2-way Radio Communication
- SLD
- Strike Alert Operational

Hazard Exposures (Yes / N/A)
- Falling Objects
- Flying Dust Particles
- Petroleum Vapors
- Suspended Loads
- Radiation X-Ray
- Temperature Extremes
- Hot Metal
- Moving Machinery
- Static Electricity
- Working over Water
- Elevated Work
- Inadequate Lighting
- Chemical Exposure
- Pipe Coating
- Purging Required
- Venting Required
- Pot Hole Existing Lines
- Hand Digging Required
- Benzene
- Lead
- Asbestos
- Natural Gas

Gas Cylinders
- Stored Upright
- Valve Caps in Place
- Oxygen 20 Feet From Fuels
- Containers Labeled
- Properly Secured
- Inspections/Certificates
- Stored Away from Heat
- Proper Ventilation
- Warning Signs

Locates
- Have all utilities been located and verified?
- Is Locate Number on-site and current?

Work assignments not addressed above shall be outlined below

All employees must print and sign their names below

Printed Name	Signature	Printed Name	Signature
1.		5.	
2.		6.	
3.		7.	
4.		8.	

Foreman Signature ____________________ **Safety Rep. Signature** ____________________

NOTE: Additional Job Briefing will be required when scope of work changes and/or conditions change

1. Have overhead power lines been located and have proper precautions been identified?
2. Have all employees received proper training and are qualified (OQ) to perform the tasks to which they have been assigned?
3. List injuries, incidents, first aid and near miss cases that occur at the job site during the course of the day:

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Welding and Cutting Procedures

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

Definitions

Authorized person—One who has the authority to perform specific duties under certain conditions or who is carrying out orders from a responsible authority.

Bonding—The permanent joining of metallic parts to form an electrically conductive path that will ensure electrical continuity and the capacity to conduct safely any current likely to be imposed.

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

Ground—The electrical potential of the earth's surface; a conducting connection, whether intentional or accidental, between an electrical circuit or equipment and the earth, or to some conducting body that serves in place of earth.

General Requirements

Responsibility

The competent person shall be responsible for inspecting the jobsite and authorizing when welding and cutting operations can proceed. The competent person shall be trained and knowledgeable in welding and cutting operations. The competent person will also be skilled and knowledgeable in all applicable regulations pertaining to safe handling of oxygen and fuel-gas equipment.

Training

All employees involved in welding and cutting shall be properly trained in the safety procedures of this chapter prior to their initial job assignment and annual refresher training. Some job tasks will require welding certification.

Safety Procedures

Hot Work Permit

Some general safety or site requirements require precautions in the form of a written permit to be completed and the work authorized. When necessary, obtain a hot work permit before starting any welding and/or cutting procedures. (Refer to the Hot Work Permit in Chapter 19).

First Aid Supplies

First aid supplies shall be readily available at all times when performing welding and cutting operations. First aid supplies shall specifically include:

- Supplies for treatment of burns
- Supplies for treatment and removal of foreign bodies to eye

Electric Welding

- Always wear a welding helmet or shield with the proper colored lens to prevent eye injury.
- Wear safety glasses at all times. Safety glasses are required to be worn under welding helmets and grinding shields to prevent slag and other foreign materials from entering the eyes when looking at and cleaning the weld.
- Never look at the welding arc with the naked eye.
- Welder helpers are required to wear safety glasses and full face shields when operating hand held grinders.
- Always make sure the frame of a truck- or trailer-mounted portable welding machine is properly bonded before use.
- Always be sure welding gloves and clothing are dry when welding.
- Collect stub ends of welding rods in an approved container.
- Allow hot work to cool before leaving it unattended.
- Remove all cigarette lighters and matches from pockets prior to starting work.

Truck- or trailer-mounted portable welding machines shall not be operated until the machine is properly bonded or electrically connected to the truck or trailer frame.

Gas Welding and Cutting

- All hoses, gauges, and torches shall be inspected regularly. Connections should be checked for leaks after each assembly and before lighting the torch. Use leak testing equipment to test for leaks. Leaks must be corrected immediately.
- Hoses shall not be repaired with tape.
- Never use gases from the cylinder without the proper use of pressure regulating valves and gauges.
- Check valves that prevent reverse flow must be used on all oxyacetylene welding and cutting torches.
- Never permit oil, grease, or oily rags to come in contact with oxygen. Spontaneous combustion can occur.
- Open cylinder valves slowly. Do not stand in front of valves when opening them.
- Always set regulating pressures with the torch needle valves open. Correct adjustment can be made only when the gases are flowing.
- When lighting a torch, open the fuel gas valve on the torch before opening the oxygen valve.
- Always light the torch with a "spark lighter"; never with a cigarette lighter or torch.
- Cylinders shall be stored in an upright position and shall be properly secured by chaining or clamping to prevent falling or tipping.
- Do not wear ragged, oil soaked, or polyester clothing while welding or cutting. Low cut shoes are not permitted.

Regulators

- Regulators should be equipped with a flashback arrestor.
- Regulators should only be used with the gases and pressure for which they are designed.
- Check regulators for any damage. Threads must be in good condition and the seating connection must be free of contamination.
- Do not use excessive force to tighten down the regulator nut.

Bell Hole Welding

- Test the atmosphere in trenches before entering to be sure there is not a gas build-up present (See Chapter 22, "Confined Space and Vessel Entry Procedures" for confined space procedures).
- Keep an extinguisher present and a stand-by person whenever welding on live gas.
- The T/E Competent Person must inspect the trench on a daily basis and take necessary precautions to prevent cave-ins. (See Chapter 23, "Trenching and Excavation" for more information related to trenching and excavations).

Guidelines for Grounding Procedures

The decision on whether it is required to ground a welding machine is based on what you do with the auxiliary power created by the welding machine's generator. You are not required to ground a truck- or trailer-mounted welding machine if:

- The auxiliary power is taken from receptacles on the machine using a cord and plug arrangement.
- The receptacles have a grounding pin.
- The frame of the machine is bonded or electrically connected to the truck or trailer frame.

You are required to ground the frame of the machine if either of these conditions is met:

- The generator on the machine is connected to the wiring system on the premises.
- The auxiliary power is hard-wired into the generator without using cords and plugs.

It may be necessary to ground welding machines according to the potential hazards that may exist within the surrounding environment. Please consult Safety Department and/or customer/client procedures when working in potentially hazardous atmospheres.

When performing grounding procedures, adhere to the following safety guidelines:

- Connect the wire and ground rod combination to the frame or grounding stud of the welding machine.
- The grounding rod must be driven an adequate distance into the ground to provide a good positive ground.
- Inspect all ground connections to ensure mechanical strength.

When using a welding machine sitting directly on earth, drive a ground rod into the earth. Ensure that the frame of the machine is bonded or electrically connected to the ground rod to create an earth connection.

Other examples of grounding during the welding process include:

- When working under high-voltage electrical lines, pipe, structural steel, and other metallic objects can pick up a static charge from the lines. Ground these objects before working on them to discharge the static electricity. Contact the Safety Department when working near high-voltage lines to ensure a work procedure is developed to effectively mitigate this exposure.
- When driving welding rigs and other mobile equipment under high-voltage lines, install static straps to maintain contact with the ground at all times if necessary. Contact the Safety Department to develop a work procedure for the safe operation of vehicles and other mobile equipment.

(See Chapter 19, “Pipeline Safety,” for more information related to grounding of pipe and mobile equipment).

Proper grounding in the welding environment is a good practice, but it does not remove all possibility of electrical shock. The welding circuit is energized at the welding voltage. You will receive a shock if you become the electrical path across the welding circuit. Take precautions to insulate yourself from the welding circuit by wearing dry insulating gloves and other insulating equipment. Maintain insulation on welding cables, electrode holders, guns, and torches to provide protection.

Equipment Placement

Keep passageways, doorways, ladders, or stairways clear of welding cables and other equipment.

Operating Procedures

When following operating procedures, adhere to these safety guidelines:

- Do not leave electrode holders unattended unless they are protected to prevent electrical contact with employees or conducting surfaces.
- Turn off welding units when work is stopped, when moving the unit, or when leaving the work area for any length of time.
- Report all defective equipment to the Supervisor for repair or replacement.
- Provide welding shields or barricades, where practical, to protect employees from direct arc rays, sparks, or grinding materials.
- Do not use grinders without proper guards in place.

Fire Protection

During a welding or cutting procedure, adhere to the following safety guidelines to decrease fire hazards:

- Relocate or clean all moveable fire hazards at least 35 ft (10.67 m) from the work area.
- Ensure that suitable fire extinguishers are available near the work site at all times.
- Do not begin work until permits are in place.
- Assign an employee as a fire watch when welding, cutting, brazing, and/or soldering are performed near combustible materials or in a location where a fire may develop. A fire watch should be trained in the use of fire extinguishing equipment and familiar with the procedures for sounding an alarm in the event of a fire. Provide the fire watch during the length of the task, and for 30 minutes following job completion.
- Protect any flammable materials that cannot be moved. Contain sparks as required by the client.
- Barricade the area below elevated welders with caution tape and other safety markers.
- Do not perform welding, cutting, or heating where the application of flammable paints, the presence of other flammable compounds, or heavy dust concentrations create a fire hazard. If fire hazards cannot be removed or safeguards put in place to confine heat, sparks and slag or protect the immovable fire hazards, then welding and cutting operations shall not be performed.

Welding Hoods and Eye Protection

When performing welding and cutting procedures, observe the following guidelines concerning PPE:

- Do not use nonstandard welding hoods, such as pancake shields.
- Wear safety glasses marked ANSI Z87.1 or goggles, with mandatory side shields, at all times, especially when the welding hood is up. Ensure that prescription safety glasses meet ANSI requirements. Employees must wear safety goggles or cover safety glasses over prescription glasses that do not meet these requirements. Side shields are required on all prescription safety glasses.
- Wear burning goggles with no less than a #3 density lens with plastic cover plates on each side for all gas welding and burning. Burning goggles are worn over approved safety glasses.

Refer to OSHA 29 CFR 1926.102 for minimum guidelines for lens shades for eye protection utilized during all welding and cutting operations.

- Wear a face shield over approved safety glasses or goggles when cutting, chipping, grinding, or buffing.

Protective Clothing

- Wear only 100% cotton or FR (fire retardant) long-sleeved shirts while performing welding and cutting.
- When welding overhead, wear a protective leather jacket and sleeves along with welding gloves for protection.

When worn, FR Clothing must meet the requirements of NFPA 2112: Standard on Flame-Resistent Garments for Protection of Industrial Personnel Against Flash Fire.

Hand Protection

Welding gloves are required when welding.

Inspection of Equipment

All welding and cutting equipment including hoses, gauges, torches, and valves must be inspected on a daily basis. Defective or damaged equipment shall not be used. Notify your foreman and/or the Safety Department for replacement of equipment. Repairs can only be made by qualified personnel.

Ventilation

General mechanical ventilation or local exhaust systems must be used for employee protection when employees work:

- In confined spaces
- With toxic metals
- In unusual conditions that cause an unsafe accumulation of contaminants

Respiratory Protection

Wear approved respirators when working in confined spaces or with toxic rods or metals, which include:

- Materials that contain, are coated with, or are bearing zinc, lead, cadmium, mercury, or beryllium.
- Stainless steel with inert gas equipment.

The supervisor or the Safety Department must select and approve respirators for specific jobs (see Chapter 41, "Respiratory Protection").

Compressed Air and Gases

Definitions

Compressed gas (non-liquefied)—A gas, other than a gas in solution, which, under the charging pressure, is entirely gaseous at a temperature of 70 degrees F.

Cylinder—A portable compressed gas container, fabricated to or authorized for use by the DOT and/or other recognized regulatory agency in that jurisdiction.

Flammable gas—A gas that is flammable in a mixture of 13 % or less (by volume) with air, or the flammable range with air is wider than 12 %, regardless of the lower limit, at atmospheric temperature and pressure.

Liquefied gas—A gas which under charging pressure is partially liquid at a temperature of 70 degrees F (20 degrees C).

Non-flammable gas—A gas that does not meet the definition of a flammable gas.

Oxidizing gas—A gas that can support and accelerate combustion of other materials.

Safety relief device—A device intended to prevent rupture on a cylinder under certain conditions of exposure.

Toxic gas—A gas having the health hazard rating of 3 or 4 defined in NFPA 704, *Standard System for the Identification of the Fire Hazards of Materials.*

Valve protection cap—a rigid, removable cover for compressed gas container valve protection.

General Safety Guidelines

When working with compressed air and gases, adhere to the following safety guidelines:

- When using compressed air, always wear proper eye protection.
- Oxygen or other compressed gases shall not be used as a substitute for compressed air.
- Compressed gas cylinders shall be legibly marked for the purpose of identifying the gas content.
- Use only hoses and couplings designed to handle compressed air and inspect them before each use.
- Never crimp, couple, or uncouple a pressurized hose. Shut off the valve and bleed down the hose.
- Do not use compressed gases for cleaning clothing, workbenches, or machinery.

- Do not support hoses from conduit, process lines, or fire lines.
- Compressed air can be extremely dangerous; handle it with care and use it only when necessary.
- Never use compressed air for personal cleaning of any type.
- Never aim or spray compressed air at a fellow employee for any reason.
- Use only approved safety nozzles on air hoses. Reduce air output to 30 psi when air is used for cleaning purposes. .Use air hoses for cleaning machinery or equipment only when brooms, brushes, or vacuum cleaners are not adequate.
- When using compressed air for cleaning, ensure that everyone is out of the area before spraying air.
- Report defective nozzles, gauges, and regulators to the supervisor immediately.
- Fasten all flexible air lines and hoses to prevent whipping in the case of a broken line.
- Always return air hoses to the proper storage place after use.
- Oxygen cylinders or apparatus shall not be handled with oily hands or gloves.
- Valves should be closed, gauges should be removed, and cylinders should be capped when not in use.
- Cylinders should not be dragged, pushed, or pulled across the floor or ground.
- Do not drop cylinders or allow them to strike each other violently.
- Do not tamper with safety devices on valves or on cylinders.
- Secure and support compressed gas cylinders at all times. Cylinders should not be left free-standing at any time.

Transportation and Storage of Cylinders

- Cylinders shall be stored in an upright position and shall be properly secured by chaining or clamping to prevent falling or tipping. Fuel gas and oxygen cylinders shall be stored a minimum of twenty (20) feet apart unless separated by a non-combustible firewall a minimum of five (5) feet high having a fire-resistance of at least one-half hour.
- Cylinders shall not be transported laying flat in the back of company vehicles.
- Only move cylinders in approved carts with the cylinders chained down. Gauges should be removed and cylinders capped while being transported.
- Cylinders shall be separated from flammable and combustible liquids and from easily ignited materials such as wood, paper, packaging materials, oil, and grease.
- Cylinders shall not be stored near any sources of heat.
- Cylinders shall not be stored near elevators, stairs, gangways, or other places where they can be easily knocked over or damaged by passing or falling objects.

Use of Cylinders

The following guidelines are used to provide a positive identification of compressed gas cylinders and ensure the proper selection, use, storage, handling, and maintenance of all such cylinders. These guidelines apply to all compressed gas cylinders, including sample cylinders, regardless of size or contents that are purchased, rented, or leased.

It is the responsibility of each supervisor to ensure, to the best of his or her ability, that the compressed gas cylinders in his or her area comply with the provisions of this section.

Never tamper with or attempt to repair compressed gas cylinders or valves. Leaking cylinders or cylinders with leaking valves should be placed outdoors in a safe area and identified with a ***Do Not Use*** tag. The local gas supplier should be contacted as soon as possible.

Markings

The chemical or trade name of the gas must be legibly marked on each compressed gas cylinder with stenciling or labeling, as indicated in, and must not be easily removable. Never handle or transport a cylinder if the contents have not been properly identified. All personnel responsible for handling cylinders should be properly trained. Please refer to Table 20-1 for assistance in identifying compressed gas cylinders.

Table 20-1. Compressed Gas Cylinder Thread Codes

Gas Name	Valve Thread Code Number
Oxygen-welding	CGA 540
Oxygen-medical pin indexed for O_2	CGA 680
Acetylene	CGA 510
Carbon dioxide	CGA 320
Nitrogen (general purpose)	CGA 580
Nitrogen (fire protection)	CGA 580 Red
Helium	CGA 580
Breathing air **Must be labeled "BREATHING AIR"**	CGA 346 Yellow
Compressed air	CGA 590
Hydrogen	CGA 350
Propane (LPG)	CGA 510
Argon	CGA 580

Inspections

All cylinders must be inspected when received to ensure that the cylinders:

- Comply with thread types listed in the "Markings" section.
- Are labeled with the correct name as identified in the "Markings" section.
- Have a protective cap over the valve that protects the valve and threads.
- Have no physical damage such as dents, rust, or corrosion around the neck or valve, gouges, or evidence of being in a fire or welded. Bottles with any of these types of damage must be removed from service.
- Have a current hydrostatic test stamp.

- Table 20-2 lists the hydrostatic test requirements.

Table 20-2. Hydrostatic Test Requirements

Department of Transportation (DOT) Specifications Stamped on Cylinder	Retest Period
DOT-3	5 years
DOT-3A, 3AA, 3AL	5 or 10 years*
DOT-3AX, 3AAX	5 years
3C, 3E	Retest not required
4B, 4BA, 4BW, 4B-240ET	5 or 10 years*
8, 8AL	Retest not required
*Check with Transportation Regulations (49 CFR 173.34).	

21

Radiation Hazards

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

Contents

The radiation hazards covered in this section are:

- RF (Non-Ionizing Radiation)
- Naturally Occurring Radioactive Materials (NORM)
- Radioactive Work

RF (Non-Ionizing Radiation)

Definitions

ANSI—American National Standards Institute

Antenna—A device used for radiating or receiving electromagnetic energy.

Athermal effect—Effect of electromagnetic energy absorption not associated with a measurable rise in temperature.

Beamwidth (Half-Power)—A plane containing the direction of the maximum lobe of the antenna pattern, the angle between the two directions in which the radiated power is one-half the maximum value of the lobe.

Cellular— A wireless phone system.

Coaxial cable—A cable comprised of a center conductor, surrounded by an insulating core, with a braided or solid shield. The conductive shield surrounds the core with outside insulation.

Controlled exposure—FCC maximum RF exposure levels for those persons who are fully aware of their exposure potential and can exercise control of their exposure.

Dipole—A linear radiator, usually fed in the center, producing a maximum of radiation in the plane normal to its axis. A normal dipole is one-half wavelength long.

Effective Radiated Power (ERP)—Power supplied to the antenna and its gain relative to a half-wave dipole in a given direction.

Electric field—An electrically charged field that surrounds a high-voltage energized conductor.

Electric field strength—The given strength or magnitude of the electric field expressed in units of volts per meter (V/m)

EMR—Electromagnetic radiation

FCC compliant site—A site that meets one of the following criteria:

- The combination of site design, antenna type and mounting, power level, and frequency of the emitters is such that under worst-case conditions no individual can be exposed to radio frequency environment (RFE) levels higher than those specified by the FCC for General Population/Uncontrolled Environments. This definition assumes that individuals at the site have neither knowledge nor understanding of RFE and are not required to follow any procedures to limit their exposure levels.
- An effective RFE program is in place to control RFE exposure levels at the site such that under worst case conditions individuals not operating under the safety program cannot be exposed to RFE levels higher than those specified by the FCC for General Population/Uncontrolled Environments, and workers operating under the safety program cannot be exposed to RFE levels higher than the FCC limits for Occupational/Controlled Environments.

Field averaging—FCC standard that stipulates a 6-minute exposure limit for uncontrolled exposure and a 30 minute exposure limit for controlled exposures.

General population environment—Defined by the FCC as an area where RFE exposure may occur to persons who are unaware of the potential for exposure and who have no control over their exposure. As specified in the RFE Program, the General Population Environment includes the Green Zone. The Green Zone may be governed by the Company RFE program, and access may be open to the public.

Hertz—The unit for expressing frequency. One hertz equals one cycle per second.

HV line towers—Towers used to support high-voltage transmission lines.

IEEE—Institute of Electric and Electronic Engineers

Ionizing—A type of energy, in the upper end of the electromagnetic spectrum, that has the ability to strip ions from molecules ,and then forms a new, distinct molecule.

Isotropic antenna—An antenna capable of radiating or receiving equally well in all directions, and equally responsive to all polarization of electric and/or magnetic fields.

Magnetic field—A magnetically charged field that surrounds a high-voltage energized conductor.

Magnetic field strength—The magnitude of the magnetic field vector expressed in units of amperes per meter (A/m).

Maximum Permissible Exposure (MPE)—The maximum electric and magnetic field strengths or the plane wave equivalent power densities to which a person may be exposed without harmful effect and with an acceptable safety factor as determined by the 1997 FCC regulation.

Occupational environment—Defined by the FCC as an area where RFE exposure may occur to persons who are aware of the potential for exposure as a condition of employment or specific activity. As specified in the Company RFE program, the Occupational Environment includes the Red, Yellow, or Green Zones. These safety zones are covered by the Company RFE program.

Parabolic antenna—Antenna consisting of a parabolic reflector and a source at or near the focus. A microwave dish antenna is an example of a parabolic antenna.

PCS—Personal communication system, such as a pager.

Peak envelope power—Average power supplied to the antenna transmission line by a radio transmitter during one radiofrequency cycle at the crest of the modulation envelope taken under normal operating conditions.

Personal monitoring device—A battery operated RFE monitoring device, worn by a person that sounds an alarm when the RFE exposure exceeds 50% of the MPE for occupational environments.

Personal Protective Equipment (PPE)—Depending on the type of work to be performed, the PPE may include, but is not limited to, hardhats, RFE personal monitors, lockout and tagout equipment and supplies, and RFE protective suits (as required by site-specific guidelines).

Radar—System that radiates pulsed or frequency modulated electromagnetic waves and utilizes the reflection of such waves from distant objects to determine their existence or position.

Radio beam—Radio waves whose energy is essentially confined with a relatively small angle in at least one plane.

Radio frequency spectrum—Defined in terms of a range from 3 kilohertz (kHz) to 300 gigahertz (GHz).

RF fields—Radio frequency (RF) electrical and magnetic fields emitted from antenna or transmitter arrays.

RFE—Radio frequency environment.

RFPM—RF personal monitors, designed to alert workers when the field approaches designated safe limits.

RF hot spot—A highly localized area of more intense RF radiation than is present in an adjacent area.

RF protective clothing—Clothing specifically designed to protect the wearer from excessive exposure to RF fields.

Uncontrolled (general public) exposure—FCC maximum RF exposure levels for those persons who are not fully aware of their exposure potential and cannot exercise control over their exposure.

General Requirements

This guide provides Company employees with RFE safety requirements and procedures for the safe entry and performance of work on RFE sites. It establishes the requirements and procedures based on relevant FCC, OSHA, and other federal regulations and industry standards such as IEEE and ANSI. Complying with the requirements in this document helps reduce the risk of exposure to RFE by Company employees and contractors during anticipated and normal installation, use, or maintenance of the RFE transmission systems.

The Company recognizes that each RFE site can have a unique set of conditions. As a result, this document provides performance-based safety requirements that provide the expected results but allow flexibility in the methods used to achieve those results. Specific methods used to comply with some requirements are provided as recommendations. Post general guidelines for working in an RFE environment at each site, and develop site-specific guidelines for each site in addition to the general guidelines provided. Refer to the guidelines located in this chapter.

Initially, RFE exposure was primarily limited to communication workers installing and maintaining communication antennas. The rapid expansion of the wireless communications industry has led to new impacts on the power-transmission industry. Wireless companies are sharing the rights-of-way with the power lines. Electrical transmission structures have been modified to perform a dual role as communication towers.

These requirements apply to all work with a potential for occupational exposure to RF radiation.

Communication

The Company will inform its employees, customers, and contractors that RFE levels, even if significantly below the FCC MPE levels, have been known to cause interference in the operation of certain medical devices such as pacemakers. Individuals with such devices must notify the Company before performing any work with a potential for exposure within an RFE. The Company should comply with all contractual terms and conditions as specified by the client and with all federal RFE regulations.

RF Emitters

Cellular phone service providers are prime users of transmission towers because of the large number and location of these towers. Wireless systems have power levels that vary with the number of active channels employed and the "reach" of each particular base station. In rural areas, higher signal levels are commonly transmitted to cover a larger range than would be transmitted in a smaller, more congested urban area.

Most transmitting antennas have directional radiation patterns in the elevation plane and do not radiate the signal more than a few degrees in a downward direction.

Health Effects

Studies have shown that overexposure to RFE can result in carcinogenic, reproductive, and neurological effects to the body.

Signs and symptoms such as pain, reddening of the skin, confusion, vertigo, nausea, headache, unusually elevated body temperature, or any other evidence of tissue burning are possible indications of overexposure.

Personal Protective Equipment (PPE)

The Company provides, at no charge to the employee, PPE when performing work at an RFE site. The Company also provides training on the proper use of the PPE. Depending on the type of work to be performed, the PPE may include but is not limited to:

- Hardhats
- Safety glasses
- RFE personal monitors

- Lockout and tagout equipment and supplies
- RFE protective suits (as required by site-specific guidelines)

Electromagnetic field dosimeters measure the exposure to electromagnetic radiation in certain ranges of the electromagnetic spectrum. Electromagnetic field dosimeters (personal RF monitors) should be worn when there is a potential for exposure within an RFE. The monitor should be either worn in the torso region of the body or handheld during the work process. Area monitors may also prove effective for indicating the presence of RF fields in the work environment.

Personal RF monitors should be worn by each employee when RF antennas are located on structures where they are working.

Hazardous Energy Control Program

The most direct and positive way to control potential RF exposure is to turn off or remove the RF equipment, but in some cases this may not be possible. In those cases, procedures should be devised wherein a prescribed power reduction can be accomplished prior to personnel access to high-field-strength areas. Both of these methods require special communications between the transmitter operator, customer or client, and all employees performing the work.

When feasible and practical, use lockout and tagout procedures when performing any maintenance, installation, or testing of RFE equipment or components in a designated Red Zone or Yellow Zone. If it is not feasible and practical to use locks and tags on the equipment while performing maintenance, installation, or testing of electrical or RFE systems, use safety procedures and PPE to protect employees from exposure to RFE hazards.

Many communications sites rely on battery-powered uninterruptible power supplies, meaning that disconnecting the main AC lines for the site will not result in the transmitter being turned off. This feature must be identified before selecting the best approach to eliminating potential RF exposure.

While performing work in an identified Red Zone or Yellow Zone, there must be at least two persons (using the buddy system) in the area at all times. One person acts as a safety observer for the other and provides emergency assistance or notification if required.

RFE Safety Training

The Company provides RFE safety training for all employees who perform work within Company designated RFE zones. The Safety Department maintains RFE safety training documentation.

The RFE safety training must include, at a minimum, the following elements:

- General principles of RFE
- Effects of RFE exposure
- Precautions and preventive work practices, including:
  - Using RFE source equipment that meets applicable RFE and safety standards whether the equipment is new, in use, or modified
  - Identifying and controlling RFE hazard areas
  - Implementing controls to reduce RFE exposures to levels that comply with applicable federal regulations (ANSI and FCC), which includes establishing safe work practice procedures

- Company safety program requirements, including:
  - Conducting RFE safety and health training to ensure that all employees understand the RFE hazards to which they might be exposed and the means by which the hazards are controlled
  - Implementing an appropriate medical surveillance program
- Company emergency notification and response procedures, including employee involvement in the structure and operation of the program regarding decisions that affect their safety and health to make full use of their insights and encourage their understanding and commitment to the established safe work practices
- Review of Company safety zone designations, including annual reviews of the effectiveness of the program so that deficiencies can be identified and resolved
- Review of RFE personal monitoring equipment

Emergency Notification and Response Procedures

Emergency contact information is posted in all Company vehicles and at the site shelters or meter board, along with a set of written directions leading to the site, which the employee reporting the emergency can give to emergency or rescue personnel. In the event of an emergency at a site, the notification and emergency response procedures are posted near the telephones. Refer to the Emergency Phone Numbers form and Directions to Site form located in this chapter.

Safety and Health Program Audit

The Company is committed to continuously improving its RFE program. The program is reviewed annually to ensure that the requirements and procedures contained within the document are effective and appropriate based on current governmental regulations.

The Company also randomly inspects RFE sites and reviews the available safety training documentation to ensure compliance with the requirements of this guide.

Safety Zones

Safety zones are identified and established by categorizing measured or calculated levels of RFE in a manner consistent with governmental guidelines (see Table 21-1). At Company sites, the safety zones are:

- **Green Zone**—All areas, measured with the shaped response probe, that register no higher than 20% of the MPE field levels for General Population Environments and are outside the area marked by a Notice sign or between a Notice sign and a Caution sign.
- **Yellow Zone**—Areas with levels at or above 21% but no higher than 50% of the MPE field levels for Occupational Environments.

  When maintenance is performed in a Yellow Zone, use hazardous energy control procedures and the buddy system to ensure that personnel are protected from exposure to RFE hazards. Only authorized personnel may enter this area. Wear RFE protective suits unless transitioning through the area.

- **Red Zone**—Areas with levels at or above 51% of the MPE field levels for Occupational Environments. Entrance into this area is prohibited without proper authorization, certification, and PPE.

  Use the buddy system and wear RFE protective suits to ensure protection from exposure to RFE hazards.

Any of the safety zones can change status due to equipment failure.

Table 21-1. Radio Frequency Emissions Zone Exposure Classification Table

Zone	Exposure Classification	Controls	Action Levels
Green	General public uncontrolled	Restricted access Notice sign	≤ 20% Uncontrolled MPE
	Occupational controlled	RFE safety training Personal RF monitoring device	
Yellow	General public uncontrolled	Restricted access—authorized personnel only Caution sign and color coding on tower	≥ 21% Uncontrolled MPE and/or ≤ 50% Controlled MPE
	Occupational controlled	RFE safety training Personal RF monitoring device Buddy system Lockout/tagout or protective clothing	
Red	Occupational controlled	Prohibited access—access only to trained and certified personnel Warning sign and color coding on tower RFE safety training Personal RF monitoring device Buddy system Lockout/tagout or protective clothing	≥ 51% Controlled MPE

Signage and Markings

Perimeter Hazard Warnings and Markings

Post RFE signs and labels at the perimeter of each zone. Other markings such as painted striping, chains, stanchions, or fencing may also be used to help identify the perimeter of each safety zone.

The RFE signs must follow the ANSI sign and color standards and use the RFE symbol. Each zone has a different sign indicating the level of hazard.

- **Green Zone**—The sign is green with black letters and has the key word "NOTICE" in the heading. The wording must be shown as in the Green Zone Notice Sign located in this chapter.
- **Yellow Zone**—The sign is yellow with black letters and has the key word "CAUTION" in the heading. The wording must be shown as in the Yellow Zone Caution Sign located in this chapter.
- **Red Zone**—The sign is red with black letters and has the key word "WARNING" in the heading. The wording must be shown as in the Red Zone Warning Sign located in this chapter.

Naturally-Occurring Radioactive Materials (NORM)

Naturally-Occurring Radioactive Materials (NORM) are radioactive materials that occur naturally and expose people to radiation. Another term used to describe these materials is Technology Enhanced Naturally-Radioactive Materials (TENORM). This hazard can exist in trenches and/or excavations where old oil sludge, scale, or liquids are present. The hazard could also exist when performing maintenance of equipment that contains remnants of this material.

Training

Employees who can be exposed to these materials will be trained in the location, identification, and methods used to protect them from these hazards.

Hazard

The primary hazard associated with exposure to NORM is lung cancer. Suitable means must be used to minimize employee exposure to this hazard.

Introduction

The majority of NORM (or TENORM) centers on waste from industrial processes. Most of the waste is produced in large volumes but with low radiation activity. While some waste is disposed of, other waste is put to commercial uses. The improper disposal, re-use, and recycling of diffuse TENORM has led to contamination events and unnecessary exposures. Disposal in piles or stacks can lead to groundwater contamination and to airborne releases of radioactive particulates and radon. Improper use and/or disposal of waste, such as for soil conditioning or back fill, can lead to radon gas exposure in homes. It can also cause direct exposure to individuals, contamination of the soil, and any crops growing in the area. Re-use of TENORM contaminated materials, such as in concrete aggregate, can lead to increased risks to the public.

This radioactivity is naturally occurring within the earth. One general area of concern for our work activities is sludge from old pipeline cleaning operations.

Location of Hazard

Radioactivity in oil and gas production and processing equipment is of natural origin and now known to be widespread throughout the world. Estimates suggest that up to 30% of domestic oil and gas wells may produce some elevated TENORM levels.

Uranium and thorium compounds are mostly insoluble, and as oil and natural gas are brought to the surface, these compounds tend to remain embedded in underground geologic formations. As the natural pressure within the bearing formation falls, formation water present in the reservoir is also extracted with the oil and gas. Some radium and radium daughter compounds are slightly soluble in water and may become mobilized when this production water is brought to the surface. The precipitate consists principally of barium sulfate, calcium sulfate, and calcium carbonate. Because the chemistry of radium is similar to that of barium and calcium, radium can also precipitate to form complex sulfates and carbonates.

The amount of TENORM material from a producing field generally increases as the amount of water pumped from the formation increases. Since radium concentrations in the original formation are highly variable, the concentrations that precipitate out in sludge and as scale on internal surfaces of oil and gas producing equipment also vary. This scale may vary in thickness from a few millimeters to more than an inch. Scale deposits can become so thick that they completely block the flow in pipes.

Scale

The oil and gas stream passes through a separator where the oil, gas, and water are divided into separate streams based on densities. Most of the solids are removed there. The produced water flows from the separators into the storage tanks and is often injected into disposal or recovery wells. Scales are usually found in piping and tubing, including the flow lines, injection and production well tubing, manifold piping and small-diameter valves, meters, screens, and filters.

Concentrations of TENORM occur in wellhead piping and production piping near the wellhead. The concentrations of radium, in scale deposited in separators, is less than that found in wellhead systems. There is a further reduction of radium concentration in heaters/treaters.

Sludge

The origin of radioactive-contaminated sludge is similar to that of scale. As the produced water is subjected to changes in temperature and pressure, dissolved solids can precipitate out of the solution and deposit sludge within the oil production system. These deposits are in the form of oily, loose material.

Testing for NORM

Oil field piping and equipment are now surveyed for the presence of radioactivity. Contaminated equipment is either held in storage or sent to a commercial decontamination facility. Tank sludge is also surveyed for radioactivity, dewatered, and held in storage pending disposal.

There are various types of equipment that can be used by properly trained personnel to measure radioactivity. The test can be conducted by using direct-reading test equipment or by wearing a small protective monitor called a dosimeter.

Employees have the right to observe the monitoring and obtain copies of test results.

Protection from NORM

There are three primary methods of protection from NORM: time, distance, and shielding.

By limiting the amount of time an employee is exposed to NORM, the overall dose received may be less, thus reducing the hazard to the employee.

Distance is also a factor. By increasing the distance between the employee and the sludge or scale, the dose can be reduced. The pipe being worked on could be removed from the area that contains the sludge or scale or the sludge or scale could be removed from the work area.

Shielding is the third method. A barrier, such as lead or concrete, can be placed between the radiation source and the employee to provide protection.

PPE is another method of employee protection. The use of impervious gloves, along with respiratory protection, can be implemented.

Good personal hygiene practices should also be practiced. There should be no eating, drinking, or smoking in a potentially contaminated work environment. A proper facility to wash hands must be established. Proper, frequent cleaning of work clothes will also help to reduce exposure. Employees must not be allowed to wear contaminated clothing away from the work areas.

Radiographic Work

Policy

The following procedures are based on requirements of the Nuclear Regulatory Commission and/or the State Department of Health, Radiation Control Branch Board, or additional safety requirements. They apply equally to radioisotope and X-ray equipment.

Objective

This provides the minimum procedures to be followed when radiographic services are performed on-site and applies to all employees and on-site contractors engaged in radiographic operations.

Responsibilities

Site Management

Site Management must assume ownership and responsibility for implementation of the requirements of this procedure.

Supervisor

Supervisors responsible for employees performing work near radiographic operations shall confirm each job has been properly evaluated for hazards and that these hazards have been properly eliminated or controlled.

Supervisors must also ensure employees are aware of any radiation hazards associated with their work area, and continuously monitor the work to assure compliance with this procedure.

Employee

Employees performing work tasks near radiographic work must do so in accordance with training and instructions received.

Site Safety Representative

The Safety Representative shall assist Site Management in compliance with this procedure.

Health and Safety Department

The Health and Safety Department shall assist Site Management in compliance with this procedure.

Procedure

Radiographic subcontractors shall make the following information available to the Site Manager or Site Safety Representative:

- A copy of the Subcontractor's Radioactive Material License or Registration
- Name and telephone number of the Subcontractor's Radiation Safety Officer
- Type and size of source being used or expected to be used in the future
- Type of exposure device, X-ray machine, or source-handling equipment to be used
- Description and location of the storage facility to be used on-site
- A copy of the Subcontractor's Operating and Emergency Procedures

The radiographer's assistant shall have in his or her possession appropriate personnel monitoring devices and an operable and calibrated survey meter.

Before any exposure, the radiography personnel shall establish and post the restricted area and remove all personnel from this area.

During the first exposure, the radiography personnel shall establish and post the restricted area and remove all personnel from this area.

The radiography personnel shall record the results of the area survey performed at the perimeter of the restricted area. A copy of the documentation of the recorded survey shall be filed with the Site Safety Representative or Site Manager at the end of each day.

During periods of inactivity, the radiographer shall ensure that the exposure device is locked to prevent accidental exposure of other individuals and/or removal from the jobsite by unauthorized personnel.

The radiography personnel shall survey the exposure device with an operable and calibrated survey meter after each exposure to assure the source of radiation was returned to a safe position.

In situations where a crank out exposure device with a source exposure tube is required to perform industrial radiography, a directional beam collimator shall be utilized. The collimator shall provide the shielding equivalence of at least three half-value layers and shall be used at all times except when panoramic exposures are required. The angle of the collimated beam shall be minimal, thus limiting the path of ionizing radiation to only the section of the specimen being radiographed.

In case of emergency, the radiography subcontractor shall contact the Site Manager and the Site Safety Representative.

In the event of an emergency or an incident involving sources of radiation, the subcontractor shall (within 10 working days of the date of the emergency or incident) provide a written report detailing the event to the Site Manager and the Site Safety Representative. The report shall include the following:

- Date of incident
- Subcontractor personnel involved
- Company personnel involved

- Identifying information about the source of radiation and equipment used
- Details of events leading up to the emergency or incident
- Corrective actions taken to rectify the situation
- Action taken to prevent the situation from reoccurring
- Amount of radiation exposure subcontractor's personnel received as a result of the emergency or incident
- Whether or not the emergency or incident was classified as reportable to the governing Federal or State agency. If so, the subcontractor shall also provide a copy of the report supplied to the governing agency.

Demarcation

When X-ray work is being done, the radiographer will place barricades around the area at a point where there will be no danger to employees; the radiographer will also post signs with the barricades.

If one encounters such a barricade with the radiographic signs in place, do not attempt to enter the barricaded area. The barricade is placed for protection, failing to observe it will mean disciplinary action.

Sample 21-1. General Guidelines for Working in an RFE Environment

General Guidelines for Working in an RFE Environment

- All personnel must be authorized to enter this area.
- All personnel must have RFE awareness training before entering.
- Obey all posted signs.
- Assume all antennas are active and do not stop in front of any antenna.
- Notify owners before working on any antenna.
- Use RFE personal monitors while working on any operational site.
- Never operate transmitters without shields.
- Do not operate base station antennas in the equipment room.

Sample 21-2. Emergency Phone Numbers

Company Name

Emergency Phone Numbers

Hospitals: ____________________

Ambulance: ____________________

Police Department: ____________________

Insurance Carrier: ____________________

Quanta Safety Department: ____________________

Director of Corporate Safety: ____________________

Version 2, 09/02

Sample 21-3. Directions to Site

DIRECTIONS TO SITE

Version 1, 09/01

Sample 21-4. Notice for Radio Frequency Environment Area

NOTICE

RADIO FREQUENCY ENVIRONMENT AREA!

AUTHORIZED PERSONNEL ONLY BEYOND THIS POINT!

Personnel proceeding beyond this point must obey all posted signs, site guidelines, and Federal Regulations for working in radio frequency environments.

In accordance with Federal Regulations on radio frequency emissions.

Sample 21-5. Caution for Radio Frequency Environment Area

CAUTION

RADIO FREQUENCY
ENVIRONMENT AREA!

**AUTHORIZED PERSONNEL ONLY
BEYOND THIS POINT!
RADIO FREQUENCY EMISSIONS
BEYOND THIS POINT
MAY EXCEED THE FEDERAL
OCCUPATIONAL
CONTROLLED EXPOSURE LIMITS!**

Personnel proceeding beyond this point must obey
all posted signs, site guidelines, and Federal Regulations
for working in radio frequency environments.

In accordance with Federal Regulations
on radio frequency emissions.

Sample 21-6. Warning for Radio Frequency Environment Area

22

Confined Space and Vessel Entry Procedures

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

Definitions

The following terms are used throughout this chapter:

Acceptable entry conditions—The conditions that must exist in a confined space to allow entry and ensure that employees involved with a confined space entry can safely enter into and work within the space.

Authorized attendant—An individual stationed outside one or more confined spaces who monitors the authorized entrants and performs all assigned attendant duties.

Authorized entrant—An employee who is authorized to enter a confined space.

Blanking or blinding—The absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore and is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

Confined space—A space that:

- Is large enough and so configured that an employee can enter and perform assigned work.
- Has limited or restricted means for entry or exit. (For example, storage tanks, process vessels, silos, bins, boilers, ventilation or exhaust ducts, sewers, underground utility vaults, tunnels, pipelines, and open top spaces more than 4 ft (1.22 m) in depth, such as pits, tubs, vaults, vessels, and excavations are spaces that may have limited means of entry.)
- Is not designed for continuous employee occupancy.

Double block and bleed—The closure of a line, duct, or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

Emergency—Any occurrence (including any failure of hazard control or monitoring equipment) or event, internal or external to the permit space, that could endanger entrants.

Engulfment—The surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be inhaled and cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

Entry—The action by which a person passes through an opening into a confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

Entry Permit (permit)—The written or printed document that is provided to allow and control entry into a permit space and that contains the information necessary for the entry.

Entry supervisor—The person (such as the supervisor, general foreman, or foreman) responsible for determining whether acceptable entry conditions are present at a confined space where entry is planned, authorizing entry and overseeing entry operations, and terminating entry when required.

An entry supervisor also may serve as an attendant or authorized entrant, as long as that person is trained and equipped, as required by this guideline, for each role he or she fills. The duties of the entry supervisor may be passed from one individual to another during the course of an entry operation.

Hazardous atmosphere—An atmosphere that might expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (that is, escape unaided from a confined space), injury, or acute illness from one or more of the following causes:

- Flammable gas, vapor, or mist in excess of 10% of its lower flammable limit (LFL)
- Airborne combustible dust at a concentration that meets or exceeds its LFL

This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 ft (1.52 m) or less.

- Atmospheric oxygen concentration below 19.5% or above 23.5%
- Atmospheric concentration of any substance for which a dose or a permissible exposure limit is established that could result in employee exposure in excess of its dose or permissible exposure limit

An atmospheric concentration of any substance that is not capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects is not covered by this provision.

- Any other atmospheric condition that is immediately dangerous to life or health

For air contaminants for which the governing regulatory agency has not determined a dose or permissible exposure limit, other sources of information, such as Safety Data Sheets (SDSs) that comply with the governing regulatory agency, published information, and internal documents, can provide guidance in establishing acceptable atmospheric conditions.

Hot Work Permit—The written authorization to perform operations (for example riveting, welding, cutting, burning, and heating) capable of providing a source of ignition.

Immediately Dangerous to Life or Health (IDLH)—Any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or interfere with an individual's ability to escape unaided from a permit space.

Inerting—The displacement of the atmosphere in a permit space by a noncombustible gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible.

This procedure produces an IDLH oxygen-deficient atmosphere.

Isolated—The state of a permit space that has been removed from service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages.

Non-permit confined space (non-permit space)—A confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

Oxygen-deficient atmosphere—An atmosphere containing less than 19.5% oxygen by volume.

Oxygen-enriched atmosphere—An atmosphere containing more than 23.5% oxygen by volume.

Permit-required confined space (permit space)—A confined space that has one or more of the following characteristics:

- Contains or has a potential to contain a hazardous atmosphere
- Contains a material that has the potential for engulfing an entrant
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross section
- Contains any other recognized serious safety or health hazard

Permit-Required Confined Space Program (permit space program)—The overall program for controlling and, where appropriate, protecting employees from permit space hazards and for regulating employee entry into permit spaces.

Prohibited condition—Any condition in a permit space that is not allowed by the permit during the period when entry is authorized.

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

Rescue service—The personnel designated to rescue employees from permit spaces.

Retrieval system—The equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device or anchor) used for non-entry rescue of personnel from permit spaces.

Testing—The process by which the atmospheric hazards that could confront entrants of a permit space are identified and evaluated.

General Requirements

These requirements are intended to protect workers from toxic, explosive, or asphyxiating atmospheres and from possible engulfment from liquids or finely divided (flowable) solid substances. It focuses on areas with potential health or safety risks, denoting these as permit-required confined spaces. When dealing with confined spaces, observe the following safety guidelines:

- Evaluate the workplace to determine if any spaces are permit-required confined spaces. Proper application of the Permit-Required Confined Space Decision Flowchart, (Exhibit 22-A) will facilitate understanding of this guideline.
- Inform all employees, subcontractors, vendors, and visitors of confined spaces through training and by posting danger signs, when appropriate, at each confined space. Danger signs should read:

  DANGER

  PERMIT-REQUIRED

  CONFINED SPACE

  DO NOT ENTER

- Continue surveillance for unidentified confined spaces.
- Make requirements in this chapter and jobsite-specific confined space entry guidelines and programs available for review by employees and their authorized representatives.
- Before removing an entrance cover, eliminate any condition making it unsafe to remove the cover. After removing entrance covers, promptly guard the opening with a railing, temporary cover, or other temporary barrier that can prevent an accidental fall through the opening and protect each employee working in the space from foreign objects entering the space.
- Take effective measures to ensure that unauthorized individuals do not enter confined spaces.
- Identify and evaluate the hazards of confined spaces before allowing employees to enter them.
- Develop and implement means, guidelines, and practices necessary for safe confined space entry operations, including, but not limited to, the following:
  - Specifying acceptable entry conditions

- Isolating the confined space
- Purging, inerting, flushing, or ventilating the confined space as necessary to eliminate or control atmospheric hazards
- Providing pedestrian, vehicle, or other barriers, as necessary, to protect entrants from external hazards
- Verifying that conditions in the confined space are acceptable for entry throughout the duration of an authorized entry

Subcontractors

When the Company arranges to have employees of another contractor (subcontractor) perform work that involves confined space entry, the Company must:

- Inform the subcontractor that the workplace contains confined spaces and that confined space entry is allowed only through compliance with a confined space program meeting the requirements in this chapter.
- Apprise the subcontractor of the elements, including hazards, identified in the confined spaces in question.
- Apprise the subcontractor of any precautions or guidelines that the Company has implemented for the protection of employees in or near confined spaces where subcontractor personnel will be working.
- Coordinate entry operations with the subcontractor when both the Company personnel and subcontractor personnel will be working in or near confined spaces as required.
- Debrief the subcontractor at the conclusion of the entry operations regarding the confined space program that was followed and any hazards confronted or created in confined spaces during entry operations.

In addition to complying with the confined space requirements, each subcontractor who is retained to perform confined space entry operations for the Company is expected to:

- Obtain any available information regarding confined space hazards and entry operations from the Company.
- Coordinate entry operations with the Company when both Company personnel and subcontractor personnel will be working in or near confined spaces, as required.
- Inform the Company of the confined space program that the subcontractor will follow and of any hazards confronted or created in confined spaces, either through a debriefing or during the entry operation.

Protection and Rescue Equipment

The following equipment must be provided at no cost to employees, properly maintained, and used as required:

- Testing and monitoring equipment needed to identify and evaluate atmospheric hazards
- Ventilating equipment needed to obtain acceptable entry conditions
- Communication equipment necessary to provide communications between the attendant and entrants and for summoning rescue and emergency services

- PPE when feasible engineering and work practice controls do not adequately protect employees
- Lighting equipment needed to enable employees to see well enough to work safely and exit the space quickly in an emergency
- Barriers and shields to protect entrants from external hazards
- Equipment and services, such as ladders, needed for safe ingress and egress by authorized entrants
- Rescue and emergency equipment needed to rescue entrants from confined spaces
- Any other equipment necessary for safe entry into and rescue from confined spaces

Testing Atmospheric Conditions

Evaluate confined space conditions as follows when entry operations are conducted:

1. Test conditions in the confined space to determine whether acceptable entry conditions exist before entry is authorized to begin.
2. If isolation of the space is unfeasible because the space is large or is part of a continuous system such as a sewer, perform pre-entry testing to the extent feasible before entry is authorized and, if entry is authorized, continuously monitor entry conditions in the areas where authorized entrants are working.
3. Test or monitor the confined space as necessary to determine whether acceptable entry conditions are being maintained during the course of entry operations.
4. When testing for atmospheric hazards, test first for oxygen, then for combustible gases and vapors, and then for toxic gases and vapors. Atmospheric testing conducted in accordance with Exhibit 22-B satisfies the requirements of this paragraph. For confined space operations in sewers, atmospheric testing conducted in accordance with Exhibit 22-B, as supplemented by Exhibit 22-C, satisfies the requirements of this paragraph.

Attendants

At least one attendant must be provided outside of a permit-required confined space into which entry is authorized for the duration of the entry operation. Attendants may be assigned to monitor more than one confined space, provided the duties described in this guideline can be effectively performed for each confined space that is monitored. Likewise, an attendant may be stationed at any location outside the confined space to be monitored, as long as the duties described in this guideline can be effectively performed for each confined space that is monitored.

If multiple spaces are to be monitored by a single attendant, provide means for the attendant to respond to an emergency affecting one or more of the confined spaces being monitored without distraction from the attendant's other responsibilities.

Developing Program Guidelines

Individuals designated as entrants, attendants, entry supervisors, or persons who test or monitor the atmosphere in a confined space must understand assigned duties and undergo training as required by program guidelines. To assist in training and operations, develop and implement guidelines for:

- Summoning rescue and emergency services, rescuing entrants from confined spaces, providing necessary emergency services to rescued employees, and preventing unauthorized personnel from attempting a rescue.

- The preparation, issuance, use, and cancellation of entry permits as required by the guidelines in this chapter.
- Coordinating entry operations when employees of more than one employer are working simultaneously as authorized entrants in a confined space, so that employees of one employer do not endanger the employees of any other employer.
- Concluding the entry after entry operations have been completed (such as closing off a permit space and canceling the permit).

Reviewing the Confined Space Program

The Company conducts an annual review of the confined space program, using the canceled permits of permit-required space entries to ensure that employees participating in entry operations are protected from confined space hazards.

Entry operations are reviewed when the Company has reason to believe that the measures taken under the confined space program might not protect employees, and the programs are revised to correct deficiencies found to exist before subsequent entries are authorized.

The following situations are examples of circumstances requiring the review of the confined space program:

- Any unauthorized entry of a confined space
- The detection of a confined space hazard not covered by the permit
- The detection of a condition prohibited by the permit
- The occurrence of an injury or near-miss during entry
- A change in the use or configuration of a confined space
- Employee complaints about the effectiveness of the program

Confined Space Entry Permit System

Before authorized entry into a confined space, the Company must prepare an entry permit to document the completion of measures required by the guidelines in this chapter. The Confined Space Entry Permit (refer to the permit located at the end of this chapter) is an example of a confined space entry permit whose elements are considered to comply with the requirements of these guidelines.

Before entry begins, the entry supervisor, identified on the confined space entry permit, must sign the permit to authorize entry. The duration of the confined space entry permit may not exceed the time required to complete the assigned task or job identified on the permit.

Make the completed confined space entry permit available to all authorized entrants at the time of entry by posting it at the entry portal.

The entry supervisor must terminate entry and cancel the confined space entry permit when:

- The entry operations covered by the permit have been completed.
- A condition that is not allowed under the permit arises in or near the confined space.

The Company retains each canceled permit-required confined space entry permit for at least one year to facilitate the review of the confined space program required by these guidelines. Note any problems encountered during an entry operation on the pertinent permit so that appropriate revisions to the confined space program can be made.

Confined Space Entry Permit

The confined space entry permit that documents compliance with this section and authorizes entry to the confined space must identify:

- The permit space to be entered.
- The purpose of the entry.
- The date and authorized duration of the confined space entry permit.
- The name of all authorized entrants within the confined space.
- The names of personnel serving as attendants.
- The name of the individual currently serving as entry supervisor, with a space for the signature or initials of the entry supervisor who originally authorized the confined space entry.
- The known hazards of the confined space to be entered.
- The measures used to isolate the confined space and eliminate or control confined space hazards before entry (those measures can include the lockout or tagging of equipment and guidelines for purging, inerting, ventilating, and flushing permit spaces).
- The acceptable entry conditions.
- The results of initial and periodic tests performed, accompanied by the names or initials of the tester and the dates the tests were performed.
- The rescue and emergency services that can be summoned and the means (the equipment to use and the numbers to call) for summoning those services.
- The communication guidelines used by authorized entrants and attendants to maintain contact during entry.
- Equipment such as PPE, testing equipment, communication equipment, alarm systems, and rescue equipment needed to comply with guidelines in this chapter.
- Any other information necessary, given the circumstances of the particular confined space, to ensure employee safety.
- Any additional permits, such as for hot work or excavation, that have been issued to authorize work in the confined space.

Vessel Hazards

Vessels provide unique hazards that must be taken into account when preparing to enter a confined space. These hazards include the following:

- **Toxic vapors**—These vapors can be a residue of material formerly contained in a vessel or released from a sludge or scale build-up in the vessel. Toxic vapors can be introduced by a failure to blank off or disconnect pipelines or ducts and can result from solvents used to clean vessels. Some vessel linings produce toxic fumes when welding is performed.
- **Flammable vapors**—These vapors can result from any of the causes of the toxic vapors and have the potential for fire or explosion.

- **Oxygen-deficient atmosphere**—Oxygen deficiency can be the result of residual chemicals absorbing or replacing oxygen in vessel atmospheres. Many vessels are equipped with inert gas systems for fire or production reasons. If these systems are faulty or accidentally activated, an oxygen deficiency can result. Inadequate ventilation in a confined space or where several employees are working can also produce an oxygen deficiency.
- **Electric shock**—Use of portable lights or tools can result in accidents involving electric shock.
- **Injury from failure to lock out**—Injury can result from inadvertent activation of agitators, conveyors, and similar items. Failure to properly lock out all mechanical equipment associated with a vessel can lead to accidental activation of the equipment.
- **Contact with chemicals**—Any residue of corrosive material or dermatitis-producing chemicals inadvertently left in a tank can produce injury.
- **Residues**—Oily or slippery residues left in vessels could cause employees to slip and fall, resulting in injury.
- **Falling objects**
- **Burn hazards**—Burns could result from:
  - Accidental steam discharge.
  - Accidental discharge of hot process material.
  - Welding without proper protective equipment.
  - Heating elements inadvertently left activated or still hot after shutdown.

Preplanning and Education

Because each vessel has different hazards associated with it, consider each separately from other vessels, with regard to planning and education. The superintendent or Safety Department should be aware of the contents of each confined space or vessel and the precautions to be taken for entry.

Preparation

Prepare a vessel for entry by following these guidelines:

- Drain material and clean the vessel as well as possible before the vessel is entered. Use steam, hot or cold water, or any other method to remove as much material as possible.
- Ensure that enough ventilation is present to provide adequate oxygen levels and remove any flammable or toxic vapors that might be present. If natural ventilation by opening the top and bottom of the vessel is not adequate, then provide forced ventilation.
- Test for any oxygen deficiency before the vessel is entered and periodically while the vessel is occupied. In some cases, continuous monitoring might be necessary. Testing must be performed by a competent person who is authorized to use the testing equipment and is familiar with the hazards involved. This individual has the authority to prevent entry into a vessel if hazards require this action. Shift operations must have a competent person available on any shift during which vessel entry takes place. Several people must have the skills and authority to cover for absent employees. A record of the people so trained must be kept by the Safety Department.

- If a vessel has contained material that produces flammable vapors, test the atmosphere to ensure that the concentration of the material is less than 10% of the lower explosive limit. It might also be necessary to test for the concentration of toxic materials. Extensive instrumentation and specialized techniques are involved in testing for many materials. Consult the superintendent or Safety Department on questions about proper testing methods.
- Disconnect all pipelines leading into and out of the vessel at the terminal closest to the tank and then blank the pipelines. When pipelines cannot be disconnected, ensure that the blanks are visible by tagging or other means. Close and tag all valves leading to and from the vessel. Only an authorized employee may remove the tags after the employee has been informed that work on the vessel has been completed.
- Disconnect all mechanical equipment that can be inadvertently started within the vessel at the power source and lock or tag out the equipment. Only the persons actually performing the task within the vessel may place and remove the lock. Try the start button to ensure that the equipment can be activated. For specific guidance on lockout and tagout, see Chapter 12, "Lockout and Tagout" in this manual.

Special Precautions

Special precautions for entry into a vessel are described as follows:

- **Attendant observers**—Whenever someone is in a vessel, an observer must be outside the vessel. This outside observer must be trained to react to an emergency and positioned to render assistance at any time to anyone inside. Under no circumstances should the outside observer enter the vessel without obtaining other assistance first. Assistants must either remain outside the vessel while the observer enters or enter the vessel while the observer remains outside. No one should enter a vessel for rescue purposes without an air-supplied respirator or Scott Air Pack.
- **Safety harnesses**—Where potential exposure in the vessel is severe, respiratory protection is required, or rescue might be difficult, a full-body harness with an attached lifeline must be used. The attendant or an assistant must attend the lifeline at all times. This person must be in a position to observe the actions of the persons inside the confined space at all times. This individual cannot be given any tasks that would divert attention from the observation of the interior of the vessel. Where manholes are smaller than 20 inches (50.8 cm) in the largest dimension, wrist harnesses must be used in addition to the full-body harness.
- **Emergency rescue equipment**—Where potential exposure inside the vessel is severe, emergency rescue equipment must be on hand at the vessel for quick use in the event of an emergency.
- **Hand tools**—All hand tools must be clean and in good condition. Because residue on tools can react violently with vessel contents, tools must be inspected before use. Spark-resistant hand tools must be used where a possibility of a flammable atmosphere could be encountered.
- **Electric power tools**—All power tools must be kept clean and in good condition. The metal parts of these tools must be either grounded with a three-wire system or double insulated. The type of tool should correspond to the type of location, such as explosion-proof tools in flammable or explosive atmospheres. All lighting in vessels must be limited to a maximum of 12 V. Step-down transformers must be provided for this purpose.
- **Ladders**—Ladders used for access into vessels must be thoroughly inspected before being used. Ladders must be the proper length to reach the bottom of the vessel and must be lashed at the top and, if possible, at the bottom or have safety feet. Specially designed ladders with hooks for securing at the manhole may be required for some vessels.

- **Welding equipment**—No type of welding can be performed where there is a concentration of flammable vapors above 10% of the lower explosive limit. At no time should welding cylinders be lowered into the vessel. The valves at the cylinders must be shut during any significant period when welding is not occurring and particularly when no one is in the area, such as lunchtime or shift change.

Personal Protective Equipment

PPE must be worn during confined space entry or operations. The rules for PPE are established by Management for the protection of the employees involved and are subject to change at the discretion of Management. Guidelines for using PPE are as follows:

- **Eye protection**—Safety glasses with side shields are required at all times. Where there is a danger of corrosive chemical splash or corrosive vapors in the area, chemical splash goggles must be worn. In some cases, face shields might be necessary in addition to goggles.
- **Hard hats**—Hard hats must be worn when there is danger of objects falling from above or of a chemical splashing, such as during solvent cleaning.
- **Clothing**—Minimize the amount of exposed skin. Provide special protection, such as rubber suits, special gloves, and even hoods, when warranted.
- **Respirators**—Respirators are not a substitute for adequate ventilation. Instances exist, however, during which they should be worn (for example, during solvent cleaning) or carried for emergencies. In such cases, select proper respirators and instruct employees in the use and maintenance of the respirators. In some cases, a self-contained breathing apparatus or fresh air-supplied mask might be required. Because of the difficulty of entering and leaving the vessel while wearing such equipment, harnesses and extra precaution might be necessary.
- **Foot protection**—Generally, rubber boots with a steel safety caps are desirable for work in vessels. Proper traction must be provided by the soles of whatever shoes are worn.
- **Burn protection**—When welding is performed in a confined space, the possibility of burns to the body is much more prevalent than when welding is done in an open area. Proper protection against burns must be provided, and, in some cases, flame-resistant clothing might be required.

Confined Space Entry Training

Training is provided so that all employees whose work is regulated by these requirements acquire the understanding, knowledge, and skills necessary for the safe performance of the duties assigned while working within a confined space.

Employees are trained whenever:

- The employee is assigned duties requiring him or her to work within a confined space.
- There is a change in assigned duties of employees required to work within a confined space.
- There is a change in confined space operations that presents a hazard about which an employee has not previously been trained.
- The employer has reason to believe that deviations from the confined space entry guidelines or inadequacies in the employee's knowledge or use of these guidelines exist.

Training establishes employee proficiency in performing work within confined spaces and may be revised, as necessary, for compliance with program requirements.

The Company certifies that the training has been accomplished, and certification contains each employee's name, the signature or initials of the trainer, and the dates of training. The certification must be available for inspection by employees and their authorized representatives.

Personnel Duties During Permit Space Operations

Entrants

The duties of authorized entrants include:

- Knowing the hazards that might be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure.
- Properly using equipment as required.
- Communicating with the attendant, as necessary, to enable the attendant to monitor entrant status and alert entrants to evacuate the confined space as required.
- Alerting the attendant whenever the entrant:
  - Recognizes any warning sign or symptom of exposure to a dangerous situation.
  - Detects a prohibited condition.
- Exiting from the permit space as quickly as possible whenever:
  - An order to evacuate is given by the attendant or the entry supervisor.
  - The entrant recognizes any warning sign or symptom of exposure to a dangerous situation.
  - The entrant detects a prohibited condition.
  - An evacuation alarm is activated.

Attendants

The duties of permit space attendants include:

- Knowing the hazards that might be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure.
- Being aware of possible behavioral effects of hazard exposure in authorized entrants.
- Continuously maintaining an accurate count of authorized entrants in the confined space and ensuring that the means used to identify authorized entrants accurately identifies who is in the confined space.
- Remaining outside the permit space during entry operations until relieved by another attendant.
- Communicating with authorized entrants as necessary to monitor entrant status and alert entrants to evacuate the space.
- Monitoring activities inside and outside the space to determine whether entrants can remain in the space or evacuate the confined space immediately when the attendant:

  - Detects a prohibited condition.
  - Detects the behavioral effects of hazard exposure in an authorized entrant.
  - Detects a situation outside the space that could endanger the authorized entrants.
  - Cannot effectively and safely perform all of the duties required.
- Summoning rescue and other emergency services as soon as the attendant determines that authorized entrants might need assistance to escape from confined space hazards.
- Taking the following actions when unauthorized persons approach or enter a permit space while entry is underway:
  - Warn the unauthorized persons that they must stay away from the confined space.
  - Advise the unauthorized persons that they must exit immediately if they have entered the confined space.
  - Inform the authorized entrants and the entry supervisor if unauthorized persons have entered the confined space.
- Performing non-entry rescues as specified by the rescue guidelines.
- Performing no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants

Entry Supervisors

The duties of entry supervisors include:

- Knowing the hazards that might be faced during confined space entry, including information on the mode, signs or symptoms, and consequences of the exposure.
- Verifying, by checking that the appropriate entries have been made on the confined space entry permit, that all tests specified by the permit have been conducted and that all guidelines and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin.
- Terminating the entry and canceling the permit as required.
- Verifying that rescue services are available and the means for summoning them are operable.
- Removing unauthorized individuals who enter or attempt to enter the permit space during entry operations.
- Determining, whenever responsibility for a permit space entry operation is transferred and at intervals dictated by the hazards and operations performed within the confined space, that entry operations remain consistent with terms of the Confined Space Entry Permit and acceptable entry conditions are maintained.

Rescue and Emergency Services

The following guidelines apply when employees enter confined spaces to perform rescue services:

- Ensure that each member of the rescue team is provided with, and is trained to properly use, the PPE and rescue equipment necessary for making rescues from confined spaces.

- Ensure that each member of the rescue team has been trained to perform assigned rescue duties. Each member of the rescue team must also receive the training required of authorized entrants.
- Ensure that each member of the rescue team has practiced making confined space rescues at least annually by means of simulated rescue operations in which they remove dummies, mannequins, or actual persons from the actual confined spaces or from representative confined spaces. Representative confined spaces must simulate the opening size, configuration, and accessibility of types of permit spaces from which rescue is to be performed.
- Ensure that each member of the rescue team is trained in basic first aid and CPR. At least one member of the rescue team holding current certification in first aid and in CPR must be available.
- When the Company arranges to have outside persons or mutual aid perform confined space rescue:
    - ❑ Inform the rescue service of the hazards they might confront when called to perform a rescue at the Company facility.
    - ❑ Provide the rescue service with access to all confined spaces from which rescue might be necessary so that the rescue service can develop appropriate rescue plans and practice rescue operations.
- To facilitate non-entry rescue, use retrieval systems or methods whenever an authorized entrant enters a confined space, unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant. Retrieval systems must meet the following requirements:
    - ❑ Each authorized entrant must use a chest or full body harness, with a retrieval line attached at the center of the entrant's back near shoulder level or above the entrant's head. Wristlets may be used in lieu of the chest or full body harness if it can be demonstrated that the use of a chest or full body harness is unfeasible or creates a greater hazard and that the use of wristlets is the safest and most effective alternative.
    - ❑ The other end of the retrieval line must be attached to a mechanical device or fixed point outside the confined space in such a manner that rescue can begin as soon as the rescuer becomes aware that rescue is necessary. A mechanical device must be available to retrieve personnel from vertical-type permit spaces more that 5 ft (1.52 m) deep.
- If an injured entrant is exposed to a substance for which an SDS or other similar written information is required to be kept at the work site, provide the SDS or written information to the medical facility treating the exposed entrant.

Exhibit 22-A. Permit-Required Confined Space Decision Flowchart

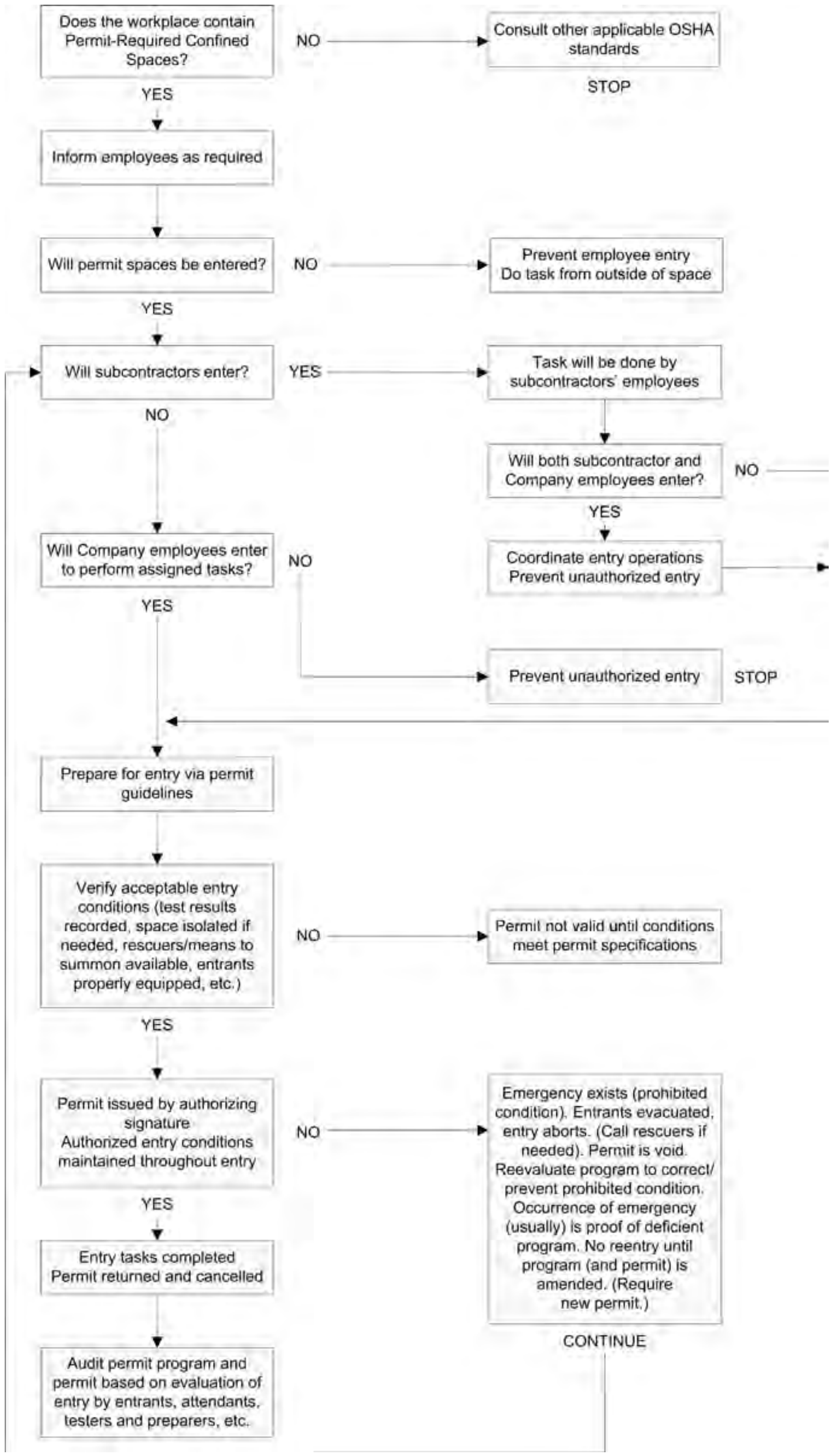

Exhibit 22-B. Guidelines for Atmospheric Testing

Guidelines For Atmospheric Testing

Atmospheric testing is required for two distinct purposes: evaluation of the hazards of the confined space and verification that acceptable entry conditions for entry into that space exist.

Evaluation Testing

The atmosphere of a confined space should be analyzed using equipment of sufficient sensitivity and specificity to identify and evaluate any hazardous atmospheres that may exist or arise, so that appropriate permit entry guidelines can be developed and acceptable entry conditions stipulated for that space. Evaluation and interpretation of this data and development of the entry guidelines should be done or reviewed by a technically qualified safety professional based on evaluation of all serious hazards.

Verification Testing

The atmosphere of a confined space that might contain a hazardous atmosphere should be tested for residues of all contaminants identified by evaluation testing using permit-specific equipment to determine that residual concentrations at the time of testing and entry are within the range of acceptable entry conditions. Results of testing (that is, actual concentration of contaminants, flammability levels, and so on) should be recorded on the permit in the space provided adjacent to the stipulated acceptable entry condition.

Duration of Testing

Measurement of values for each atmospheric parameter should be made for at least the minimum response time of the test instrument specified by the manufacturer.

Testing Stratified Atmospheres

When monitoring for entries involving a descent into atmospheres that might be stratified, the atmospheric envelope should be tested a distance of approximately 4 ft (1.22 m) in the direction of travel and to each side. If a sampling probe is used, the entrant's rate of progress should be slowed to accommodate the sampling speed and detector response.

Exhibit 22-C. Sewer System Entry

Sewer System Entry

Sewer entry differs in three vital respects from other confined space entries. First, any way to completely isolate the space (a section of a continuous system) to be entered rarely exists. Second, because isolation is not complete, the atmosphere, suddenly and unpredictably, can become lethally hazardous (toxic, flammable, or explosive) from causes beyond the control of the entrant or the Company. Third, experienced sewer workers are especially knowledgeable in entry and work in their confined spaces because of their frequent entries. Unlike other types of employment where confined space entry is a rare and exceptional event, sewer workers' usual work environment is a confined space.

Adherence to Guidelines

The Company designates as entrants only employees who are thoroughly trained in the sewer entry guidelines and demonstrate that they follow these entry guidelines exactly as prescribed when performing sewer entries.

Atmospheric Monitoring

Entrants should be trained in the use of, and be equipped with, atmospheric monitoring equipment that sounds an audible alarm, in addition to its visual readout, whenever one of the following conditions is encountered:

- Oxygen concentration less than 19.5%
- Flammable gas or vapor at 10% or more of the LFL
- Hydrogen sulfide or carbon monoxide at or above their Permissible Exposure Limits (PEL) (10 ppm or 50 ppm, respectively)
- A broad range sensor device is used, at 100 ppm as characterized by its response to toluene

Normally, the oxygen sensor/broad range sensor instrument is best suited for sewer entry. However, substance-specific devices should be used whenever actual contaminants have been identified. The entrant should carry and use the instrument in sewer line work to monitor the atmosphere in the entrant's environment and, in advance of the entrant's direction of movement, to warn the entrant of any deterioration in atmospheric conditions. Where several entrants are working together in the same immediate location, one instrument, used by the lead entrant, is acceptable.

Surge Flow and Flooding

Sewer crews should develop and maintain liaison, to the extent possible, with the local weather bureau and fire and emergency service in their area to be apprised of conditions that might affect sewer work. Sewer work must be delayed or interrupted and entrants withdrawn whenever sewer lines might be suddenly flooded by rain or fire suppression activities or when flammable or other hazardous materials are released into sewers during industrial or transportation accidents.

Special Equipment

Entry into large bore sewers can require the use of special equipment. Such equipment might include atmosphere monitoring devices with automatic audible alarms, escape self-contained breathing apparatus (ESCBA) with at least a 10-minute air supply (or other National Institute for Occupational Safety and Health (NIOSH) approved self-rescuer), waterproof flashlights, boats and rafts, radios, and rope standoffs for pulling around bends and corners as needed.

Sample 22-1. Confined Space Entry Permit

Company Name

CONFINED SPACE ENTRY PERMIT

Permit only authorized for one shift.

Specific Location ______________________

Duration
From: ____ Date ____ Hour
To: ____ Date ____ Hour

Confined Space Description: ______________________
Purpose of Entry: ______________________

Hazards of Space:
Identify which are applicable.

1. Contains or has the potential to contain a hazardous atmosphere.
2. Contains a material that has the potential to engulf an entrant.
3. Has internal configuration that could trap or asphyxiate entrant by inwardly converging walls
4. Other ______________________

I. Atmosphere Tests: (Perform in the following order)

Test Item	Initial Results	Allowable Limits	Re-entry		
1. Oxygen		19.5% - 23.5%			
2. Flammability		< 10% LEL			
3. Hydrogen Sulfide*		< 10 ppm			
4. Benzene*		< 1 ppm			
5. Norm*		< 2 mrems/hr			
6. Other					

*(If Applicable)

Monitoring Equipment: ______________________

Make ____________ Serial # ____________

Location of atmospheric gas test(s) ______________________
Time of initial test(s) ______________________
Person conducting initial tests ______________________

CONTINUOUS MONITORING REQUIRED

II. Following Items Completed:

	Yes	N/A
1. Contents removed/purged		
2. Energy Isolation		
3. Blinding/Disconnecting		
4. Ventilation Provided		
5. Rescue Plan Complete (Sec. VI)		
6. Rescue Equipment on Site		
7. Adequate/Safe Lighting		
8. Calibration Check of Monitor Prior to use		
9. Tailgate Safety Meeting		
10. Hot work permit required		
11. Other		

Explain Other ______________________

Explain (N/A) answers ______________________

RESPIRATORY PROTECTIVE EQUIPMENT REQUIRED? YES_____ NO _____

III. Protective and rescue equipment required.

	Yes	N/A
1. Goggles		
2. Chemical Gloves		
3. Chemical Boots		
4. Face Shield		
5. Slicker Suit		
6. Acid Suit		
7. ALR/SCBA		
8. FRC		
9. Full Body Harness/Life Line		
10. Other		

Explain Other ______________________

Explain (N/A) answers ______________________

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(Confined Space Entry Permit, continued)

Authorized Entrants/Or Method Used

Name	Time In	Time Out
Name	Time In	Time Out
Name	Time In	Time Out
Name	Time In	Time Out

(Additional signature lines on back)

Communication Procedure ____________

Additional Permits Issued ____________

Foreman Verbally Notified ____________ Time

Signature of Entry Supervisor ____________ Date

Sign when Permit Canceled ____________ Date

I have witnessed that the conditions listed above are as indicated and understand they may change

Contractor Signature ____________

Contractor Signature ____________

IV. Attendant(s) ____________

V. Special Precautions Required for Entry ____________

VI. Rescue Plan ____________

1. Location of safe briefing area(s) ____________
2. Emergency Numbers (Medical/Rescue) ____________ (Fire) ____________ (Supervisor) ____________

Problems Encountered/Comments ____________

This Permit Is Void When Acceptable Entry Conditions Are Exceeded.

Authorized Entrants

Name	Time In	Time Out
Name	Time In	Time Out
Name	Time In	Time Out
Name	Time In	Time Out
Name	Time In	Time Out
Name	Time In	Time Out
Name	Time In	Time Out
Name	Time In	Time Out

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(Confined Space Entry Permit, continued)

Name	Time In	Time Out
Name	Time In	Time Out
Name	Time In	Time Out
Name	Time In	Time Out
Name	Time In	Time Out
Name	Time In	Time Out
Name	Time In	Time Out
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Name	Time In	Time Out
Name	Time In	Time Out
Name	Time In	Time Out
Name	Time In	Time Out
Name	Time In	Time Out

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23

Trenching and Excavation

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

Definitions

Aluminum hydraulic shoring—A pre-engineered shoring system consisting of aluminum hydraulic cylinders (cross braces) used in conjunction with vertical rails (uprights) or horizontal rails (walers). Shoring systems are designed to support the sidewalls of an excavation and prevent cave-ins.

Benching—A method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal steps, usually with vertical or near vertical surfaces between levels.

Cave-in—The separation of a mass of soil or rock material from the side of an excavation or the loss of soil from under a trench shield or support system and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, or otherwise injure and immobilize a person.

Cemented soil—A soil in which a chemical agent, such as calcium carbonate, holds the particles together such that a hand-size sample cannot be crushed into powder or individual particles by finger pressure.

Cohesive soil—Clay (fine grained soil) or soil with high clay content that has cohesive strength. Cohesive soil does not crumble, can be excavated with vertical side slopes, and is plastic when moist. Cohesive soil is hard to break up when dry and exhibits significant cohesion when submerged. Cohesive soils include clay, sandy clay, organic clay, and clay-like silt.

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

Excavation—Any man-made cut, cavity, trench, or depression formed by removal of earth.

Faces or sides—The vertical or inclined earth surfaces formed as a result of excavation work.

Fissured—The quality of a soil material that has a tendency to break along definite planes of fracture with little resistance or material that exhibits open cracks, such as tension cracks, in an exposed surface.

Granular soil—Gravel, sand, or silt (coarse grained soil) with little or no clay content. Granular soil has no cohesive strength. Some moist granular soils exhibit apparent cohesion. Granular soil cannot be molded when moist and crumbles easily when dry.

Hazardous atmosphere—An atmosphere that by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic, or otherwise harmful can cause death, illness, or injury.

Layered system—Two or more distinctly different soil or rock types arranged in layers. Micaceous seams or weakened planes in rock or shale are considered layered.

Protective system—A method of protecting employees from cave-ins, material that could fall or roll from an excavation face or into an excavation, or the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

Registered professional engineer—A person who is registered as a professional engineer in the state where the work is being performed. A professional engineer registered in any state is deemed to be a registered professional engineer within the meaning of this standard when approving designs for manufactured protective systems or tabulated data used in interstate commerce.

Shield—A structure that can withstand the forces imposed on it by a cave-in and thereby protect employees within the structure. Shields can be permanent structures or designed to be portable and moved along as the work progresses. Shields can be pre manufactured or built at the jobsite.

Shoring—A structure such as a metal hydraulic, mechanical, or timber shoring system that supports the sides of an excavation to prevent cave-ins.

Sloping—A method of protecting employees from cave-ins. The sides of the excavation are inclined away from the excavation. The angle of the incline required to prevent a cave-in varies according to the soil type, environmental conditions of exposure, and application of surcharge loads.

Stable rock—Natural solid mineral material that can be excavated with vertical sides and that will remain intact while exposed. Unstable rock is considered to be stable when the rock material on the side or sides of the excavation is secured against caving-in by rock bolts or by another protective system that has been designed by a registered professional engineer.

Tabulated data—Tables and charts approved by a registered professional engineer and used to design and construct a protective system.

Trench—A narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 ft (4.57 m). If forms or other structures are installed in an excavation in a way that reduces the dimensions (measured from the forms or structure to the side of the excavation) to 15 ft (4.57 m) or less, an excavation is considered a trench.

Type A soil—Cohesive soils with an unconfined compressive strength of 1.5 tons per square foot (tsf) or greater. Examples of cohesive soils are clay, silty clay, sandy clay, clay loam, and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hard pan are also considered Type A. However, no soil is Type A if:

- The soil is fissured.
- The soil is subject to vibration from heavy traffic, pile driving, or similar effects.
- The soil has been previously disturbed.
- The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater.
- The material is subject to other factors that would require it to be classified as a less stable material.

Type B soil—Cohesive soil with an unconfined compressive strength greater than 0.5 tsf but less than 1.5 tsf; granular cohesion less soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam, and in some cases, silty clay loam and sandy clay loam; previously disturbed soils except those that would otherwise be classed as Type C soil; soil that meets the unconfined compressive strength or cementation requirements for Type A but is fissured or subject to vibration; dry rock that is not stable; material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

Type C soil—Cohesive soil with an unconfined compressive strength of 0.5 tsf or less; granular soils, including gravel, sand, and loamy sand; submerged soils, including soil from which water is freely seeping; submerged rock that is not stable; material in a sloped, layered system where the layers dip into the excavation at a slope of four horizontal to one vertical (4H:1V) or steeper.

Unconfined compressive strength—The load per unit area at which a soil will fail in compression. It can be determined by laboratory testing or estimated by a pocket penetrometer, thumb penetration, or other methods.

Uprights—The vertical members of a trench shoring system placed in contact with the earth and usually positioned so that individual members do not contact each other. Uprights placed so that individual members are closely spaced, in contact with or interconnected to each other, are often called “sheeting.”

Walers—Horizontal members of a shoring system that are placed parallel to the excavation face and whose sides bear against the vertical members of the shoring system or the earth.

General Requirements

All excavations and trenches must be evaluated on a daily basis by a competent person before entry.

The following guidelines establish the minimum requirements of the applicable state and federal safety regulations for all work in excavations and trenches that might expose employees to the hazards of moving ground:

- All surface encumbrances adjacent to an excavation that might create a hazard to employees must be removed, secured, or supported as necessary to protect employees.
- The estimated location of underground installations, such as sewer, telephone, electric, water, or other underground utilities must be identified before opening an excavation. Utility companies, owners, and local One Call locator services must be contacted within established or customary local response times, advised of the proposed work, and asked to establish the location of the utility underground installations before the work begins.

  When excavations approach the estimated location of underground installations, the exact location is determined by probing or hand digging, as necessary, to prevent accidental contact with the underground installations. While the excavation is open, underground installations that create a hazard to employees will be supported, protected, or removed as necessary to protect employees.
- Appropriate access and egress in the form of a stairway, ladder, or ramp must be provided in all excavations deeper than 4 ft (1.23 m). In trenches, the stairway, ladder, or ramp must be installed so that a worker does not have to travel farther than 25 ft (7.62 m) in any direction to exit.
- Employees exposed to vehicular traffic must wear highly visible vests or other equivalent apparel.

- Employees should not work under excavation equipment and must be protected from falling loads that might be dropped by lifting or excavating equipment.
- A warning system must be provided when mobile equipment is operated adjacent to an excavation and the operator does not have a clear and direct view of the edge of the excavation. The warning system may include barricades, signals, stop logs, or other authorized methods.
- When deemed necessary by a competent person, excavations are tested to identify and prevent exposure to hazardous atmospheres. Emergency rescue equipment, such as rescue breathing apparatus, a safety harness and lifeline, or a basket stretcher must be available where a hazardous atmosphere exists or could be expected to develop in an excavation.
- Employees will not work in excavations where they are exposed to the hazards associated with water accumulation. If water accumulation in an excavation is controlled using pumps, the operation of the pumps must be monitored by a competent person.

A means for the removal of water accumulation shall be provided when such a hazard exists. Inspection of an excavation shall be made by a competent person when accumulation of water is present.

- The stability of adjacent structures, such as buildings, walls, and sidewalks must be maintained using a support system as necessary to protect employees.
- Employees must be protected from loose rock or soil that could fall or roll into the excavation by placing and keeping such material at least 2 ft (0.61 m) from the edge of the excavation.
- A competent person must make daily inspections of excavations to identify and eliminate conditions that could result in cave-ins, failure of support systems, hazardous atmospheres, or other unsafe conditions. Inspections must be conducted before the start of work each day and after every rainstorm or other occurrence that might increase the hazard of moving ground. If problems are found, provisions should be made for immediate removal of personnel. Refer to the Trenching/Excavation Report located at the end of this chapter.
- Where employees or equipment are allowed or required to cross over excavations that are 6 ft (1.83 m) or greater in depth, appropriate fall protection in the form of walkways or bridges with standard guardrails must be provided.
- An open excavation or trench that is left open overnight must be barricaded, covered, posted with warning signs designating the hazard, and/or secured in a manner that prevents anyone from entering the excavation intentionally or accidentally.

Protective Systems

Sloping, shoring, or shielding will be provided in excavations, except where the excavation is made in stable rock or the excavation is less than 5 ft (1.52 m) deep and an examination by a competent person does not indicate a potential for cave-in.

Sloping

When sloping or benching is chosen as the method to protect employees in an excavation, one of the following optional designs of sloping and benching systems must be used:

- **Option 1**—Slope the excavation at an angle of one and one-half horizontal to one vertical (1-1/2H:1V) or flatter.
- **Option 2**—Perform a soil classification and determine the acceptable slopes required.

- **Option 3**—Use a project-specific design prepared by a registered professional engineer. Engineered designs must be in writing and must include the name and registration number of the engineer, detailed plans, the calculations used in the design, the magnitude of slopes, and the configurations determined to be safe. A copy of the design will be maintained at the jobsite during the use of the engineered system.

Shoring or Shielding

Only the following methods for support systems, shield systems, and other protective systems can be used at a Company jobsite:

- **Option 1**—Perform a soil classification and determine the appropriate aluminum hydraulic shoring configuration using the shoring manufacturer's tabulated data.

  When using the manufacturer's tabulated data, the shoring system must be installed in accordance with all the specifications, recommendations, limitations, or approvals to deviate issued by the manufacturer. The manufacturer's tabulated data, specifications, recommendations, limitations, and any approval to deviate must be in writing and maintained at the jobsite during the use of the shoring system.

- **Option 2**—Use a project-specific design prepared by a registered professional engineer.

  Engineered designs must be in writing and include the name and registration number of the engineer, detailed plans, the calculations used in the design, and the sizes, types, and configurations of materials to be used in the support system. A copy of the design must be maintained at the jobsite during the use of the engineered system.

General Guidelines

The materials and equipment used for protective systems must be free of damage or defects that might impair their proper functions. Manufactured materials and equipment must be used and maintained in accordance with the recommendations of the manufacturer. If material or equipment used in a protective system is damaged, it must be inspected by a competent person before being reused.

The installation and removal of supports must be performed in accordance with all of the following guidelines:

- Members of support systems must be securely fastened together to prevent sliding, falling, kickouts, or other predictable failures.
- Support systems must be installed and removed in a manner that protects employees from cave-ins, structural collapses, or being struck by members of the support system.
- Individual members of support systems must not exceed their design capacities.
- Before individual members can be removed, additional precautions must be taken to protect employees, including installing other structural members to support any additional load imposed on the support system.
- Removal begins at and progresses from the bottom of the excavation. Members must be released slowly to reduce the likelihood of failure of the remaining members or a cave-in.
- Backfilling must progress with the removal of support systems.
- Support systems must be coordinated with the excavation of trenches and must extend to within 2 ft (0.61 m) of the bottom of the trench but only if the system is designed to resist the forces calculated for the full depth of trench and there is no indication of a loss of soil from behind or below the bottom of the support system.

- Shield systems must not be subjected to loads exceeding their design capacities. Shields must be installed in a manner that restricts lateral or hazardous movement in the event that a lateral load is applied suddenly. Employees must be protected when entering or exiting the areas protected by a shield. Employees are not allowed within the shield during installation, removal, or vertical movement.
- When shield systems are used in trenches, excavation of material may proceed 2 ft (0.61 m) below the bottom of the shield only if the shield is designed to resist the forces calculated for the full depth of trench and there is no indication of a loss of soil from behind or below the bottom of the shield.

Soil Classification

This section describes a method of classifying soil and rock deposits based on site and environmental conditions and the structure and composition of the deposits. This section describes acceptable visual and manual tests for use in classifying soils.

NOTE

Soil classification must be made by a Competent Person.

Soil and rock deposits are classified based on the results of at least one visual and one manual analysis. These analyses must be conducted by a competent person using the tests described in this chapter or other approved methods of soil classification, such as those adopted by the American Society for Testing Materials (ASTM) or the United States Department of Agriculture (USDA).

The methods used for visual and manual analyses must provide quantitative and qualitative information sufficient to identify the properties, factors, and conditions of the deposits.

A layered system must be classified based on the weakest layer. However, each layer may be classified individually when a more stable layer lies below a less stable layer.

If, after classifying a deposit, the properties, factors, or conditions change in any way, the changes must be evaluated by a competent person. The deposit must be reclassified as necessary to reflect the new circumstances.

Visual Analysis

The visual analysis is conducted to collect qualitative information about the excavation site in general, the soil adjacent to the excavation, the soil forming the sides of the excavation, and soil samples taken from the excavated material. The visual analysis includes:

- Observing samples of the soil that are excavated and soil in the sides of the excavation to estimate the range of particle sizes and the relative amounts of particle sizes. Fine-grained material is cohesive.
- Observing the soil as it is excavated to determine if it stays in clumps. Soil that breaks up easily and does not stay in clumps is granular.
- Observing sides of the opened excavation and the surface area adjacent to the excavation to identify tension cracks or fissured material.
- Observing the area adjacent to the excavation and the excavation itself to identify existing underground utilities, structures, or previously disturbed soils.
- Observing the opened sides of the excavation to identify layered systems. Examine layered systems to determine if the layers slope toward the excavation and to estimate the degree of slope in the layers.
- Observing the area adjacent to the excavation and the areas within the excavation to identify potential sources of vibration that might affect the stability of the excavation.

- Observing the area adjacent to the excavation and the sides of the opened excavation for evidence of surface water, water seeping from the sides of the excavation, or the location of the water table.

Manual Analysis

Manual analysis is conducted to collect quantitative and qualitative information about the properties of the soil and provide more information to properly classify the soil. The manual analysis includes some or all of the following methods:

- Evaluating the plasticity of the soil by molding a moist or wet sample of soil into a ball and attempting to roll it into threads as thin as 1/8 inch (0.32 cm) in diameter. Cohesive material can be rolled into a thread at least 2 inches (5.08 cm) long without crumbling or breaking.
- Evaluating the cohesiveness of the soil. If the soil is dry and crumbles into individual grains or fine powder with little or moderate pressure, it is granular. If the soil is dry and falls into clumps that break into smaller clumps but the smaller clumps can only be broken up with difficulty, it might be clay in combination with gravel, sand, or silt. If the dry soil breaks into small clumps that can only be broken with difficulty and there is no visual indication the soil is fissured, the soil may be considered unfissured.
- Applying the thumb penetration test to estimate the unconfined compressive strength of cohesive soils. Type A soils with an unconfined compressive strength of 1.5 tsf can be readily indented by the thumb; however, they can be penetrated by the thumb only with very great effort. Type C soils with an unconfined compressive strength of 0.5 tsf can be easily penetrated several inches by the thumb and can be molded by light finger pressure.

  The thumb test should be conducted on an undisturbed soil sample, such as a large clump of soil, as soon as possible after excavation to minimize the effects of drying. If the excavation is later exposed to rain, flooding, or other moisture, the classification of the soil must be changed accordingly.
- Estimating the unconfined compressive strength of soils by using a pocket penetrometer or a hand-operated shear vane in accordance with the manufacturer’s recommendations.
- Performing a drying test to differentiate among cohesive material with fissures, unfissured cohesive material, and granular material. After thoroughly drying a sample of soil that is approximately 1 inch (2.54 cm) thick and 6 inches (15.24 cm) in diameter, evaluate the results as follows:
  - If the sample develops cracks as it dries, significant fissures are indicated.
  - If the sample dries without cracking and can be broken by hand, then the material is either unfissured cohesive or fissured cohesive.
  - If considerable force is necessary to break the sample, the soil has significant cohesive material content. The soil can be classified as unfissured cohesive material, and the unconfined compressive strength should be determined.
  - If the sample breaks easily by hand, it is either a fissured cohesive material or a granular material. To distinguish between the two, pulverize the dried clumps of the sample by hand or by stepping on them. If the clumps do not pulverize easily, the material is cohesive with fissures. If they pulverize easily into very small fragments, the material is granular.

Sloping and Benching Specifications

This section contains the specifications for using sloping and benching to protect employees working in excavations.

These slope and bench specifications only apply if a soil classification has been conducted and the excavation will be 20 ft (6.10 m) deep or less.

Determine the maximum allowable slope based on the soil classification by using the information in Table 23-1.

Table 23-1. Maximum Allowable Slope Based on Soil Classification

Maximum Allowable Slopes		
Soil or Rock Type	**Maximum Allowable Slopes (H:V)[1] for Excavations Less Than 20 Ft Deep [3]**	
Stable rock	Vertical	(90 degrees)
Type A[2]	3/4:1	(53 degrees)
Type B	1:1	(45 degrees)
Type C	1-1/2:1	(34 degrees)

1. The numbers shown in parentheses next to the maximum allowable slopes are angles expressed in degrees from the horizontal. The angles have been rounded off.
2. A short-term, maximum slope of 1/2:1 (63 degrees) is allowable in excavations in Type A soil less than 12 ft (3.66 m) deep. The short-term maximum allowable slopes for excavations deeper than 12 ft (3.66 m) is 3/4 (53 degrees).
3. Sloping or benching for excavations deeper than 20 ft (6.10 m) must be designed by a registered professional engineer.

Allowable slope or bench configuration based on the soil classification is determined using Figure 23-1 and Figure 23-2.

Figure 23-1. Excavations in Type A, B, and C Soils

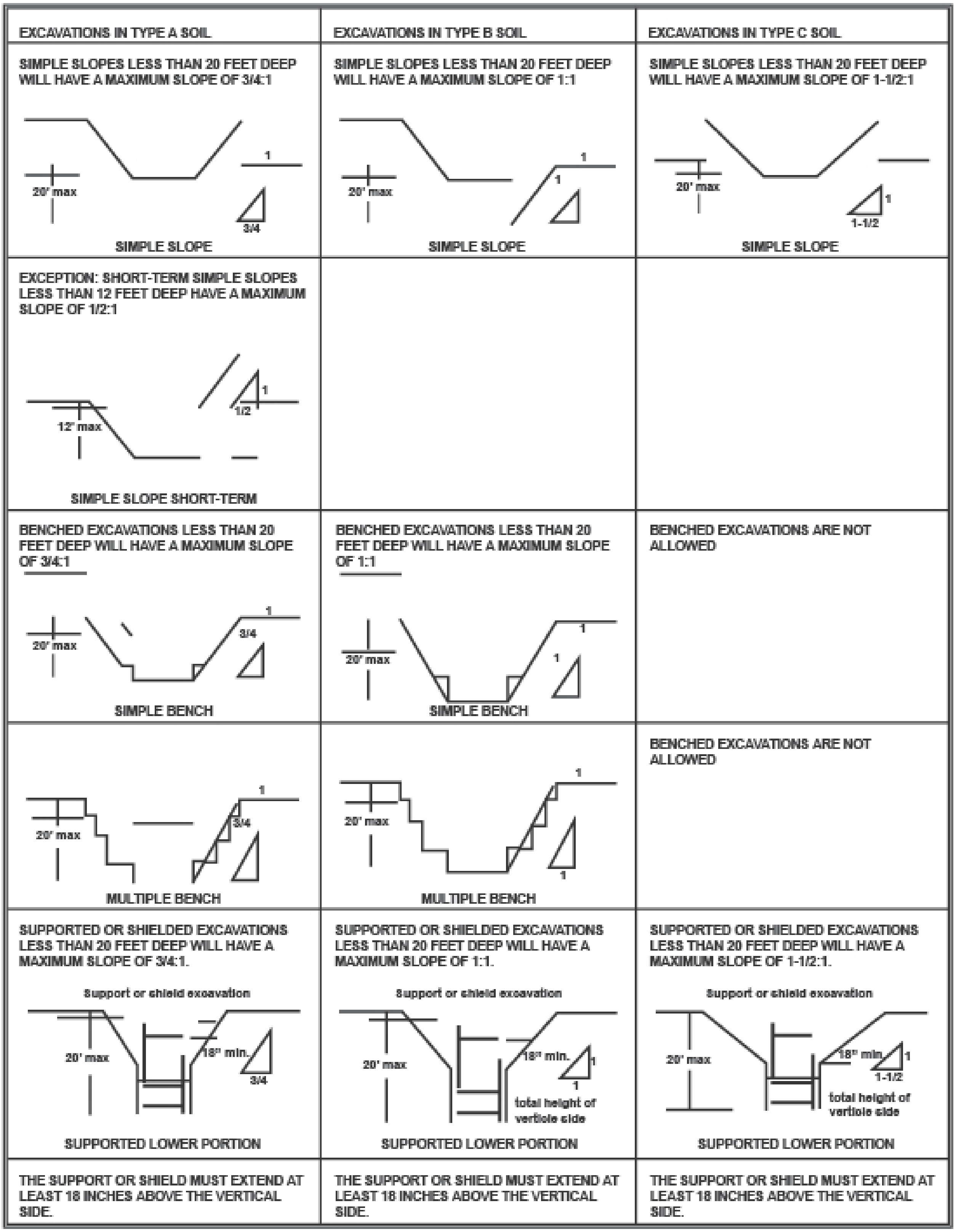
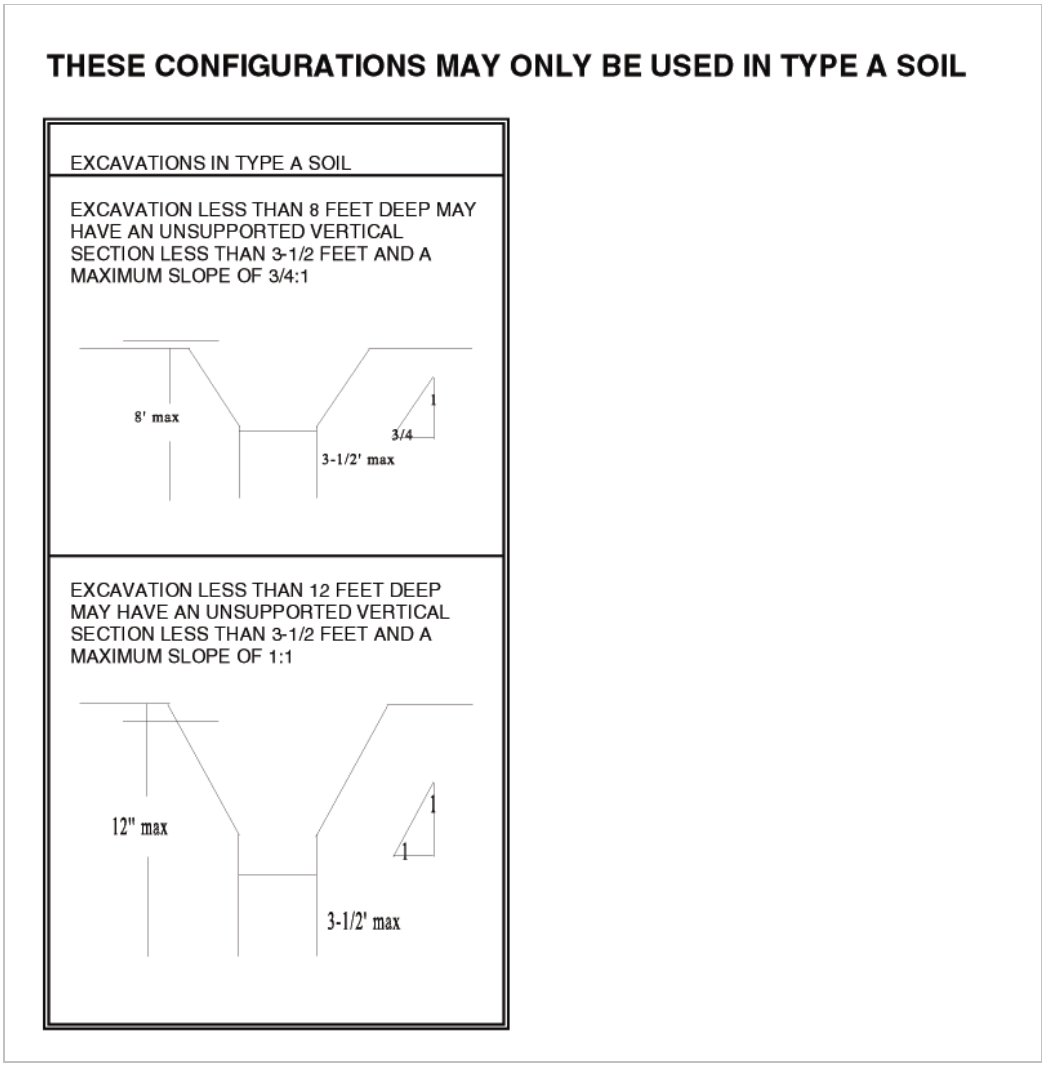


Figure 23-2. Excavations in Type A Soil



The following tables (Table 23-2 through Table 23-4) provide the appropriate trench widths at the top of the excavation for each soil classification, based on the depth of the excavation and the width at the bottom.

Table 23-2. Trench Widths Soil Type A

Trench Widths Soil Type A at Top of Excavations, W1 (ft)							
Depth of Excavation TD (ft)	**Width at Bottom of Excavation WB (ft)**						
	4	**5**	**6**	**7**	**8**	**9**	**10**
5	11.5	12.5	13.5	14.5	15.5	16.5	17.5
6	13	14	15	16	17	18	19
7	14.5	15.5	16.5	17.5	18.5	19.5	20.5
8	16	17	18	19	20	21	22
9	17.5	18.5	19.5	20.5	21.5	22.5	23.5
10	19	20	21	22	23	24	25
11	20.5	21.5	22.5	23.5	24.5	25.5	26.5
12	22	23	24	25	26	27	28
13	23.5	24.5	25.5	26.5	27.5	28.5	29.5
14	25	26	27	28	29	30	31
15	26.5	27.5	28.5	29.5	30.5	31.5	32.5
16	28	29	30	31	32	33	34
17	29.5	30.5	31.5	32.5	33.5	34.5	35.5
18	31	32	33	34	35.	36	37
19	32.5	33.5	34.5	35.5	36.5	37.5	38.5
20	34	35	36	37	38	39	40

Table 23-3. Trench Widths Soil Type B

Trench Widths Soil Type B at Top of Excavations, W1 (ft)							
Depth of Excavation TD (ft)	Width at Bottom of Excavation WB (ft)						
	4	5	6	7	8	9	10
5	14	15	16	17	18	19	20
6	16	17	18	19	20	21	22
7	18	19	20	21	22	23	24
8	20	21	22	23	24	25	26
9	22	23	24	25	26	27	28
10	24	25	26	27	28	29	30
11	26	27	28	29	30	31	32
12	28	29	30	31	32	33	34
13	30	31	32	33	34	35	36
14	32	33	34	35	36	37	38
15	34	35	36	37	38	39	40
16	36	37	38	39	40	41	42
17	38	39	40	41	42	43	44
18	40	41	42	43	44	45	46
19	42	43	44	45	46	47	48
20	44	45	46	47	48	49	50

Table 23-4. Trench Widths Soil Type C

Trench Widths Soil Type C at Top of Excavations, W1 (ft)							
Depth of Excavation TD (ft)	Width at Bottom of Excavation WB (ft)						
	4	5	6	7	8	9	10
5	19	20	21	22	23	24	25
6	22	23	24	25	26	27	28
7	25	26	27	28	29	30	31
8	28	29	30	31	32	33	34
9	31	32	33	34	35	36	37
10	34	35	36	37	38	39	40
11	37	38	39	40	41	42	43
12	40	41	42	43	44	45	46
13	43	44	45	46	47	48	49
14	46	47	48	49	50	51	52
15	49	50	51	52	53	54	55
16	52	53	54	55	56	57	58
17	55	56	57	58	59	60	61
18	58	59	60	61	62	63	64
19	61	62	63	64	65	66	67
20	64	65	66	67	68	69	70

Timber Shoring Requirements

This information can be used when timber shoring is provided as a method of protection from cave-ins in trenches that do not exceed 20 ft (6.10 m) in depth. When trenches exceed 20 feet, a registered, professional engineer must design the system. Other timber shoring configurations, other systems of support such as hydraulic and pneumatic systems, and other protective systems such as sloping, benching, shielding, and freezing systems must be designed in accordance with the all requirements.

Tabulated Data

Information is presented in tabular form in Table 23-5 through Table 23-10. Each table presents the minimum sizes of timber members to use in a shoring system, and each table contains data only for the particular soil type in which the excavation or portion of the excavation is made. This data is arranged to allow the user the flexibility to select from among several acceptable configurations of members, based on varying the horizontal spacing of the cross braces. Stable rock is exempt from shoring requirements, and therefore, no data is presented for this condition.

Dimensions of Timber Members

The sizes of the timber members listed in Table 23-5 through Table 23-10 are taken from the National Bureau of Standards (NBS) report, "Recommended Technical Provisions for Construction Practice in Shoring and Sloping of Trenches and Excavations." In addition, where NBS did not recommend specific sizes of members, member sizes are based on an analysis of the sizes required for use by existing codes and empirical practice.

The required dimensions of the members listed in these tables refer to actual dimensions and not nominal dimensions of the timber. Employers wanting to use nominal size shoring are directed to Table 23-8 through Table 23-10, the Corps of Engineers, Bureau of Reclamation, or data from other acceptable sources.

Use of Tables

The members of the shoring system that are to be selected using this information are the cross braces, the uprights, and the walers where walers are required. Minimum sizes of members are specified for use in different types of soil. There are six tables of information, two for each soil type. The soil type must first be determined in accordance with the soil classification system described in the “Soil Classification” section earlier in this chapter. Using the appropriate table, the selection of the size and spacing of the members is then made. The selection is based on the depth and width of the trench where the members are to be installed, and in most instances, the selection is also based on the horizontal spacing of the cross braces. In instances where a choice of horizontal spacing of cross bracing is available, the horizontal spacing of the cross braces must be chosen by the user before the size of any member can be determined. When the soil type, the width and depth of the trench, the horizontal spacing of the cross braces, and the size and vertical spacing of the cross braces are known, the size and vertical spacing of the cross braces, the size and vertical spacing of the walers, and the size and horizontal spacing of the uprights can be read from the appropriate table.

Table 23-5. Timber Trench Shoring—Minimum Timber Requirements* for Soil Type A

Pa = 25 X H + 72psf (2 ft Surcharge)

Depth of Trench (ft)	Size (Actual) and Spacing of Members **													
	Cross Braces							Walers		Uprights				
	Horiz. Spacing (ft)	Width of Trench (ft)					Vertical Spacing (ft)	Size (in)	Vertical Spacing (ft)	Maximum allowable Horizontal Spacing (ft)				
		Up to 4	Up to 6	Up to 9	Up to 12	Up to 15				Close	4	5	6	8
5 to 10	Up to 6	4 x 4	4 x 4	4 x 6	6 x 6	6 x 6	4	Not req'd	***				2 x 6	
	Up to 8	4 x 4	4 x 4	4 x 6	6 x 6	6 x 6	4	Not req'd	***					2 x 8
	Up to 10	4 x 6	4 x 6	4 x 6	6 x 6	6 x 6	4	8 x 8	4			2 x 6		
	Up to 12	4 x 6	4 x 6	6 x 6	6 x 6	6 x 6	4	8 x 8	4				2 x 6	
10 to 15	Up to 6	4 x 4	4 x 4	4 x 6	6 x 6	6 x 6	4	Not req'd	***				3 x 8	
	Up to 8	4 x 6	4 x 6	6 x 6	6 x 6	6 x 6	4	8 x 8	4		2 x 6			
	Up to 10	6 x 6	6 x 6	6 x 6	6 x 8	6 x 8	4	8 x 10	4			2 x 6		
	Up to 12	6 x 6	6 x 6	6 x 6	6 x 8	6 x 8	4	10 x 10	4				3 x 8	
15 to 20	Up to 6	6 x 6	6 x 6	6 x 6	6 x 8	6 x 8	4	6 x 8	4	3 x 6				
	Up to 8	6 x 6	6 x 6	6 x 6	6 x 8	6 x 8	4	8 x 8	4	3 x 6				
	Up to 10	8 x 8	8 x 8	8 x 8	8 x 8	8 x 10	4	8 x 10	4	3 x 6				
	Up to 12	8 x 8	8 x 8	8 x 8	8 x 8	8 x 10	4	10 x 10	4	3 x 6				
Over 20	See Note 1													

* Requirements apply to mixed oak or equivalent with a bending strength of not less than 850 psi.

** Manufactured members of equivalent strength may be substituted for wood.

Notes for this table can be found in the “Notes for All Timber Trench Shoring Tables” section later in this chapter.

Table 23-6. Timber Trench Shoring—Minimum Timber Requirements* for Soil Type B

Pa = 45 X H + 72psf (2 ft Surcharge)

Depth of Trench (ft)	Size (Actual) and Spacing of Members **													
	Cross Braces							Walers		Uprights				
	Horiz. Spacing (ft)	Width of Trench (ft)					Vertical Spacing (ft)	Size (in)	Vertical Spacing (ft)	Maximum Allowable Horizontal Spacing (ft)				
		Up to 4	Up to 6	Up to 9	Up to 12	Up to 15				Close	2	3		
5 to 10	Up to 6	4 x 6	4 x 6	6 x 6	6 x 6	6 x 6	5	6 x 8	5			2 x 6		
	Up to 8	6 x 6	6 x 6	6 x 6	6 x 8	6 x 8	5	8 x 10	5			2 x 6		
	Up to 10	6 x 6	6 x 6	6 x 6	6 x 8	6 x 8	5	10 x 10	5			2 x 6		
	See Note 1													
10 to 15	Up to 6	6 x 6	6 x 6	6 x 6	6 x 8	6 x 8	5	8 x 8	5		2 x 6			
	Up to 8	6 x 8	6 x 8	6 x 8	8 x 8	8 x 8	5	10 x 10	5		2 x 6			
	Up to 10	8 x 8	8 x 8	6 x 8	8 x 8		5	10 x 12	5		2 x 6			
	See Note 1													
15 to 20	Up to 6	6 x 8	6 x 8	6 x 8	8 x 8	8 x 8	5	8 x 10	5	3 x 6				
	Up to 8	8 x 8	8 x 8	8 x 8	8 x 8	8 x 10	5	10 x 12	5	3 x 6				
	Up to 10	8 x 10	8 x 10	8 x 10	8 x 10	8 x 10	5	12 x 12	5	3 x 6				
	See Note 1													
Over 20	See Note 1													

* Requirements apply to mixed oak or equivalent with a bending strength of not less than 850 psi.

** Manufactured members of equivalent strength may be substituted for wood.

Notes for this table can be found in the “Notes for All Timber Trench Shoring Tables” section later in this chapter.

Table 23-7. Timber Trench Shoring—Minimum Timber Requirements* for Soil Type C

Pa = 80 X H + 72psf (2 ft Surcharge)

Depth of Trench (ft)	Size (Actual) and Spacing of Members **														
	Cross Braces							Walers		Uprights					
	Horiz. Spacing (ft)	Width of Trench (ft)					Vertical Spacing (ft)	Size (in)	Vertical Spacing (ft)	Maximum Allowable Horizontal Spacing (ft) See Note 2					
		Up to 4	Up to 6	Up to 9	Up to 12	Up to 15				Close	2	3			
5 to 10	Up to 6	6 x 8	6 x 8	6 x 8	8 x 8	8 x 8	5	8 x 10	5		2 x 6				
	Up to 8	8 x 8	8 x 8	8 x 8	8 x 8	8 x 10	5	10 x 12	5		2 x 6				
	Up to 10	8 x 10	8 x 10	8 x 10	8 x 10	10 x 10	5	12 x 12	5		2 x 6				
	See Note 1														
10 to 15	Up to 6	8 x 8	8 x 8	8 x 8	8 x 8	8 x 10	5	10 x 12	5		2 x 6				
	Up to 8	8 x 10	8 x 10	8 x 10	8 x 10	10 x 10	5	12 x 12	5		2 x 6				
	See Note 1														
	See Note 1														
15 to 20	Up to 6	8 x 10	8 x 10	8 x 10	8 x 10	10 x 10	5	12 x 12	5		3 x 6				
	See Note 1														
	See Note 1														
	See Note 1														
Over 20	See Note 1														

* Requirements apply to mixed oak or equivalent with a bending strength of not less than 850 psi.

** Manufactured members of equivalent strength may be substituted for wood.

Notes for this table can be found in the “Notes for All Timber Trench Shoring Tables” section later in this chapter.

Table 23-8. Timber Trench Shoring—Minimum Timber Requirements* for Soil Type A

Pa = 25 X H + 72psf (2 ft Surcharge)

Depth of Trench (ft)	Size (S4S) and Spacing of Members **													
	Cross Braces							Walers		Uprights				
	Horiz. Spacing (ft)	Width of Trench (ft)					Vertical Spacing (ft)	Size (in)	Vertical Spacing (ft)	Maximum Allowable Horizontal Spacing				
		Up to 4	Up to 6	Up to 9	Up to 12	Up to 15				Close	4	5	6	8
5 to 10	Up to 6	4 x 4	4 x 4	4 x 4	4 x 4	4 x 6	4	Not req'd	Not req'd				4 x 6	
	Up to 8	4 x 4	4 x 4	4 x 4	4 x 6	4 x 6	4	Not req'd	Not req'd					4 x 8
	Up to 10	4 x 6	4 x 6	4 x 6	6 x 6	6 x 6	4	8 x 8	4			4 x 6		
	Up to 12	4 x 6	4 x 6	4 x 6	6 x 6	6 x 6	4	8 x 8	4				4 x 6	
10 to 15	Up to 6	4 x 4	4 x 4	4 x 4	6 x 6	6 x 6	4	Not req'd	Not req'd				4 x 10	
	Up to 8	4 x 6	4 x 6	4 x 6	6 x 6	6 x 6	4	6 x 8	4		4 x 6			
	Up to 10	6 x 6	6 x 6	6 x 6	6 x 6	6 x 6	4	8 x 8	4			4 x 8		
	Up to 12	6 x 6	6 x 6	6 x 6	6 x 6	6 x 6	4	8 x 10	4		4 x 6		4 x 10	
15 to 20	Up to 6	6 x 6	6 x 6	6 x 6	6 x 6	6 x 6	4	6 x 8	4	3 x 6				
	Up to 8	6 x 6	6 x 6	6 x 6	6 x 6	6 x 6	4	8 x 8	4	3 x 6	4 x 12			
	Up to 10	6 x 6	6 x 6	6 x 6	6 x 6	6 x 8	4	8 x 10	4	3 x 6				
	Up to 12	6 x 6	6 x 6	6 x 6	6 x 8	6 x 8	4	8 x 12	4	3 x 6	4 x 12			
Over 20	See Note 1													

* Requirements apply to Douglas fir or equivalent with a bending strength not less than 1,500 psi.

** Manufactured members of equivalent strength may be substituted for wood.

Notes for this table can be found in the "Notes for All Timber Trench Shoring Tables" section later in this chapter.

Table 23-9. Timber Trench Shoring—Minimum Timber Requirements* for Soil Type B

Pa = 45 X H + 72psf (2 ft Surcharge)

Depth of Trench (ft)	Size (S4S) and Spacing of Members **													
	Cross Braces							Walers		Uprights				
	Horiz. Spacing (ft)	Width of Trench (ft)					Vertical Spacing (ft)	Size (in)	Vertical Spacing (ft)	Maximum Allowable Horizontal Spacing				
		Up to 4	Up to 6	Up to 9	Up to 12	Up to 15				Close	2	3	4	6
5 to 10	Up to 6	4 x 6	4 x 6	4 x 6	6 x 6	6 x 6	5	6 x 8	5			3 x 12		4 x 12
	Up to 8	4 x 6	4 x 6	6 x 6	6 x 6	6 x 6	5	8 x 8	5		3 x 8	4 x 8	4 x 8	
	Up to 10	4 x 6	4 x 6	6 x 6	6 x 6	6 x 8	5	8 x 10	5			4 x 8		
	See Note 1													
10 to 15	Up to 6	6 x 6	6 x 6	6 x 6	6 x 8	6 x 8	5	8 x 8	5	3 x 6	4 x 10			
	Up to 8	6 x 8	6 x 8	6 x 8	8 x 8	8 x 8	5	10 x 10	5	3 x 6	4 x 10			
	Up to 10	6 x 8	6 x 8	8 x 8	8 x 8	8 x 8	5	10 x 12	5	3 x 6	4 x 10			
	See Note 1													
15 to 20	Up to 6	6 x 8	6 x 8	6 x 8	6 x 8	8 x 8	5	8 x 10	5	4 x 6				
	Up to 8	6 x 8	6 x 8	6 x 8	8 x 8	8 x 8	5	10 x 12	5	4 x 6				
	Up to 10	8 x 8	8 x 8	8 x 8	8 x 8	8 x 8	5	12 x 12	5	4 x 6				
	See Note 1													
Over 20	See Note 1													

* Requirements apply to Douglas fir or equivalent with a bending strength not less than 1,500 psi.

** Manufactured members of equivalent strength may be substituted for wood.

Notes for this table can be found in the “Notes for All Timber Trench Shoring Tables” section later in this chapter.

Table 23-10. Timber Trench Shoring—Minimum Timber Requirements* for Soil Type C

Pa = 80 X H + 72psf (2 ft Surcharge)

Depth of Trench (ft)	Size (S4S) and Spacing of Members **													
	Cross Braces							Walers		Uprights				
	Horiz. Spacing (ft)	Width of Trench (ft)					Vertical Spacing (ft)	Size (in)	Vertical Spacing (ft)	Maximum Allowable Horizontal Spacing				
		Up to 4	Up to 6	Up to 9	Up to 12	Up to 15				Close				
5 to 10	Up to 6	6 x 6	6 x 6	6 x 6	6 x 6	8 x 8	5	8 x 8	5	3 x 6				
	Up to 8	6 x 6	6 x 6	6 x 6	8 x 8	8 x 8	5	10 x 10	5	3 x 6				
	Up to 10	6 x 6	6 x 6	8 x 8	8 x 8	8 x 8	5	10 x 12	5	3 x 6				
	See Note 1													
10 to15	Up to 6	6 x 8	6 x 8	6 x 8	8 x 8	8 x 8	5	10 x 10	5	4 x 6				
	Up to 8	8 x 8	8 x 8	8 x 8	8 x 8	8 x 8	5	12 x 12	5	4 x 6				
	See Note 1													
	See Note 1													
15 to 20	Up to 6	8 x 8	8 x 8	8 x 8	8 x 10	8 x 10	5	10 x 12	5	4 x 6				
	See Note 1													
	See Note 1													
	See Note 1													
Over 20	See Note 1													

* Requirements apply to Douglas fir or equivalent with a bending strength not less than 1,500 psi.

** Manufactured members of equivalent strength may be substituted for wood.

Notes for this table can be found in the “Notes for All Timber Trench Shoring Tables” section later in this chapter.

Notes for All Timber Trench Shoring Tables

1. Member sizes at spacing other than indicated within the tables are to be determined by a registered professional engineer.
2. When conditions are saturated or submerged, use Tight Sheeting. Tight Sheeting refers to the use of specially-edged timber planks (tongue and groove, for example) at least 3 inches (7.62 cm) thick, steel sheet piling, or similar construction that when driven or placed in position provide a tight wall to resist the lateral pressure of water to prevent the loss of backfill material. Close Sheeting refers to the placement of planks side-by-side allowing as little space as possible between them.
3. All spacing indicated is measured center to center.
4. Walers are to be installed with greater dimension horizontal.

5. If the vertical distance from the center of the lowest cross brace to the bottom of the trench exceeds 2-1/2 feet (0.76 m), firmly embed uprights or use a mudsill. Where uprights are embedded, the vertical distance from the center of the lowest cross brace to the bottom of the trench must not exceed 36 inches (91.44 cm). When mudsills are used, the vertical distance must not exceed 42 inches (1.07 m). Mudsills are walers that are installed at the toe of the trench side.
6. Trench jacks may be used in lieu of, or in combination with, timber cross braces.
7. When the vertical spacing of cross braces is 4 ft (1.23 m), place the top cross brace no more than 2 ft (0.61 m) below the top of the trench. When the vertical spacing of cross braces is 5 ft (1.52 m), place the top cross brace no more than 2-1/2 feet (0.76 m) below the top of the trench.

Limitation of Application

The timber shoring specification is not intended to apply to every situation that might be experienced in the field. This data was developed to apply to the situations that are most commonly experienced in current trenching practice. When any of the following conditions are present, the members specified in the tables are not considered adequate. Either an alternate timber shoring system must be designed or another type of protective system used when:

- Loads imposed by structures or stored material adjacent to the trench weigh in excess of the load imposed by a 2-ft (0.61-m) soil surcharge (the term "adjacent" as used here means the area within a horizontal distance from the edge of the trench equal to the depth of the trench).
- Vertical loads imposed on cross braces exceed a 240-lb (108.86-kg) gravity load distributed on a 1-ft (30.48-cm) section of the center of the cross brace.
- Surcharge loads are present from equipment weighing in excess of 20,000 lb (9,072 kg).
- Only the lower portion of a trench is shored and the remaining portion of the trench is sloped or benched, unless the sloped portion is sloped at an angle less steep than three horizontal to one vertical (3H:1V) or the members are selected from the tables for use at a depth that is determined from the top of the overall trench and not from the toe of the sloped portion.

Aluminum Hydraulic Shoring Specifications

This section contains the specifications for using aluminum hydraulic shoring to protect employees working in excavations. These shoring specifications only apply if a soil classification has been conducted. Whenever aluminum hydraulic shoring is used, the manufacturer's tabulated data should be used as the primary source for proper installation, use, and removal of the protective system.

Determine the maximum allowable spacing of aluminum hydraulic shoring components based on the soil classification and the depth of the excavation by using the following tables.

Table 23-11. Vertical Shores for Type A Soil

Depth of Trench (ft)	Hydraulic Cylinders				
	Maximum Horizontal Spacing (ft)	Maximum Vertical Spacing (ft)	Width of Trench (ft)		
			Up To 8	Over 8 Up To 12	Over 12 Up To 15
Over 5 Up To 10	8	4	2-inch diameter	2-inch diameter Note (2)	3-inch diameter
Over 10 Up To 15	8				
Over 15 Up To 20	7				
Over 20	Note (1) – To be designed by a registered professional engineer				
Notes for this table can be found in the "Notes for Aluminum Hydraulic Shoring Tables" section later in this chapter.					

Table 23-12. Vertical Shores for Type B Soil

Depth of Trench (ft)	Hydraulic Cylinders				
	Maximum Horizontal Spacing (ft)	Maximum Vertical Spacing (ft)	Width Of Trench (ft)		
			Up To 8	Over 8 Up To 12	Over 12 Up To 15
Over 5 Up To 10	8	4	2-inch diameter	2-inch diameter Note (2)	3-inch diameter
Over 10 Up To 15	6.5				
Over 15 Up To 20	5.5				
Over 20	Note (1) – To be designed by a registered professional engineer				
Notes for this table can be found in the "Notes for Aluminum Hydraulic Shoring Tables" section later in this chapter.					

Table 23-13. Waler Systems for Type B Soil

Depth Of Trench (ft)	Walers		Hydraulic Cylinders Width of Trench (ft)						Timber Uprights Horizontal Spacing		
	Vertical Spacing (ft)	Section Modulus (in^3)	Up To 8		8 To 12		12 To 15		Solid Sheet	2 ft	3 ft
			Hor. Space	Cyl. Dia.	Hor. Space	Cyl. Dia.	Hor. Space	Cyl. Dia.			
Over 5 Up To 10	4	3.5	8.0	2 in.	8.0	2 in. [2]	8.0	3 in.	——	——	3 x 12
		7.0	9.0	2 in.	8.0	2 in. [2]	9.0	3 in.			
		14.0	12.0	3 in.	12.0	3 in.	12.0	3 in.			
Over 10 Up To 15	4	3.5	6.0	2 in.	6.0	2 in. [2]	6.0	3 in.	——	3 x 12	——
		7.0	8.0	3 in.	8.0	3 in.	8.0	3 in.			
		14.0	10.0	3 in.	10.0	3 in.	10.0	3 in.			
Over 15 Up To 20	4	3.5	5.5	2 in.	5.5	2 in. [2]	5.5	3 in.	3 x 12	——	——
		7.0	6.0	3 in.	6.0	3 in.	6.0	3 in.			
		14.0	9.0	3 in.	9.0	3 in.	9.0	3 in.			
Over 20	Note (1) – To be designed by a registered professional engineer										
Notes for this table can be found in the "Notes for Aluminum Hydraulic Shoring Tables" section later in this chapter.											

Table 23-14. Waler Systems for Type C Soil

Depth of Trench (ft)	Walers		Hydraulic Cylinders Width of Trench (ft)						Timber Uprights Horizontal Spacing		
	Vertical Spacing (ft)	Section Modulus (in^3)	Up To 8		8 To 12		12 To 15		Solid sheet	2 ft	3 ft
			Hor. Space	Cyl. Dia.	Hor. Space	Cyl. Dia.	Hor. Space	Cyl. Dia.			
Over 5 Up To 10	4	3.5	6.0	2 in.	6.0	2 in. [2]	6.0	3 in.	3 x 12	——	——
		7.0	6.5	2 in.	6.5	2 in. [2]	6.5	3 in.			
		14.0	10.0	3 in.	10.0	3 in.	10.0	3 in.			
Over 10 Up To 15	4	3.5	4.0	2 in.	4.0	2 in. [2]	4.0	3 in.	3 x 12	——	——
		7.0	5.5	3 in.	5.5	3 in.	5.5	3 in.			
		14.0	8.0	3 in.	8.0	3 in.	8.0	3 in.			
Over 15 Up To 20	4	3.5	3.5	2 in.	5.5	2 in. [2]	3.5	3 in.	3 x 12	——	——
		7.0	5.0	3 in.	5.0	3 in.	5.0	3 in.			
		14.0	6.0	3 in.	6.0	3 in.	6.0	3 in.			
Over 20	Note (1) – To be designed by a registered professional engineer										
Notes for this table can be found in the "Notes for Aluminum Hydraulic Shoring Tables" section later in this chapter.											

Notes for Aluminum Hydraulic Shoring Tables

The following notes apply to all of the aluminum hydraulic shoring tables:

1. Trenches deeper than 20 ft (6.10 m) must be constructed and maintained in accordance with the design prepared by a registered professional engineer.
2. Two-inch (5.08-cm) diameter cylinders, at this width, must have structural steel tube (3.5 X 3.5 X 0.1875) oversleeves or structural oversleeves that meet the manufacturer's specification, extending the full, collapsed length.

3. Hydraulic cylinders must have at least the following capacities:
   - ❑ Two-inch (5.08-cm) cylinders must have a minimum 2-inch (5.08-cm) inside diameter with a safe working capacity of not less than 18,000 lb (8,164.80 kg) axial compressive load at maximum extension. The maximum extension must include the full range of cylinder extensions as recommended by the product manufacturer.
   - ❑ Three-inch (7.62-cm) cylinders must have a minimum 3-inch (7.62-cm) inside diameter with a safe working capacity of not less than 30,000 lb (13,608 kg) axial compressive load at maximum extension. The maximum extension must include the full range of cylinder extensions as recommended by the product manufacturer.
4. All spacing indicated is measured center to center.
5. Vertical shoring rails must have a minimum section modulus of 0.40 inches (1.02 cm).
6. Vertical shores must be spaced equally and horizontally, and there must be at least three members in each shoring group.
7. Plywood must be 1.125 inches (2.86 cm) thick or be 0.75 inches (1.91 cm) thick, 14-ply, arctic white birch (Finland form). Plywood is not intended as a structural member, only for prevention of local raveling (sloughing of the trench face) between the shores.
8. Timber specified in the tables is selected Douglas fir with a bending strength of not less than 1,500 psi. The dimensions given are actual, not nominal.
9. Walers are calculated for simple span conditions.

The limitations on the application of the shoring tables are given in the following section.

Limitations of Application

The aluminum hydraulic shoring specifications tables might not apply to every situation in the field. Shoring systems, for situations not covered by these tables, must be designed by a registered professional engineer.

When any of the following conditions are present or the members specified in the tables are not adequate, an alternate system must be designed by a registered professional engineer.

- When loads imposed by structures or by stored material adjacent to the trench weigh more than the load imposed by a 2-ft (0.61-ft) soil surcharge (The term “adjacent” as used here means the area within a horizontal distance from the edge of the trench is equal to the depth of the trench.)
- When vertical loads imposed on cross braces exceed a 240-lb (108.86-kg) gravity load distributed on a 1-ft (30.48-cm) section of the center of the cross brace
- When surcharge loads are present from equipment weighing more than 20,000 lb (9,072 kg)
- When only the lower portion of the trench is shored and the remaining portion of the trench is sloped or benched, unless the slope is at an angle less steep than 3H:1V or the members are selected from the tables for use at a depth that is determined from the top of the overall trench and not from the toe of the sloped portion.

Sample 23-1. Trenching/Excavation Report

Excavation Report

Date: ____________________ Job No. ______________________________

Project Name: ____

City: ______________________________ State: ____________________

1. What is the classification of the soil(s)? A B C
2. What testing method was used to classify the soil?

   ____

3. A proper method of access/egress has been provided? Y N
4. Spoil pile(s) was located a proper distance from top of trench? Y N
5. Were any tension cracks observed along top of trench? Y* N
6. Was any water seepage noted in the trench walls or trench bottom? Y* N
7. Was there any evidence of caving or sloughing of soil since the last inspection? Y* N
8. Was there any evidence of shrinkage cracks in trench walls? Y* N
9. Were there any zones of unusually weak soils or materials not anticipated? Y* N
10. Were all short-term trenches covered within 24 hours? Y N
11. Was traffic in area adequately away from trenching operations and barricades? Y* N
12. Were trees, boulders, or other hazards located near the excavation? Y* N
13. Were vibrations from equipment or traffic too close to trenching operations? Y* N
14. List all heavy equipment being operated near the excavation:

    ____

    ____

15. What type of protective system was used?

    Trench box ______________________________

    Sloping ______________________________

    Benching ______________________________

    Shoring ______________________________

    Other ______________________________

16. Weather condition: ____________________ Rainfall ____________________
17. * If Yes is circled above, explain observations and actions taken:

    ____

    ____

    ____

Signature of Competent Person: ______________________________

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Horizontal Directional Drilling Safety

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

General Requirements

Horizontal Directional Drilling (HDD) safety must start at the senior management level, and every employee must be committed to safety to maximize effectiveness and profitability. Each HDD job is different, but all must be approached with safety as a primary concern. A well-planned process that is managed and executed by trained personnel and utilizes best practices allows construction to continue profitably without compromising safety.

Crew Responsibilities

Competent Person

A competent person must ensure that a documented JTSA is provided for all jobsite personnel before beginning operations and periodically during the project and must then assign duties to suitably qualified personnel. A competent person must ensure that all personnel understand and follow generally accepted construction safety practices and appropriate procedures. Refer to the JTSA form located at the end of this chapter.

Operators

Operators of drilling, tracking, and support equipment must be deemed qualified by the competent person or must be supervised by a qualified operator. Operators must have continuous two-way radio contact with the drill locator and other site personnel to coordinate the drilling operation.

Support

Support personnel must be briefed by a competent person upon arrival and must follow and maintain all safety procedures throughout the job. Support personnel and visitors must be informed of their responsibilities, any hazards, and any restrictions on activities.

Hazard Recognition

Before beginning any HDD activity, a JTSA must be performed to identify all perceived hazards. Procedures must be created to remove, isolate, or otherwise control the identified hazards.

Hazardous activities specific to HDD that must also be addressed include:

- Rig operation
- Pilot bore tracking
- Utility clearances
- Electrical strike protection
- Rotating drill pipe (drill stem and rod)
- Overhead electrical hazards
- Potholing
- Drilling fluid system operation
- Working on the product side
- Communications
- Handling loose drill pipe
- Making and breaking tool joints
- Reel trailer operation
- Environmental and traffic control

Underground

Be aware of the potential for underground hazards, which include the following:

- Electrical power cables
- Fluid and gas pipes
- Fiber optic cables and communications cables
- Sewage, storm, and water lines
- Others, as determined by site conditions

Surface

Thoroughly evaluate the jobsite surface for indications of potential underground hazards. Possible indications of hazards include:

- Transformer boxes
- Meter peds
- Utility boxes
- Depressions
- Road repairs
- Water and gas shutoffs
- Marking signs or casing vents

- Changes in vegetation
- Pole risers
- Underground feeds
- Manholes, handholes, and underground vaults
- Any other signs of existing utility marks

Site Assessment

Carefully document existing site conditions along and adjacent to the drilling alignment. Accurately locate and photograph cracked sidewalks, driveways, and facades of structures. Photograph and document trees or other vegetation that exhibit distinct signs of distress.

Prejob Planning

Take the following steps to ensure safe and efficient construction with minimum interruption:

1. Notify owners of subsurface utilities along and on either side of the proposed drill path of the impending work through local One Call notification services.
2. Obtain all necessary permits or authorizations to carry construction activities near or across all such buried obstructions.
3. Ensure that all utility crossings are exposed using a hydro-excavation, hand excavation, or other approved method (such as potholing) to verify location and confirm depth.
4. Arrange the construction schedule to minimize disruption (for example, when drilling under railroad beds, major highways, or river crossings).
5. Determine and document the proposed drill path, including its horizontal and vertical alignments, and the location of buried utilities and substructures along the path.

Bore Pits

During an HDD project, the following guidelines regarding bore pits must be observed:

- Entrance and exit pits must be of sufficient size to avoid a sudden radius change of the drill pipe and consequent excessive deformation at these locations. Size of the bore pits is a function of the pipe depth, diameter, and material.
- All pits must be shored, sloped, or protected by an approved method as required by regulatory agencies.

Overhead Lines

When performing HDD operations near overhead power lines, observe the following safety guidelines:

- Avoid overhead lines.
- Overhead lines are of particular concern during mobilization and demobilization while handling drill pipe or when loading and unloading heavy equipment. Maintain a minimum clearance of 10 ft (3.05 m) of separation between equipment and power lines. When clearance is less than 10 ft (3.05 m), insulate, isolate, or guard equipment, material, and tools.

- If necessary, place highly visible markers on either side of the overhead hazard, install physical barriers (goal posts), or designate an individual to notify equipment operators as they approach the hazard.

Verifying Utility Locations and Potholing

The following guidelines must be followed to ensure safety during HDD operations where underground utilities might be encountered:

- The location of all identified utilities must be verified using nondestructive methods of excavation. The bore profile must be designed to maintain acceptable clearances between underground utilities and structures and the final reamed hole. Possible migration of the back reamer from the pilot bore toward the utility caused by excessive steering or a tight radius must be carefully considered when establishing clearances.
- If any risk to the utility from the drilling activity is present, a "window" must be excavated at or near the utility to visually monitor the potentially hazardous situation. Drilling fluids must be removed during this process.
- Exposed existing utilities must be adequately protected and supported.
- When crossing or running parallel to existing utilities within 3 ft (0.91 m) of the bore, the utilities shall be visually confirmed by exposing the bore at appropriate intervals.
- Because of a high risk and hazard potential, a competent person must visually confirm the location of gas lines, electrical utilities, fiber, and communication lines within the immediate vicinity of the bore path.
- Contract documents and state and local regulations must be checked to determine responsibility for verifying locations of unmarked utilities.
- When utilizing high-pressure water for verifying utility locations, the proper PPE shall include long-sleeved arm protection, di-electric shoes/boots or overshoes, safety glasses and face shield, and Class 3 rubber insulating di-electric gloves.

As a general guide to identifying utilities, the standard surface marking colors are shown in Table 24-1.

Table 24-1. Surface Marking Colors

Color	Utility
Red	Electric power, including street lighting
Yellow	Gas, oil, steam, and petroleum
Blue	Water and irrigation
Green	Sewer and storm drains
Orange	Fiber optic, telephone, and cable TV
Pink	Temporary survey markings
White	Proposed construction area or work limits
Purple	Reclaimed water

Traffic Control (Pedestrian and Vehicle)

Considerations

Necessary traffic control must be maintained throughout projects. Mobilization, demobilization, material handling, and intermittent movement of mobile equipment typically require traffic control if the activities conflict with vehicular or pedestrian traffic.

Permits, Methods, and Accessibility

Traffic control includes permits, planning, notification, flag persons, warning signs, and barricades. The work area, particularly around the drill rig and entrance and exit pits, must also be secured to prevent unauthorized entry. Emergency vehicles and buses must have access to the work area during construction. See the “Personal Protective Equipment,” “Electrical Strike Sensing System and Equipment Protection,” and “Work Zone and General Public Protection” sections within this chapter, which address work zones and other protective measures.

Communication and Safety Equipment

Communication

Communication is a critical ingredient of any successful HDD project. It is imperative that the drill locator and the drill rig operator have an understanding of the job before beginning the work.

Personal Protective Equipment

PPE that is required on an HDD jobsite is similar to that required on other construction jobsites and includes the following:

- Approved safety vests
- Hardhats
- Approved eye protection
- Approved and inspected dielectric boots (over 6 inches in height) worn over work boots.
- Approved and tested dielectric gloves, leather protectors, and bag

The bore operator must have dielectric gloves on the machine.

- Any other safety equipment mandated by other rules or required by the owner or regulatory agency

Electrical Strike Sensing System and Equipment Protection

The drilling unit must be equipped with an Electrical Strike Sensing System, which must be used according to the recommendations of the manufacturer. The system may include audible and visual warning alarms, grounding mats, and PPE. Electrical sensing stakes must be driven into the ground and the strike alert system tested before use and during operation.

Work Zone and General Public Protection

Establish a work zone extending 10 ft (3.05 m) from all sides of the machine. Additionally, a safety perimeter must extend 10 ft (3.05 m) in all directions from the drill head while drilling and back reaming. This distance must be maintained until work on the project is completed. Where a 10-ft (3.05-m) perimeter cannot be established, a documented alternative protection plan must be implemented. Place warning signs around the protected area clearly stating: "Danger, Do Not Enter."

As a minimum, a work zone must consist of cones, tape, and warning signs.

Drilling Precautions

Observe the following precautions during drilling operations:

- If a hazardous obstruction or situation is suspected during drilling, stop the operation until the hazard is eliminated.
- Identify and avoid potential "pinch points" on the drill rig and support.
- Ensure that workers stay clear of the rotating drill string.
- Do not operate the drill when personnel are working on or near the drill string.
- Do not operate the drill without positive communication with the drill locator or exit-side personnel.
- Ensure that the machine is off when personnel are working on or with the drill string.
- Do not exceed the maximum torque and thrust/pullback capacity of the drill pipe specified by the manufacturer.
- Use remote breakout wrenches (breakout tongs) in a safe manner. Never use drilling machine torque or backhoes with wrenches to make or break tool joints. Pipe wrenches are not allowed. Ensure that there is no stored torque in the drill string before attempting to change end tools.

Bore Path Interference

The planned bore path must be walked with the tracking equipment to evaluate any potential fields of electromagnetic (active) interference and to look for signs of reinforced concrete or other possible passive interference that may hinder the operation. The identified hazards must then be discussed.

Reaming and Installation Precautions

The following precautions must be observed during reaming and product installation:

- Two-way radio communication must be maintained at all times between entry and exit–side personnel.
- The drill pipe must not be rotated until all personnel have been notified and have made acknowledgment.

All personnel must be out of the entrance and exit pit before the drill pipe is rotated.

- Workers must never step over rotating drill pipe and must maintain a safe distance of at least 3 ft (0.91 m) when working near rotating drill pipes.

Response to Events

If an existing utility is struck during the HDD operation, emergency procedures must be initiated to reduce the likelihood of injury. Established procedures to follow in the event of utility strikes are summarized in the following sections.

Electrical Strike

Observe the following safety procedures if an electrical strike occurs:

1. Do not move. The voltage difference between the equipment and the ground or even between a person’s feet can be sufficient to cause injury or death.
2. Do not touch the machine, drill pipe, water system, mud-mixing system, or anything connected to the drill. These items might be energized.
3. Remain calm and instruct the drill operator to put on rubber gloves and reverse the direction of advance in an attempt to break contact with the electrical line. Do not use rotations in an attempt to break contact—push or pull only.
4. Contact the electrical utility company immediately.
5. Instruct the drill operator to follow the procedure recommended by the manufacturer to determine if the drill is energized before attempting to dismount the machine.

Gas Strike

Observe the following safety guidelines if a gas line strike occurs:

1. Call 911 immediately if an existing gas line is ruptured (Federal Law).
2. Evacuate the area immediately.

3. Instruct the drill operator to shut down all engines and, under no circumstance, to attempt to reverse the bore to break contact. Further movement can cause a spark.
4. Contact emergency services and the gas utility company immediately.

Fiber Optic Strike

Observe the following safety procedures if a fiber optic strike occurs:

1. Do not look into the cut ends of the cable, which can cause severe eye injury.
2. Stop drilling immediately.
3. Contact the utility owner.

Communications Line Strike

If a communications line strike occurs, stop drilling immediately and contact the utility company.

Sanitary or Storm Sewer and Water Strike

Observe the following safety procedures if a water or sewer line strike occurs:

1. Stop drilling immediately.
2. Warn all bystanders that a strike has occurred and that they should stay away.
3. Obtain medical attention for personnel who have come into contact with sewage.
4. Contact the utility owner immediately.

Environmentally Sensitive Issues

Environmental issues related to HDD may include:

- Access restrictions due to wetlands, intermittent drainage channels, endangered plant or animal species, endangered habitat, and potential erosion.
- Oil and fuel spills from leaking or ruptured hoses on equipment or spillage during storage, fueling, and mechanical service.
- Drilling fluid spills on the surface that cause suffocation of small wildlife and alter flora, fauna, and wildlife habitat (particularly if the bore is for environmental reasons) and spills that enter and change the drainage characteristics of dry drainage channels or drainage pipes.
- Inadvertent drilling fluid returns in watercourses that might pose a significant environmental threat. Turbidity in the water can cause suffocation of marine wildlife. On the bottom of a body of water, heavy drilling fluids might cover habitats, organisms, and fish eggs.
- Groundwater contamination from drilling fluid additives such as soda ash, polymers, detergents, and bentonite. When additives approved for water well drilling are introduced into a microenvironment in mass quantities, the additives can be considered hazardous to that microenvironment.

To prevent adverse affects to the environment, properly dispose of all drilling fluid.

Other Considerations

Other jobsite-related concerns vary from one location and project to another, depending on several factors. State and local laws and regulations, the sensitivity of the local environment, and the sensitivity of local residents and regulatory officials all impact the issues to be considered and the level of effort required to address the issues.

Subcontractors

Subcontractor Safety Compliance

The standards within this HDD program are the minimum acceptable safety operating procedures that apply to projects. More stringent standards imposed by any other agency associated with the work, material, or equipment or by subcontractors and suppliers of material and equipment take precedence.

Subcontractor Accident Reporting

Any subcontractor associated with HDD work must report all accidents, including contact with power lines, power poles, fiber optic lines, gas lines, water lines, or sewer lines to the Company immediately.

Safety Meetings

Safety meetings are an integral part of a proactive safety management process. There are many types of safety meetings held.

Daily, before the start of work, the crew generally should hold a documented tailgate safety meeting. The meeting should focus on safety issues relevant to the work processes to be performed that day, along with reminders regarding the safe use and inspection of the tools and equipment required for the tasks to be performed that day. The crew should also discuss any near-misses, noncompliance, or other safety issues that were encountered the previous day.

A weekly safety meeting will be held on each jobsite. The purpose is to cover subjects of great importance and relevance to the success of the job. The subjects discussed and attendance will be documented by signing a meeting roster. These meetings supplement and support the safety training provided for all employees. Weekly safety meetings will generally last between 15 and 30 minutes.

The topics may be:

- Pre-chosen and information sent to the field by the Corporate Office and/or Operating Unit.
- Pertinent to the work being performed.
- Tools and equipment being used in the field.
- Work procedures and policies of the client/customer.
- Issues related to the crew’s activities.
- “Special” safety meetings, which may be called when:
    - ❑ An incident occurs on a jobsite.
    - ❑ Non-compliance was observed.
    - ❑ New work practices and/or policies are implemented.

- ❑ New tools and/or equipment are introduced into the work area.
- ❑ Other reasons.

Job Task Safety Analysis

Each day, before the start of each workday, the supervisor/foreman (person in charge) or their designee, should conduct a job briefing or Job Task Safety Analysis (JTSA) with the employees involved (see Chapter 29). The purpose of the JTSA is to identify the hazards associated with the scope of work, determine the safety precautions that will be implemented, and the required PPE by the crew performing the work assignment. The JTSA helps ensure that all members of the crew understand the work assignment and acknowledge that they understand and will follow the safety plan established to complete the work assignment. The JTSA should be documented and signed by all crewmembers. Refer to Sample 24-1. The following are requirements for the JTSA:

- The foreman (person in charge) should assemble the crew at the job site and explain the work to be done, and outline the steps to be followed.
- The foreman (person in charge) and the members of the crew will identify the hazards of the job. The crew should identify appropriate controls to eliminate, mitigate, control, or reduce the accident-producing potential of the hazards.
- If the hazards cannot be eliminated from the jobsite, the JTSA should list how the hazards can be mitigated, controlled, or reduced. This may be done by:
    - ❑ Dedicated assignment of work responsibilities.
    - ❑ Methods to isolate or control the hazard.
    - ❑ Other forms of protection (PPE, training, others) to reduce the hazard to the employees.
- The foreman (person in charge) must ensure that each member of the crew understands all instructions given.
- If the work or operations to be performed during the workday or shift are repetitive and similar, at least one JTSA should be conducted before the start of the first job of each day or shift. An additional JTSA should be completed and a meeting held with the members of the crew if significant changes that might affect the safety of the employees occur during the course of the work. Significant changes include changes in the scope of the work, work assignments, crew structure, crew leadership, environmental conditions, or when other hazards (not originally noted) are determined to be present in the workplace.
- The discussion should be in such detail that all employees, by virtue of training and experience, can reasonably be expected to recognize and avoid the hazards involved in the job. A more extensive discussion should be conducted if the work is complicated or particularly hazardous or if the employee cannot be expected to recognize and avoid the hazards involved in the job.
- The foreman (person in charge) is responsible for accounting for all employees after the completion of each job.

Sample 24-1. Job Task Safety Analysis Form—Horizontal Directional Drilling (HDD)

Job Task Safety Analysis - Horizontal Directional Drilling (HDD)

Company Name:	**Date:**	**Time:**	**Job #:**
Location:		**City:**	**State:**
Describe job task:			
Competent Person Trenching / Excavation:			**Soil Classification:**
Person responsible for First Aid / CPR:			
Name and Location of Emergency Medical Facility:			
Location of the AED:			**Emergency Contact Number: 911**

PPE Required	Yes	N/A
Hardhat		
Safety Glasses/Goggles		
Hearing Protection		
Leather Gloves		
Rubber Boots		
Metatarsal Covers		
Face Shield		
Welding Hood		
Chemical Rubber Gloves		
Class 2 Reflective Vest		
Class 3 Reflective Vest		
Full-face Respirator		
Half-mask Respirator		
Fire Extinguisher		
Personal Flotation Device		
Disposable coveralls		
FR Coveralls		

Ladders	Yes	N/A
Daily Inspection		
Warn./Usage Labels Affix.		
3 Feet Above Landing		
Ladder Secured		

Sanitation	Yes	N/A
Water (Marked as Potable)		
Single Use Cups		
Clean Restrooms		
Hand Wash Station		

Confined Space	Yes	N/A
Competent Person		
Permitted/Non-Permitted		
Calibrated Monitor		
Continous Monitoring		
Hole Watch		
Man Hole Guard		
Forced Ventilation		
Rescue Equipment		
Resc. Team/Serv. Identified		
Hot Work Permit		
Warning Signs		
Written Program on Hand		
Contractors Notified		
Confined Space Log Book		

Excavations	Yes	N/A
Competent Person		
Utilities Located		
Integrity of Adj. Structures		
Soil Classification		
Location of Spoil Bank		
Overhead Load Protect.		
Water in Trench		
Ladders/Ramps (Circle 1)		
Ladders Secured		
Sloping/Benching		
Shoring System		
Tabulated Data		
Atmosphere Tested		
Daily/Periodic Inspection		
Warning System		
Emergency Rescue Equip.		
Log Book		

Traffic Control	Yes	N/A
Traffic Control Plan		
Right/Left Lane Closed		
Sign - Flagman Ahead		
Sign - Construction Ahead		
Arrow Board		
Message Board		
Traffic Control Zone		
Advance Warning Area		
Transition Area		
Buffer Space		
Work Area		
Termination Area		
Barricades/Cones		
Stop/Slow Paddles		

Medical	Yes	N/A
Employees trained FA/CPR		
First Aid Kit		
Bloodborne Pathogen Kit		

Administrative Issues	Yes	N/A
OSHA Poster		
MSDS Manual		
Written Safety Program		
Permits		
Logs		
Daily AED Check		

Locates

	Yes	N/A
Have all utilities been located and verified?		
Is Locate Number on-site and current?		

Electrical	Yes	N/A
Daily Inspec. Tools, Cords		
GFCI/Assured Grounding		
Survey of Daily Conditions		
Minimum Safe Distances		
Energized/Deenergized		
Grounding Equipment		

HDD Safety	Yes	N/A
Permits Completed		
2-way Radio Communications		
Soil Analysis		
Blue Prints Reviewed		
Bore Route Marked		
Pot Hole(s) Completed		
Underground Lines Identified		
Hazards Identified		
SLD		
Warning Signs Posted		
Drill Barricaded		
Dielectric Boots (Tested)		
Dielectric Gloves		
Grid System In Place		
Operator's Manual Review		
Equipment/Tools Inspected		
Equipment Grounded		
Strike Alert Operational		
Emergency Plans		
Employees Trained		

Power Lines

Power Company notified when work is conducted near ANY electrical source.

Yes ☐
N/A ☐

Work assignments not addressed above shall be outlined below

All employees must print and sign their names below

Printed Name	Signature	Printed Name	Signature
1.		6.	
2.		7.	
3.		8.	
4.		9.	
5.		10.	

Foreman Signature ____________________ **Safety Rep. Signature** ____________________

NOTE: Additional Job Briefing will be required when scope of work changes and/or conditions change

1. Have overhead power lines been located and have proper precautions been identified?
2. Have all employees received proper training and are qualified to perform the tasks to which they have been assigned?
3. List injuries, incidents, first aid and near miss accidents that occur at the job site during the course of the day?

25

Personal Protective Equipment

Purpose

To identify the guidelines relating to minimal policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

General Requirements

Each employee is required to wear the appropriate personal protective equipment (PPE). Though PPE is designed to prevent injury or illness, wearing PPE should not be considered sufficient employee protection. Implementing engineering controls to eliminate or minimize occupational hazards is the ultimate control.

PPE equipment provided may include, but is not limited to:

- Eye protection
- Face protection
- Head protection
- Hearing protection
- Hand protection
- Protective clothing
- Respiratory equipment
- Foot protection
- Protective shields and barriers

Requirements for PPE are outlined in the following sections.

Equipment Selection

After it has been established that PPE is needed for a designated job using either a hazard assessment or JTSA, use the following guidelines in choosing PPE:

- Select PPE based on the degree of protection required and the degree of protection afforded by a particular piece of equipment.
- Select PPE that meets nationally accepted performance specifications and standards. Where specific regulations exist for certain types of equipment, those regulations must be followed.
- When making selections, consider the comfort and ease with which a particular piece of equipment can be used or worn.
- Ensure that the equipment protects the employees from specific hazards identified in hazard assessments.
- Selected PPE must be fitted correctly to each employee.

Equipment Use

Although employees understand the benefits of PPE, they do not always wear or use it properly. The following guidelines can help enforce proper use of this equipment by employees:

- Work with the Safety Department and employees to test proposed equipment or devices before the items are approved for purchase. Employee opinions about what equipment will be comfortable and fits well are valuable.
- Give each employee a clear and reasonable explanation as to why the safety equipment must be worn.
- Incorporate standards for specified safety equipment into the job description or requirements, and make it a condition of employment.
- Use disciplinary measures when the failure to wear the provided safety equipment endangers the well-being of the employee or those working nearby. Management has the responsibility of enforcing safety rules and regulations.

Contact the Safety Department with any questions raised or problems encountered in the correct selection and use of PPE. The Safety Department usually designates the type of equipment to be used.

Use and Maintenance of PPE

PPE shall be used and maintained in a sanitary and reliable condition.

When PPE is issued for reasons of hazards or work processes, unsafe environment, chemical hazards, radiological hazards, or mechanical irritants capable of causing injury or impairment in the function of any part of the body, then the use of that PPE shall be mandatory.

Types of PPE

Head and Scalp Protection

Wear ANSI Z89.1 approved hardhats in good condition in all field work areas, roads, laydown yards, and shops during working hours. “Bump” caps and metal hardhats are not acceptable.

Eye Protection

- Wear ANSI Z87.1 approved safety glasses with side shields during working hours for all field jobsites and in shops.
- Wear approved welding hoods for all welding or cutting operations.
- Wear burning goggles with no less than a #3 density lens with plastic cover plates on each side for all gas welding and burning. Burning goggles are worn over approved safety glasses.

Refer to OSHA 29 CFR 1926.102 for minimum guidelines for lens shades for eye protection utilized during all welding and cutting operations.

- Wear a face shield over approved safety glasses or goggles when cutting, chipping, grinding, or buffing.
- Wear full face shields over approved safety glasses when handling molten materials, such as lead or tar.
- Ensure that prescription safety glasses meet ANSI requirements. Employees must wear goggles or cover safety glasses over prescription glasses that do not meet these requirements. Side shields are required on all prescription safety glasses.
- Ensure that all visitors who are not wearing ANSI-approved safety glasses are provided with and wear visitor cover safety glasses or visitor safety goggles.
- Employees must wear full face (arc-rated face shield) protection whenever there is a danger of electrical arcs, flashes or flying objects resulting from an electrical explosion when primary switching operations are performed.

Hearing Protection

Conservation Policy

The Safety Department and/or the customer/client will indicate areas where hearing protection is required. This requirement is enforced for employees working around noisy equipment and in Company or customer/client facilities that have been designated as “Hearing protection required” areas. Disposable earplugs are typically used on all jobsites.

The Safety Department requires that approved hearing protection be worn by employees working in designated high noise areas, operating tools or equipment, or working near tools or equipment where the TWA is above permissible noise-limited standards.

Approved hearing protection consists of earplugs or earmuffs that eliminate the noise exposure to within a permissible limit.

Exposure Monitoring

Designated high noise areas are monitored periodically using a “delta” scale of the sound level meter. Documentation of all sound level monitoring is maintained by the Safety Department.

Audiometric Testing

Audiometric testing is recommended to establish baseline audiometric evaluations when employee exposure will equal or exceed an eight-hour TWA of 85 decibels. The decision to use audiometric testing will be evaluated on an individual project basis by management. Audiometric testing may be required by governmental regulatory agencies, according to the type of work being performed, and/or by the client.

Re-testing should be conducted annually for employee hearing loss evaluation.

High Noise Equipment

Evaluation of construction equipment under general use has determined that hearing protection might be required when employees are involved in the tasks or are working with the equipment listed in Table 25-1. This list of tasks and tools is representative only and is not meant to be all-inclusive.

Table 25-1. High Noise Tasks and Equipment

Chain saws	Concrete cut-off saws
Table saws	Skill saws
Air grinders	Pavement breakers
Electric grinders	Pneumatic chipping tools
Bull dozers	Concrete pumpers
Impact wrenches	Arc gouging torches
Air compressors	Cherry pickers
Pile drivers	Welding machines
Ground tampers	Powder-actuated tools
Vibratory Plow Tractors	Trenchers
Blasting operations	Hammer drills
Horizontal Directional Drilling (HDD) operations	Excavation equipment
Locate equipment (water jetting and vacuum truck)	Jackhammers
Wood Chippers	

Training

Employees shall receive training on the Company's hearing conservation program during safety orientation and annually, thereafter. Training includes identification of designated high noise areas, the tasks that expose employees to high noise levels, and the effects of high noise levels. Records are maintained on all training performed and on employees receiving such training. Refer to the Employee Training Record forms located at the end of this chapter.

Documentation

Noise surveys, hearing examinations records, and training documentation for the types and application of hearing protection provided are maintained by the Safety Department.

Hand Protection

Wear gloves or other suitable hand protection while engaged in work that can result in hand injuries or exposure to toxic materials that could cause injury or illness. The jobsite supervisor will designate the tasks for which gloves are required. The type of gloves worn must be appropriate for the type of work being performed, as follows:

- Wear plastic or rubber-coated gloves when handling solvents, acids, or chemically-treated material or when the Safety Data Sheets (SDS) recommend the use of protective gloves.
- Wear leather gloves when handling iron, rebar, cable, or other materials that could cause injury.
- Wear dielectrically-tested, rubber gloves with leather protectors on all power line work or wherever contact with energized circuits is possible.
- Welding gloves are required when welding.
- Wear cotton gloves as deemed necessary.

Gloves must not be worn by employees working around moving equipment or machinery that might catch the gloves and pull a hand into the equipment. Gloves are normally provided by each employee except when safety standards require specialized gloves. In these cases, the Company provides the necessary gloves.

Foot Protection

Good leather shoes with a defined heel (1/4 inch or greater) are minimum shoe requirements.

Some company/clients and/or jobsites require more protective safety shoes or boots.

Certain specialized tasks require additional foot protection. Employees performing these tasks, without steel-toed safety shoes and/or boots, will be provided with and must wear metatarsal covers.

Under no circumstances is open-toed or canvas footwear of any type allowed.

Respiratory Protection

Ventilators, fans, air movers, dust masks, respirators, or a combination of these devices are used when acceptable air contaminant levels are exceeded. Wear NIOSH or MSHA approved respirators around hazardous or toxic fumes. Wear a SCBA or positive pressure air-supplied mask when working in a hazardous fume or vapor atmosphere. Employees wearing respirators must be in a respiratory protection program. (See Chapter 41, “Respiratory Protection”)

Skin

Use protective skin cream when exposed to chemicals, such as creosote or other irritants. Employees susceptible to sunburn should wear protective sunscreen when exposed to harmful ultraviolet rays for extended periods of time.

Life Preservers

Wear an approved work vest or life preserver when:

- Working over or near inland waterways or offshore.

- Working below platform decks or outside of protective handrails, including boat landings and splash zone areas.
- Transferring between boats and platforms.
- Working in any area over water where handrails have been or are being removed.
- Required by offshore transportation such as helicopters, crew boats, or other vehicle.

Personal Protective Clothing

When employees are exposed to flames or electrical arcs, employees shall wear clothing per the following minimum requirements:

- **Shirts**—FR arc-rated long sleeve shirt (minimum of ARC 2 and rated according to the exposure)
- **Jackets or coats**—When worn, FR arc-rated (minimum of ARC 2 and rated according to the exposure)
- **Rainwear** —When worn, FR arc-rated (minimum of ARC 2 and rated according to the exposure)
- **Pants**—FR arc-rated (minimum of ARC 2 and rated according to the exposure)
- **Coveralls**—When worn, FR arc-rated (minimum of ARC 2 and rated according to the exposure)
- **Headgear**—When wearing winter hard hat liners, FR required

Employees shall wear approved fire-retardant (FR) clothing which is arc-rated according to the exposure to protect their bodies. The outermost garment worn on the body shall be FR. Clothing that is 100% cotton may only be worn underneath the outer FR layer of clothing. All undergarments should be 100% cotton or other natural fibers. Clothing made from the following types of fabric, either alone or in blends,is prohibited: acteate, nylon, polyester, and rayon.

A hazard assessment must be made prior to the start of each job. The assessment should determine to what extent the employee may be exposed to flames or electrical arcs. The assessment should also determine the parts of the employee's body that might be exposed to flames or electrical arcs. The result of the hazard assessment may determine that the exposure requires a greater level of fire-retardant (FR) protection.

When employees are exposed to flash fires, employees shall wear protective clothing per the following minimum requirements:

- **Shirts**—FR-rated long sleeve shirt
- **Jackets or coats**—When worn, FR-rated
- **Rainwear** —When worn, FR-rated
- **Pants**—FR-rated or 100% cotton or other natural fibers
- **Coveralls**—When worn, FR-rated

- **Headgear**—When wearing winter hard hat liners, FR required

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Employees must wear approved fire-retardant (FR) clothing to protect their upper body. FR clothing worn for the protection from flash fires must meet the requirements of NFPA 2112: Standard on Flame-Resistant Garments for Protection of Industrial Personnel Against Flash Fire.

For more information about performing a hazard assessment, see Chapter 29 “Hazard Recognition”.

Fall Protection

Wear safety harnesses equipped with shock-absorbing lanyards and double-locking snaphooks and tie off to approved anchor points when working from elevated areas when:

- Work is being performed 6 ft (1.83 m) or more above ground elevation and no other fall protection system is in place.
- The roof pitch equals or exceeds 4 vertical to 12 horizontal (4V:12H) or working closer than 4 ft (1.22 m) from a roof edge.
- Two-point suspension scaffolds or stages are in use.
- Work is being performed off of scaffolds not equipped with guardrails.
- Ladders are placed near the edge of a roof or floor opening.
- The work area is elevated and no protection is available to prevent the worker from falling.

The Company requires 100% tie-off at all times. The Company does not allow the use of body belts for fall arrest. Every safety belt, safety harness, and lanyard must be inspected by the wearer before each use. Every employee issued a safety harness must be instructed by a qualified person in the proper method of wearing, using, and securing this equipment.

Miscellaneous Safety Equipment

The Safety Department, in concurrence with operations management, determines the type of specialized equipment needed for unusual or unique work environments or job tasks.

Hazard Assessment

The Company has assessed job classifications and jobsites to determine what hazards are most prevalent. Policies regarding hazards were written to comply with regulatory requirements and generally accepted safe work practices. For more information, see Chapter 29, “Hazard Recognition.”

Training

Qualified employees must obtain training in the proper use of PPE, including:

- Proper fitting of equipment
- When equipment is necessary
- What equipment is required

- How to wear and adjust the equipment
- The basic limitations of the equipment
- The proper care, maintenance, useful life, and disposal of applicable PPE
- Proper storage methods
- Proper cleaning methods

Employees receive training whenever the job task requires that PPE be worn. Retraining is conducted when the employer believes that an employee does not have the skill or understanding to use PPE properly. Retraining also occurs when operational changes make previous training obsolete or when PPE changes are made by the Safety Department. Records are maintained on all training performed and on employees receiving such training.

Documentation

PPE training is documented. Training records should include the name, date, and type of training conducted. Training records must be kept in each employee's file.

Certification

The appropriate certification is signed to document training on the use and care of PPE. This form must be dated and signed by the supervisors who perform the evaluation and training.

Inspection of PPE

All PPE shall be inspected prior to each use. Defective or damaged PPE shall not be used. Notify your foreman and/or the Safety Department of the need for replacement PPE.

Sample 25-1. Employee Training Record (Roster)

Type Company Name Here

EMPLOYEE TRAINING RECORD

This is to certify that I have received Basic Personal Protective Equipment Training.

Name (Print)	**Signature**	**Employee #**	**Date**

Training Conducted by:

Instructor　　　　　　　　　　Date

Version 1, 09/01

Sample 25-2. Employee Training Record (Individual)

Type Company Name Here

EMPLOYEE TRAINING RECORD

This is to certify that I have received Basic Personal Protective Equipment Training.

Name: ______________________

Signature: ______________________

Employee #: ______________________

Date: ______________________

Training Conducted by:

______________________ ______________________

Instructor Date

Version 1, 09/01

26

Motor Vehicle Safety Procedures

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

Definitions

Company vehicle – For the purposes of this guideline, a company vehicle is defined as any vehicle that is owned, rented, or leased by the Company.

Commercial Motor Vehicle (CMV) - A motor vehicle or combination of motor vehicles used in commerce to transport passengers or property if the motor vehicle:

- Has a gross combination weight rating of 26,001 or more pounds inclusive of a towed unit with a gross vehicle weight rating of more than 10,000 pounds;
- Has a gross vehicle weight rating of 26,001 or more pounds;
- Is designed to transport 16 or more passengers, including the driver;
- Is of any size and is used in the transportation of materials found to be hazardous for the purposes of the Hazardous Materials Transportation Act and which require the motor vehicle to be placarded.

CDL License

Employees who are authorized to drive a commercial motor vehicle (CMV) must comply with the following guidelines:

- The driver must have a valid state CDL driver's license in compliance with appropriate state and federal DOT laws.
- The CDL must have been issued for the class of vehicle being driven.
- The CDL must have the proper endorsements for the vehicle being driven and/or cargo being hauled.
- The driver must have a valid medical card.

Any driver operating a company owned/leased vehicle (any truck, pickup, SUV, car, etc.) after work hours must have a valid CDL driver's license issued in compliance with appropriate state and federal DOT laws within 6 months of being assigned the vehicle.

Employees who are assigned a company vehicle (any truck, pickup, SUV, car, or other) and authorized to operate the vehicle after work hours must comply with the following guidelines:

- Any driver operating a company vehicle (any truck, pick-up, SUV, car, or other) after work hours must have a valid CDL driver's license issued in compliance with appropriate state and federal DOT laws.
- Newly hired employees must obtain a CDL within 6 months of being assigned the vehicle.
- Employees are not required to have a CDL license to operate a short-term rental car.

Restriction on Use of Hand-Held Mobile Phones

The following guidelines apply to the operation of any company vehicle (any truck, pickup, SUV, car, CMV or other) at all times.

- Texting while driving a company vehicle is strictly prohibited.
- Drivers are prohibited from using hand-held mobile phones while operating a vehicle. If it becomes necessary to use a mobile phone, the driver must pull off of the road to an acceptable safe area to make or accept phone calls.

General Requirements

- The Operating Unit will obtain an MVR annually, or as needed, to verify a driver's history of safe vehicle operation. Employees determined to have an unacceptable driving record may have their privilege to drive a company vehicle limited or suspended. The Operating Unit has the sole discretion to determine whether and when an employee may utilize a company vehicle and may, among other things, prohibit an employee from operating a Company vehicle altogether. In the event an employee's privilege to operate a Company vehicle has been limited or suspended in some fashion, the Operating Unit may require that any outstanding violations or citations are cleared, or other conditions are satisfied, before Company vehicle driving privileges are restored.

- Company vehicles must be operated at all times in accordance with all applicable federal, state, and local laws.
- All traffic violations or indictments for moving violations involving company vehicles must be reported to the driver's immediate supervisor within 24 hours of the occurrence and to the Operating Unit Safety department within 48 hours.
- All costs (excluding any property damage or bodily injury) resulting from traffic fines, parking fines, bail bonds, legal defense of criminal charges, and so forth against Operating Unit drivers resulting from occurrences while in company vehicles must be assumed by the driver. The Operating Unit drivers must operate company vehicles legally and safely.
- Drivers are expected to operate company vehicles within the legal speed limit of the area in which they drive. However, drivers are also expected to reduce speed accordingly when confronted with unfavorable road or weather conditions.
- The use of radar detectors in company vehicles is strictly forbidden.
- Authorized drivers, operating a vehicle during the course and scope of work, shall follow all safe driving procedures in place by federal, state, and local jurisdictions.
- All occupants of company vehicles must wear seat belts at all times.
- The drinking of alcoholic beverages or the use of illegal drugs while in or using a company vehicle is forbidden during and after work hours.
- Driving a company owned, leased, or rented vehicle while under the influence of intoxicating beverages, narcotics, or other drugs that might affect the driver's alertness and skill is strictly forbidden and will subject the employee to suspension of the use of company vehicles and disciplinary action up to and including termination.
- Company vehicles are to be used for Operating Unit business only. Personal use of company vehicles during nonworking hours or use away from the assigned work site requires the prior consent and approval of the Operating Unit.
- Company vehicles are to be driven only by the employee to whom the vehicle has been assigned or by an employee who has been authorized to operate a particular company vehicle.
- Routine maintenance of all assigned company vehicles is the responsibility of the Operating Unit employee.
- Vehicles should be maintained in accordance with the manufacturers' specifications, or in compliance with the preventative maintenance schedules developed by the Operating Unit.
- Drivers of the company vehicles are responsible for reporting any maintenance problems to their Supervisor immediately.
- Drivers are responsible for performing vehicle inspections prior to operating a vehicle and should never operate an unsafe vehicle.
- Each driver is expected to understand and practice defensive driving.
- Each driver is expected to take all reasonable actions to prevent accidents irrespective of the improper action of others and in spite of any adverse driving conditions that may exist.
- Drivers hauling, towing, or carrying cargo should have the load secured properly.

- Company vehicles are to be operated as models for courteous driving and safety. Each company vehicle and driver represents the company in the eyes of the public and clients, so the vehicle must be operated at all times in a way that will create a positive and favorable impression.
- Company trucks must be driven in strict compliance with federal safety regulations, or in the case where federal government regulations do not apply, company trucks must be operated in compliance with motor vehicle safety regulations of the state in which the trucks are operated.
- Policies and procedures established by the Operating Unit shall be reviewed with all new employees and with all other employees when any changes are made to the requirements as applicable.
- After an employee has reviewed the policies and procedures he/she shall acknowledge their understanding of the requirements by signing an acknowledgement form. This acknowledgment form shall be maintained in the employee’s file.

27

Construction Mechanized Equipment

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

Definitions

Construction vehicle—Vehicles that operate within an off-highway jobsite that is not open to public traffic.

Earthmoving equipment—Scrapers, loaders, crawler or wheel tractors, bulldozers, off-highway trucks, graders, excavators, backhoes, agricultural and industrial tractors, skid steer, and other similar equipment.

Pile driving equipment—diesel or hydraulic hammer and vibratory pile driver.

Lifting and hauling equipment—Forklifts and side booms.

Construction Vehicles

Only a qualified or authorized person shall operate construction equipment. A qualified person is one who, through knowledge, skills, and experience, has demonstrated their ability to operate the equipment.

Equipment left unattended at night, adjacent to a highway in normal use, or adjacent to construction areas where work is in progress, must have appropriate lights or reflectors, or barricades equipped with appropriate lights or reflectors, to identify the location of the equipment.

Employees that work with split or locking rim wheels must be provided with proper training and follow the approved procedures for that type of work. Use the provided safety tire rack, cage, or equivalent protection when inflating, mounting, or dismounting tires installed on split rims or rims equipped with locking rings or similar devices.

Substantially block or crib heavy machinery, equipment, or parts thereof that are suspended or held aloft by slings, hoists, or jacks to prevent equipment from falling or shifting before employees are permitted to work under or between them. Fully lower or block bulldozer and scraper blades, end-loader buckets, dump bodies, and similar equipment when the equipment is being repaired or is not in use. Place all controls in a neutral position, with the motors stopped and brakes set, unless work being performed requires otherwise.

Set the parking brake whenever the equipment is parked, and chock the wheels of any equipment parked on an incline.

The use, care, and charging of all batteries must conform to the requirements in this guideline.

All cab glass must be safety glass, or the equivalent, that introduces no visible distortion affecting the safe operation of any machine covered by these guidelines.

All employees operating equipment outlined within these guidelines must receive training on the proper inspection, care, and use of the equipment.

Equipment must be inspected before entering the project site and only operated by trained and qualified personnel in accordance with the following safety guidelines:

- Never disable, modify, or bypass any safety device.
- Use three (3) points of contact to access or egress all equipment.
- Make sure equipment is not in gear before starting the machine.
- Always operate equipment from the driver's seat.
- The driver is responsible for the safety of all passengers and the stability of materials being hauled or handled by his or her equipment.
- All speed limit and other regulatory signs must be obeyed and pedestrians given the right of way.
- The operator must look to the rear and sound the horn before backing up. All vehicles should be equipped with a backup alarm.
- The driver must shut off the motor before refueling.
- The driver must shut off the motor and set the brakes before leaving the operator cab.
- Personnel may not ride in the bed of a dump truck or other vehicle hauling equipment or material, except with the approval of the responsible supervisor and then, only after the stability of the equipment, material, or personnel has been checked.
- A flagman should direct a vehicle backing up in congested areas.
- Drivers must dismount from the cab and remain clear while trucks are being loaded by power equipment.
- Dozer blades, end loader buckets, forklift forks, or similar equipment parts must be lowered to the ground before the operator leaves the rig.
- Cranes with “live” booms are not permitted on the site.
- Employees are not permitted to ride on the side of construction equipment, in the bucket, or on crane hooks and “headache” balls.
- Use all required PPE when operating this equipment.

- Operators of construction mechanized equipment must have the proper training and/or certification to operate the equipment.
- The operating functions of the equipment controls must be clearly labeled or identified.
- Equipment must have a pre-operational inspection prior to use.
- Defective equipment must be taken out of service and shall not be used until repairs are made.
- Lock all instrument panels, side panels, and doors when parking the machine.

Construction vehicles, as covered by this section, are those vehicles that operate within an off-highway jobsite that is not open to public traffic. Construction vehicles must be used only in accordance with the following guidelines:

- All vehicles must have a service brake system, an emergency brake system, and a parking brake system, which may use common components. These systems must be maintained in operable condition.
- Whenever visibility conditions warrant additional light, all vehicles or vehicle combinations in use must be equipped with at least two headlights and two taillights in operable condition.
- All vehicles or vehicle combinations must have brake lights in operable condition regardless of light conditions.
- All vehicles must be equipped with an adequate audible warning device in an operable condition at the operator's station.
- No employee may use any construction or mechanized equipment having an obstructed view to the rear unless:
  - The vehicle has a reverse signal alarm audible above the surrounding noise level.
  - The vehicle is backed up only when an observer signals that it is safe to do so.
- All vehicles with cabs must be equipped with windshields and powered wipers. Cracked and broken glass must be replaced. Vehicles operating in areas or under conditions that cause fogging or frosting of the windshields must be equipped with operable defogging or defrosting devices.
- All haulage vehicles, whose payload is loaded by means of cranes, power shovels, loaders, or similar equipment, must have a cab shield or canopy adequate to protect the operator from shifting or falling materials.
- Tools and material must be secured to prevent movement when transported in the same compartment with employees.
- Vehicles used to transport employees must have enough firmly secured seats for the number of employees to be carried.
- Seat belts and anchorages meeting all applicable standards must be installed and functioning properly in all motor vehicles.
- The operator must wear seat belts, when provided, at all times.
- Employees may only ride in vehicles designed for transporting passengers where seats and seat belts are provided. Riding in the bed of trucks is prohibited.

- Trucks with dump bodies must be equipped with positive means of permanently attached support that is capable of being locked in position to prevent accidental lowering of the body while maintenance or inspection work is being done.
- Operating levers controlling hoisting or dumping devices on haulage bodies must be equipped with a latch or other device that prevents accidental starting or tripping of the mechanism.
- Trip handles for tailgates of dump trucks must be arranged so that the operator is clear during dumping.
- All rubber-tired motor vehicle equipment must be equipped with fenders.
- Mud flaps may be used in lieu of fenders whenever motor vehicle equipment is not designed for fenders.
- All vehicles in use must be inspected at the beginning and end of each shift.

Pre-Operational Inspection

Check the following items:

- Fluid leaks
- Tires and lug nuts
- Cutting edges and digging bucket teeth
- Structural cracks
- Anything unusual

Before starting the engine, check:

- Engine oil level
- Engine coolant level and condition of all belts
- Warning lights and flashers
- Brakes
- Seat belt
- Cleanliness of the cab
- Verify location of fire extinguisher and check to see if it is operational
- Grease the equipment as needed according to manufacturer's specifications

ATVs

An all-terrain vehicle (ATV), also known as a quad, quad bike, three-wheeler, or four-wheeler, is defined as a vehicle that travels on low-pressure tires, with a seat straddled by the operator with handlebars for steering control. As the name implies, ATVs are designed to handle a wider variety of terrain than other vehicles similar to what is found on many construction right-of-way areas. Most ATVs are designed for use by a single operator, but some newer models are designed for one passenger. The rider sits on and operates these vehicles like a motorcycle, while extra wheels provide more stability at lower speeds.

Control

ATVs are provided as a transportation tool. Serious injuries can result if a driver loses control. To prevent in losing control, the driver should practice and apply the following:

- Do not get in a hurry
- Do not drive too fast for the conditions
- Know the limits of the vehicle
- Always be alert to changing conditions and situations
- Have foresight to anticipate and prepare for the situations ahead
- Use good judgment
- Develop safe operating skills

General Safety Precautions

- Properly secure the ATV in the back of the truck or on the trailer when transporting
- Always use proper ramps for loading and unloading
- Always wear a helmet, safety glasses with face shield or goggles, and gloves when operating an ATV
- Inspect the ATV daily before riding
- Only carry passengers on ATVs designed for passengers
- Keep feet on the footrests during operation
- Slow down when turning
- Avoid locking the brakes
- Secure all tools and equipment hauled on the ATV
- Use ATVs only for their intended purpose
- Stay on construction right-of-way. Do not operate on private property without prior permission.

Earthmoving Equipment

The guidelines in the following sections apply to earthmoving equipment, such as the following:

- Scrapers
- Loaders
- Crawler or wheel tractors
- Bulldozers
- Off-highway trucks
- Graders
- Excavators
- Backhoes
- Agricultural and industrial tractors

- Skid steers

Seat Belts

Observe the following guidelines regarding the use of seat belts:

- Seat belts are provided on all equipment covered by the requirements in this chapter and as all applicable federal, state, and local regulations require.
- The operator must wear seat belts, when provided, at all times.
- Seat belts are not provided for equipment that does not have rollover protective structure (ROPS) or adequate canopy protection.

General Safety Rules

- Only a qualified or authorized person shall operate earthmoving equipment. A qualified person is one who, through knowledge, skills, and experience, has demonstrated their ability to operate the equipment.
- Keep arms, legs, and head inside the cab while operating the equipment.
- Load, unload, and turn on level ground when possible.
- Operate on stable surfaces only.
- Do not travel across slopes. Travel straight up or down, with the heavy end of the equipment pointed uphill.
- Travel and turn with the bucket in the lowest position available.

Access Roadways and Grades

When using equipment on access roadways or grades, observe the following guidelines:

- Do not move or cause to be moved construction equipment or vehicles on any access roadway or grade unless the access roadway or grade is constructed and maintained to safely accommodate the movement of the equipment and vehicles involved.
- Use only emergency access ramps and berms that are constructed to restrain and control runaway vehicles.
- Ensure that all earthmoving equipment mentioned in these requirements have a service braking system capable of stopping and holding the fully loaded equipment.
- Equip pneumatic-tired, earthmoving haulage equipment (trucks, scrapers, tractors, and trailing units) whose maximum speed exceeds 15 mph with fenders on all wheels.

Audible Alarms

All bidirectional machines, such as rollers, compactors, front-end loaders, bulldozers, and similar equipment, must be equipped with a horn, distinguishable from the surrounding noise level, that must operated, as needed, when the machine is moving in either direction. The horn must be maintained in an operative condition.

Earthmoving or compacting equipment that has an obstructed view to the rear may not be permitted to be used in reverse gear unless the equipment has an operating reverse signal alarm distinguishable from the surrounding noise level or an employee signals that it is safe to do so.

Scissor points on all front-end loaders, which constitute a hazard to the operator during normal operation, must be guarded.

Fueling of Vehicles and Equipment

- Dispensing of diesel and gasoline should be done through a pump and hose. If this is not possible, approved safety cans with flexible spouts must be used.
- All skid tanks containing flammable liquids shall be properly grounded.
- Storage tanks, approved safety cans, or both shall be properly labeled identifying their contents.
- Dispensing tanks for gasoline/diesel shall not be equipped with automatic nozzles. The nozzle should need to be hand activated when filling.
- The area around gasoline/diesel dispensing tanks should have the following signs posted:
  - No smoking or open flames
  - Contents in tank "Gasoline" or "Diesel"
  - Turn off engine while re-fueling
- A minimum of a 20-lb. dry chemical fire extinguisher shall be hung or placed no closer than 25 feet (7.62 meters) and no further than 75 feet (22.86 meters) of the dispensing area.
- Smoking is prohibited during refueling operations.
- Avoid overfilling any fuel tank. In the event of a spill, take appropriate action to clean up the spill. Allow time for vapors to disperse before starting the engine.
- Make sure the hose nozzle makes contact with the tank while filling. This contact will prevent a static spark.
- Metal safety cans are not to be filled while being stored in the back of a truck. Take the container out of the truck and place the container on the ground. Refill and then place the cans in the truck.

Site-Clearing Operations

The following guidelines must be observed during site-clearing operations:

- Employees engaged in site clearing must be protected from hazards of irritants and toxic plants and suitably instructed in first-aid treatment.
- All equipment used in site-clearing operations must be equipped with rollover guards meeting the requirements of this subpart. In addition, rider-operated equipment must be equipped with an overhead and rear canopy guard meeting the following requirements:
  - The overhead covering on this canopy structure must be of at least 1/8-inch (0.32-cm) steel plate, 1/4-inch (0.64-cm) woven wire mesh with openings no greater than 1 inch (2.54 cm), or the equivalent.
  - The opening in the rear of the canopy structure must be covered with not less than 1/4-inch (0.64-cm) woven wire mesh with openings no greater than 1 inch (2.54 cm).

Pile Driving Operations

Observe the following guidelines during pile driving operations:

- Ensure that overhead protection does not obscure the vision of the operator and meets the requirements of all applicable regulations.
- Provide stop blocks for the leads to prevent the hammer from being raised against the head block.
- Provide a blocking device, capable of safely supporting the weight of the hammer, for placement in the leads under the hammer at all times while employees are working under the hammer.
- Provide guards across the top of the head block to prevent the cable from jumping out of the sheaves.
- Stabilize the leads when they must be inclined in the driving of batter piles.
- Provide fixed leads with ladder and adequate rings or similar attachment points so that the loft worker can engage his or her safety belt lanyard to the leads. If the leads are provided with loft platforms, protect such platforms with standard guardrails.
- Securely attach steam hose leading to a steam hammer or jet pipe to the hammer with an adequate length of at least 1/4-inch (0.64-cm) diameter chain or cable to prevent whipping in the event the joint at the hammer is broken. Provide air hammer hoses with the same protection as required for steam lines.
- Provide safety chains or the equivalent for each hose connection to prevent the line from thrashing around in case the coupling becomes disconnected.
- Ensure that steam line controls consist of two shutoff valves, one of which is a quick-acting lever type within easy reach of the hammer operator.
- Provide guys, outriggers, thrust outs, or counterbalances as necessary to maintain stability of pile driver rigs.
- Ensure that barges or floats supporting pile-driving operations meet all applicable requirements. Employees must wear personal flotation devices (PFD) when working near water.

Pile Driving Equipment

Observe the following guidelines when operating pile-driving equipment:

- Instruct engineers and winchmen to accept signals only from the designated signalmen.
- Keep all employees clear when piling is being hoisted into the leads.
- When piles are being driven in an excavated pit, ensure that the walls of the pit are sloped to the angle of repose or sheet-piled and braced.
- When steel-tube piles are being “blown out,” keep employees well beyond the range of falling materials.
- When it is necessary to cut off the tops of driven piles, suspend pile driving operations, except where the cutting operations are located at least twice the length of the longest pile from the driver.

- When driving jacked piles, provide all access with ladders and bulkheaded curbs to prevent material from falling into the pit.

Lifting and Hauling Equipment

Industrial trucks and forklifts must meet requirements mentioned in other sections of this chapter, in addition to complying with the following:

- Lift trucks, powered industrial trucks, and forklifts must have the rated capacity clearly posted on the vehicle so as to be clearly visible to the operator. When auxiliary, removable counterweights are provided by the manufacturer, corresponding alternate rated capacities also must be clearly shown on the vehicle. Do not exceed these ratings.
- No modifications or additions that affect the capacity or safe operation of the equipment may be made without the manufacturer's written approval. If such modifications or changes are made, the capacity, operation, and maintenance instruction plates, tags, or decals must be changed accordingly. In no case may the original safety factor of the equipment be reduced.
- If a load is lifted by two or more trucks working in unison, the proportion of the total load carried by any one truck must not exceed its capacity.
- Steering or spinner knobs must not be attached to the steering wheel unless the steering mechanism is of a type that prevents road reactions from causing the steering wheel to spin. The steering knob must be mounted within the periphery of the wheel.
- All high lift rider industrial trucks must be equipped with overhead guards.
- All industrial trucks in use must meet all applicable standard requirements for design, construction, stability, inspection, testing, maintenance, and operation.
- Unauthorized personnel must not be permitted to ride on powered industrial trucks.
- Whenever a truck is equipped with only vertical or vertical and horizontal controls that can be elevated with the lifting carriage or forks for lifting personnel, the following additional precautions must be taken for the protection of personnel being elevated:
    - A certified safety platform must be firmly secured to the lifting carriage and forks.
    - Means must be provided whereby personnel on the platform can shut off power to the truck.
    - Such protection from falling objects must be provided as required by the operating conditions.

Forklifts

Probably no other tool exists that is more important to materials handling than the powered industrial truck, the forklift. Like many companies, the Company relies on these versatile vehicles to load, unload, and move stock and other materials.

The guidelines in this section must be followed whenever employees work with powered industrial trucks. These guidelines:

- Provide a safe working environment.
- Govern operator use of powered industrial trucks.
- Ensure proper care and maintenance of powered industrial trucks.

The procedures in this document are designed to ensure that powered industrial truck safety training, operation, and maintenance practices are communicated to and understood by the affected employees. These requirements are also designed to ensure that procedures are in place to safeguard the health and safety of all employees.

The Company intends to comply with all requirements for construction activities. These regulations have requirements for powered industrial truck operations, including battery care and charging. The Company also complies with applicable requirements for design, construction, stability, inspection, testing, maintenance, and operation found in ASME/ANSI B56.1, *Safety Standard for Low Lift and High Lift Trucks*. However, the powered industrial trucks operated in Company storage and maintenance yards and warehouses comply with these requirements.

Training

Before the Company begins training a new employee, the supervisor determines if the potential powered industrial truck operator is capable of performing the duties necessary to be a competent and safe driver. This assessment is based on the physical and mental abilities of the operator to perform job functions that are essential to the operation of the vehicle.

Performance Evaluation

Each certified powered industrial truck operator is evaluated once each year to verify that the operator has retained and uses the knowledge and skills needed to drive safely. Complete this evaluation by reviewing the operator’s performance record or skills proficiency noted during work operations or by other methods determined necessary by the Safety Department. If the evaluation shows that the operator is lacking the appropriate skills and knowledge, the operator has an accident or near-miss, or the operator is observed performing an unsafe operating procedure, the operator must be retrained.

Preoperational Inspection Procedures

The Company requires operators to perform preoperational equipment checks on powered industrial trucks to ensure the safe operating condition of the vehicle before each shift in which those trucks will be used. The preoperational check is performed by completing a Department of Transportation (DOT) daily truck inspection checklist. Checklist forms are provided in each charging and parking area within user departments.

Do not leave blank spaces on the form. If an item does not apply, mark the space with “N/A.” The Company also requires that operators fill out the comment section thoroughly and accurately if any operational or visual defects are present. This allows the Maintenance Department to pinpoint and repair the problem before the truck becomes unsafe to operate.

Preoperational inspection procedures used by operators include:

- Inspection of fork pins and stops to ensure that they are in place.
- Inspection of all cowling and body parts.
- Inspection of wheels and tires.
- Inspection for any broken or loosened parts.
- Verification of adequate fuel level, crankcase oil level, radiator water level (if applicable), engine air cleaner, fan belt, hydraulic fluid level, battery water level, and other points required by the particular model.

- Record of the hour shown on the hour meter, which is important for maintenance scheduling.
- Verification that the hour meter, headlights, taillights, warning lights, and other lights operate properly.
- Verification that the oil pressure gauge, water temperature gauge, and ammeter operate properly. These instruments vary by model and fuel used.
- Inspection of the clutch, hydraulics, and other controls.
- Inspection of the brakes. Mechanical failure of brakes is the single most common cause of forklift accidents.
- Fire extinguisher.

Periodic Inspection Procedures

Periodic inspections are held in conjunction with the maintenance or service schedule of the particular powered industrial truck. Maintenance schedules are expressed in days and operating or running hours. The maintenance supervisor performs periodic and monthly inspections and maintenance. Most manufacturer operator instruction manuals contain the recommended maintenance schedule. Authorized workshops or service technicians complete inspections and maintenance or repair beyond the recommended service schedules.

A supply of inspection checklist forms is provided in each charging and parking area within user departments. The equipment controller retains all truck periodic inspection checklist forms for each vehicle.

Operating Procedures

Powered industrial trucks can create certain hazards that only safe operation can prevent, which is the reason the Company has created the operating procedures in the following sections.

Driving

Driving a powered industrial truck is fundamentally different than driving a car or other trucks. In fact, powered industrial trucks:

- Are usually steered by the rear wheels.
- Steer more easily when loaded than when empty.
- Are driven in reverse as often as they are driven forward.
- Are often steered with one hand.
- Have a center of gravity toward the rear, shifting to the front as forks are raised.

Unlike cars, some powered industrial trucks have a greater chance of tipping over when suddenly turned. Powered industrial trucks are designed with a very short rear wheel swing. This means that, at high speeds, sudden turns can tip them and result in serious injury and damage. Speed can cause the center of gravity of trucks to shift dramatically, and speeding over rough surfaces can cause tipping.

Although structurally different than cars, powered industrial trucks, like cars, can collide with property and people. Therefore operators are required to observe the following driving guidelines:

- Watch where you are going.
- Keep to the right.
- Obey speed limits.
- Stay at least three vehicle lengths from other vehicles.
- Slow down at all intersections.
- Always give the pedestrian the right of way.
- Do not engage is horseplay.
- Do not allow riders on the forks, the seat, or the back.
- Always keep arms and legs inside the vehicle.
- Face the direction of travel.
- Keep the forks as low as possible to the surface when traveling.
- When you leave the forklift but remain within 25 ft (7.62 m) of the truck, completely lower the load-engaging means unless it supports an elevated platform, put the controls in neutral, and set the brakes to prevent movement.
- When you leave a vehicle unattended, shut off the power, set the brakes, bring the mast to the vertical position, completely lower the load-engaging means, put the controls in neutral and remove the key.
- When you leave the vehicle on an incline, chock the wheels.
- Do not operate a forklift with a leak in the fuel system.

Load Lifting and Carrying

Powered industrial trucks can lift only a limited amount. Each truck has a specific load capacity, which is indicated on the rating plate. Powered industrial trucks also have three-point suspension, which forms an imaginary triangle from the left front wheel to the right front wheel to the point between the two back wheels. The center of gravity for a powered industrial truck must lie somewhere within this triangle, or the truck will tip over. The load and its position on the forks, as well as traveling speed and slopes, all affect the center of gravity. Loads need special care so that they do not tip over or fall. To prevent tipping and load falling hazards:

- Check the maximum load capacity on the forklift nameplate. Do not load a truck in excess of the rated capacity of the truck.
- Do not move a loaded forklift until the load is safe and secure.
- Carry the load low enough to avoid hitting overhead obstructions such as doorways, pipes, electrical conduits, or sprinklers.
- Be aware of the position of the forks at all times.
- Be aware of overhead clearances.
- Always chock the wheels of a truck being loaded or unloaded.

- Stop completely before raising or lowering a load.
- Never travel with a load raised high.

Fuel Handling and Storage

Some powered industrial trucks operate with highly flammable and combustible fuels.

Liquid fuels, such as gasoline and diesel, are stored and handled in accordance with National Fire Prevention Association (NFPA) Flammable and Combustible Liquids Code.

All employees who handle or use flammable liquids are instructed by the Company Safety Director in safe handling and use of the liquids and are made aware of the specific OSHA requirements for how to use the liquids.

Battery Charging and Changing

Batteries present a hazard because they contain corrosive, acidic, or alkali chemical solutions. During recharging, a worker can be exposed not only to the solution, but also to hydrogen gas, which is produced during the recharging process. Because of the hazards involved in battery charging and changing, only personnel who have been trained in the appropriate procedures, understand the dangers involved, and know the appropriate precautions to take are allowed to perform this work.

Good housekeeping procedures are essential. Employees must keep the work area clean and free of any combustible materials and maintain a moderate temperature range suitable for battery maintenance. The following safety features should be available when forklift batteries are changed or charged:

- Eyewash station for workers
- A hose and floor drain for flushing and neutralizing spilled electrolyte
- A charging apparatus that is protected to prevent damage from vehicles
- Because the Company uses on-board chargers, a designated charging area that meets the electrical requirements for fire protection

Smoking is prohibited in charging areas. Battery charging generates hydrogen gas, which can present an explosion hazard. This precaution also applies to open flames, sparks, or electric arcs. An effective means of fire protection must be provided in the area.

Carbon Monoxide Awareness

Powered industrial trucks with internal combustion engines produce carbon monoxide (CO)—an odorless, colorless, and deadly gas produced by the incomplete burning of any material that contains carbon. These materials include gasoline, natural gas, propane, coal, and wood. The most common source of CO is the internal combustion engine. Trucks, cars, forklifts, floor polishers, pressure washers, or any other machines powered by fossil fuels generate CO.

If inhaled, CO restricts the ability of blood to carry needed oxygen to body tissues. Overexposure to CO, combined with less oxygen, results in carbon monoxide poisoning. Mild poisoning can result in headaches, tightness in the chest, dizziness, drowsiness, inattention, fatigue, flushed face, or nausea. Continued exposure can induce lack of coordination, confusion, weakness, or loss of consciousness. A heart condition, smoking, taking drugs or alcohol, and pregnancy can aggravate CO poisoning. Physical activity can also make a situation worse because the body needs more oxygen to exert itself. Severe CO poisoning can kill a person within minutes, sometimes without warning symptoms. When more CO is in the air and the exposure is longer, the danger is greater.

Personal Protective Equipment

Powered industrial truck operators wear hardhats and safety glasses.

All operators required to wear this safety equipment are trained to understand:

- When PPE is necessary
- What PPE is required
- How to properly put on, take off, adjust, and wear PPE
- The limitations of PPE
- The proper care, maintenance, useful life, and disposal of PPE

Pedestrians

Because powered industrial trucks are typically used near pedestrians, Company management requires pedestrians and powered industrial truck operators to watch out for each other. All powered industrial truck operators must remember that pedestrians always have the right of way.

Side Booms

Side booms are a common tool used in pipeline construction. All employees must understand their use and limitations, and operators must be properly trained to:

- Provide a safe working environment.
- Govern operator use of side booms.
- Ensure proper care and maintenance of side booms.

These procedures are designed to ensure that side boom safety training, operation, and maintenance practices are communicated to and understood by the affected employees. These requirements are also designed to ensure that procedures are in place to protect the health and safety of all employees.

Responsibility

Side boom operations are administered under the direction of a competent person, someone capable of identifying existing and predictable hazards in the surroundings or working conditions and who has authorization to take prompt corrective measures to eliminate the hazards. The following employees are considered competent persons for the Company:

- Safety personnel
- Project managers
- Project superintendents
- Equipment superintendent
- Mechanics

Operating Guidelines

The Company and its operators must comply with all requirements for construction activities and the manufacturer specifications and limitations that apply to the operation of any and all side booms. Where manufacturer specifications are not available, the limitations assigned to the equipment are based on the determinations of a qualified engineer who is competent in this field, and such determinations are appropriately documented and recorded. Attachments used with side booms must not exceed the capacity, rating, or scope recommended by the manufacturer.

Rated load capacities and recommended operating speeds, special hazard warnings, or instructions must be posted conspicuously on equipment. Instructions or warnings must be visible to the operator while at the control station.

Hand signals to side boom operators must be those prescribed by the applicable ANSI standard for the type of side boom in use. An illustration of the signals must be posted at the jobsite. Refer to the Side Boom Signals illustration located at the end of this chapter. All employees must be kept clear of suspended loads and loads about to be lifted.

See Chapter 15, “Cranes,” for information regarding cranes.

Side Boom Inspections

The Company must designate a competent person who will inspect all machinery and equipment before and during each use to ensure that it is in safe operating condition. Any deficiencies must be repaired, or defective parts replaced, before continued use.

A thorough annual inspection of hoisting machinery must be made by a competent person. The Company must maintain a record of the dates and results of inspections for each hoisting machine and piece of equipment.

Inspect winch cable and drums.

Wire rope safety factors must be in accordance with ANSI standards. Wire rope must be taken out of service if:

- Six or more randomly distributed broken wires are found in one lay of a running rope.
- Three or more broken wires are found in one strand in one lay.
- One-third of the original diameter of the individual outside wires has been worn away.
- There is kinking, crushing, bird caging, or any other damage resulting in distortion of the rope structure.
- There has been a reduction from the nominal diameter greater than the following:
  - 1/64 inch for diameters up to and including 5/16 inch
  - 1/32 inch for diameters of 3/8 to 1/2 inch
  - 3/64 inch for diameters of 9/16 to 3/4 inch
  - 1/16 inch for diameters of 7/8 to 1-1/8 inches
  - 3/32 inch for diameters of 1-1/4 to 1-1/2 inches
- There are more than two broken wires in one lay in sections beyond end connections or more than one broken wire at an end connection in standing ropes.

Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other moving parts or equipment must be guarded if such parts are exposed to contact by employees or otherwise create a hazard. Guarding must meet ANSI requirements.

All exhaust pipes must be guarded or insulated in areas where contact by employees is possible in the performance of normal duties.

Make sure all warning labels and signs are legible.

Check backup alarms.

Check all fluid levels.

Verify the fire extinguisher location and check to see if it is operational.

Side Boom Operations

Operators

- Only a qualified or authorized person shall operate a side boom. A qualified person is one who, through knowledge, skills, and experience, has demonstrated their ability to operate the equipment.
- Always use the seat belt when operating the equipment.
- Check that controls are in their proper settings before starting the machine.
- Verify the capacity of the side boom to safely lift the load.
- Use a spotter when working around power lines, underground utilities, and other tight working conditions.
- No personnel shall be under the boom while it is being raised or lowered.
- Read, understand, and follow the manufacturer's specifications within the Operating Manual.
- Keep equipment as far away as practical from the side of the excavation.
- Use mats when working on soft ground or in wet lands.
- Lower the load to the ground before the operator leaves the seat of the equipment.
- Remove unnecessary people from the work area.
- Hand signals should be given by only one person at a time and must be understood by all personnel on site.
- Before moving the side boom, the load line should be secured.
- No riders are permitted on a side boom.
- Know the location of the emergency quick release.
- When refueling, bond the supply tank to prevent static discharge and possible fire.
- Shut off engine, set parking brake, and remove the key when leaving the machine.
- Use three (3) points of contact to access or egress the machine.

Workers

- Stay clear of pinch points created by operating equipment.
- Never get under a load or between the load and the machine.
- Be aware of suspended loads, counter weights, and pinch points. Maintain eye contact with the operator.
- Be aware of and listen for backup alarms.
- Know the location of the nearest fire extinguisher.

Side Boom Operations Near Power Lines

The Company complies with all applicable crane regulations. Except where electrical distribution and transmission lines have been de-energized and visibly grounded at the point of work or where insulating barriers that not part of or attached to the equipment or machinery have been erected to prevent physical contact with the lines, equipment or machine operation near power lines must meet the following specifications:

Inform workers of the hazards created by overhead lines and appropriate power line clearance.

All overhead lines are to be considered energized unless the electrical utility owning the line indicates that the line is not energized and that the line is visibly grounded and has been appropriately marked.

- De-energize all electrical lines and ground them, or erect insulating barriers to prevent physical contact with the lines.
- When operating a side boom in an elevated position near overhead lines, maintain the following clearances between any part of the equipment and the power lines:
    - For lines rated up to 350 kV, minimum clearance between the lines and any part of the crane or load shall be 20 ft (3.05 m).
    - For lines rated over 350 kV, minimum clearance between the lines and any part of the crane or load shall be 50 ft (3.05 m).
- In transit with no load and boom lowered, maintain the following clearances between any part of the equipment and the power lines:
    - Clearance must be a minimum of 6 ft (1.22 m) for voltages less than 50 kV
    - Clearance of 10 ft (3.05 m) for voltages from 50 kV to 345 kV
    - Clearance of 16 ft (4.88 m) for voltages from 345kV to 750 kV
    - Clearance of 20 ft (6.10 m) for voltages from 750kV to 1000kV

- Designate a person to be a dedicated spotter to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to visually maintain the desired clearance.
    - The operator and signal person must be familiar with all hand signals for the side boom being operated.
    - A chart of the appropriate hand signals must be available at the crane site.
- Cage-type boom guards, insulating links, or proximity warning devices used on side booms must not alter the requirements of any other regulation in this section, even if the use of such a device is required by law or regulation.
- Before work begins near transmission towers where an electrical charge can be induced in the equipment or materials being handled, de-energize the line or conduct tests to determine whether the electrical charge is induced on the side boom. Take the following precautions to dissipate induced voltages when necessary:
    - Provide equipment with an electrical ground attached directly to the upper rotating structure supporting the boom.
    - Attach ground jumper cables to materials being handled by boom equipment when electrical charge is induced while working near energized transmission lines and equipment. Attach the ground cable to the load with an approved hot line tool.
- Use nonconductive taglines to stabilize the load.
- Use insulating boots and gloves.

Combustible and flammable materials must be removed from the immediate area before operations begin.

Do not make any modifications or additions that affect the capacity or safe operation of the equipment without the written approval of the manufacturer. If such modifications or changes are made, change the capacity, operation, and maintenance instruction plates, tags, or decals accordingly. The original safety factor of the equipment must not be reduced.

Side boom cranes mounted on wheel or crawler tractors must meet the requirements of SAE J743a-1964.

Training

Training can be provided by Company trainers or through third-party vendors. The Company may utilize a third-party vendor to test the competency of operators and to certify crane operators.

Each type of side boom has a different “feel” to it, which makes operating each type slightly different from operating the others. The work areas where these side booms are being used also present particular hazards. For these reasons, it is impractical to develop a single generic training program that fits all cranes and side booms; therefore, training describes the operational hazards of cranes, which include:

- Hazards associated with the particular make and model of the crane.

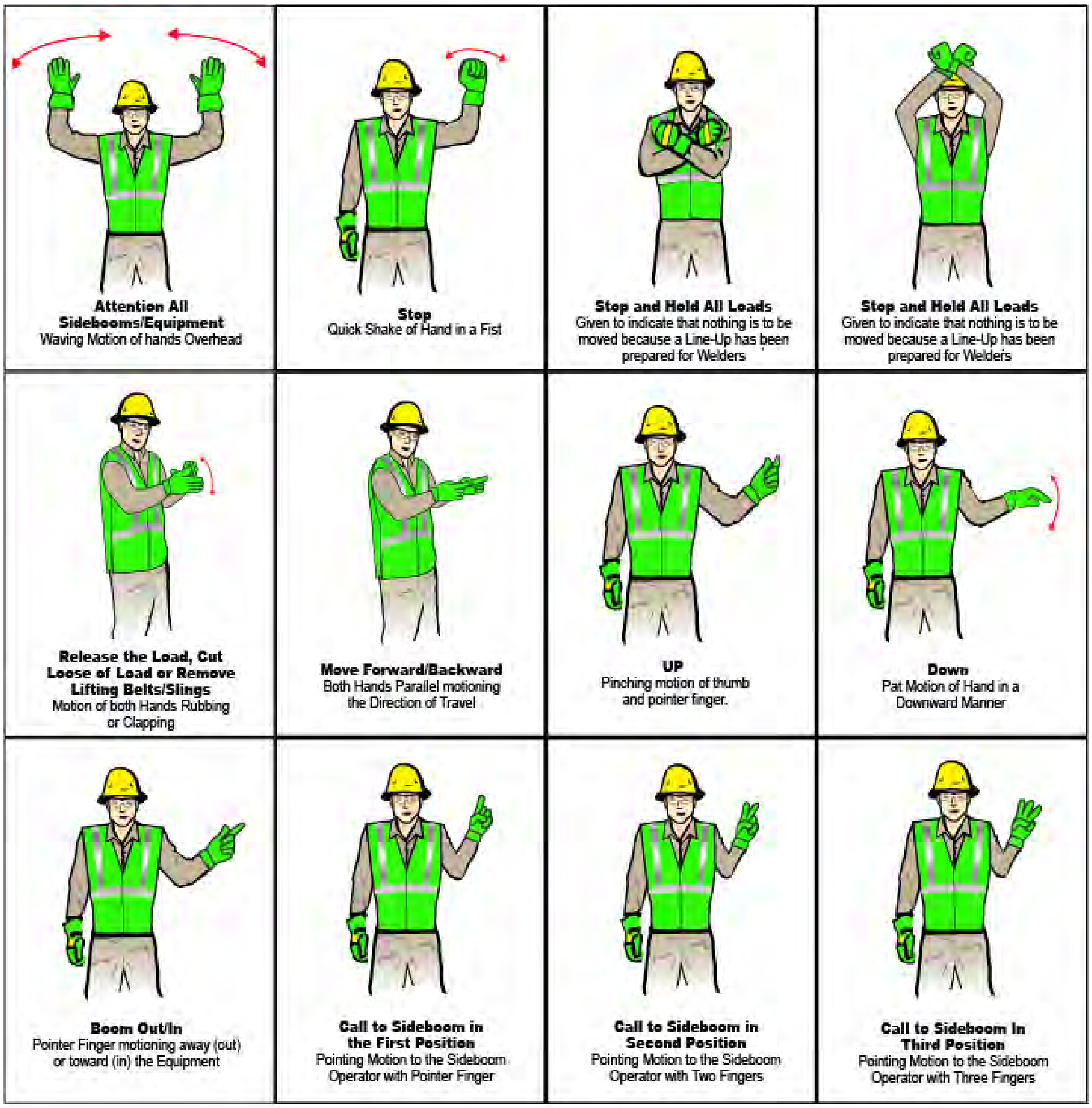
- Hazards of the workplace.
- General hazards that apply to the operation of all or most cranes.

Each operator receives training in elements of the Company training program for various types of cranes. If that employee is authorized to operate a specific type of crane and if the Company has written documentation of the training, the employee does not need to be retrained regarding those elements.

Performance Evaluation

Each certified side boom operator is evaluated to verify competence in operating equipment safely. If the evaluation shows that the operator lacks the appropriate skills and knowledge, the operator is retrained by Company instructors. When an operator has an accident or near-miss or is observed using unsafe operating procedures, the Company may provide retraining.

Sample 27-1. Side Boom Signals



28

Work Zone Safety

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

General Requirements

Flagger Safety

When signaling traffic in a work zone using flags, observe the following guidelines:

- Ensure that all flag persons have completed the Flag Person Certification Course and understand the requirements of this section before flagging traffic.
- Ensure that required advance warning signs precede flagger stations.
- Provide flag persons with clean drinking water at their flagging station (water cooler) when the flag person is to be at the flagger station for a period exceeding 30 minutes.
- Ensure that signaling directions by flag persons conform to the directions described in Chapter 6E, "Flagger Control," of the *Manual on Uniform Traffic Control Devices (MUTCD).*
- Ensure that flags are used to direct traffic only during an emergency.
- Ensure that flag persons use a legible, 24-inch (45.72-cm) STOP/SLOW paddle mounted on a 7-ft (2.13-m) PVC pole for hand signaling. Red lights may be used in periods of darkness.
- Ensure that the flagger's station is illuminated to the point that the flag person is visible to oncoming traffic when the flagger is working in darkness.
- Provide flag persons with a minimum of Class 2 reflective vest and hardhat while flagging and ensure that this safety equipment is used. Check state and local requirements for vest color, hardhat color, and lighting requirements before the flagging operations begin. Flaggers must wear a Class 3 reflective vest for night flagging operations.

- Ensure that flagger stations are set up far enough ahead of the workspace so that approaching traffic has sufficient distance to stop before entering the work zone.
- Position flag persons on the shoulder of the road, adjacent to the traffic being controlled or in a barricaded area.
- Allow flag persons to stand in the lane being used by moving traffic only after traffic has stopped. When traffic has stopped, the flag person may stand in the traffic lane to be visible to drivers.
- Ensure that flag persons stand alone to allow optimum visibility to on coming traffic. Do not allow other employees or persons to stand or congregate at the flagging location.
- Instruct flaggers to stand in an open area, not under trees, in curves, over the crest of the hill or directly behind parked vehicles to enhance their visibility to oncoming motorists.
- Ensure that flag persons do not leave their flagging stations unless relieved by another trained flag person or in the event of an emergency.
- Provide flag persons with a horn, whistle, or other sounding device to warn workers of approaching dangers, such as out-of-control vehicles.

Traffic Control Plans

All projects must have a Traffic Control Plan (TCP) as outlined in Part 6C, “Temporary Traffic Control Elements,” of the *MUTCD* to address the specific traffic hazards associated with each project. Each crew should develop a TCP during the tailgate safety meeting. The crew must decide what devices will be used, where they will be placed, and so on. This plan is documented on the Job Task Safety Analysis form being used. More elaborate plans might need to be developed and documented where the scope of the work has a greater impact on the public, such as along major traffic routes or at interstate highway crossings where helicopters fly across structures.

The TCP encompasses the following:

- The state and local requirements for traffic control in that state
- The type of training required, if any
- Who will be trained
- Supervisor responsible for implementing and managing the TCP
- The recognized traffic control hazards or needs
- How the hazards will be abated or controlled
- The development of the TCP, which will comply with the following guidelines:
  - Traffic control standards must be in accordance with the more stringent of either federal or state regulations.

    The *MUTCD* is the federal regulation governing traffic control in the United States. The *MUTC*D is the minimum guideline that must be followed when controlling traffic. The supervisor must check to see if the state where the work is being done has a stricter traffic control standard. If so, the state standard applies to traffic control performed in that state.
  - Before any project begins, the supervisor or crew leader must discuss and document any recognized traffic control needs or hazards. All traffic controls and hazard controls or abatements must be documented daily.

- Signs required by TCP guidelines must be visible at all times when work is being performed and must be removed or covered promptly when the hazards no longer exist. All traffic warning signs used for night work activities must be made of reflective material.
- Advance warning signs must be a minimum of 48 inches (1.22 m) on each side.
- Post legible traffic signs at all points of hazard in construction areas.
- When company vehicles are parked on the shoulder of a highway, post at least one Shoulder Work sign.
- When paved shoulders a width of 8 ft (2.44 m) or more are closed on freeways, post a Shoulder Closed sign to warn traffic that a disabled vehicle might not be able to move off of the roadway.
- All traffic control signs or devices used for protection of construction workers must conform to the *MUTCD*.
- Post advance warning signs in all directions of travel when vehicles or equipment are parked within 15 ft (4.57 m) of the roadway.
- Turn on vehicle flashers or beacons when vehicles are parked within 15 ft (4.57 m) of the roadway.
- Advance warning signs must be upright and legible from at least 200 ft (60.96 m).
- Where space permits, space advanced warning signs according to Table 28-1.

Table 28-1. Suggested Advance Warning Sign Spacing
(Table 6C-1 of the MUTCD)

Road Type	Distance Between Signs (feet)		
	A	B (if needed)	C (if needed)
Urban (Low speed)	200	200	200
Urban (High Speed)	350	350	350
Rural	500	500	500
Expressway, freeway	1,000	1,600	2,600

- Right-of-way entrances to puller and tensioner sites or other right-of-way locations that are used often during the day and that lead from a frequently used roadway must be marked with one advanced warning sign posted in each direction of travel.
- When blasting is done within 1,000 ft (304.8 m) of a roadway, adhere to the guidelines set forth in the Part 6F, “Temporary Traffic Control Zone Devices,” and Part 6H, “Typical Application,” of the *MUTCD*
- Place at least three 36-inch (0.91 m) road cones between the roadway and vehicles or equipment set up or parked with 15 ft (4.57 m) of the roadway (three cones per vehicle).
- Position cones to provide adequate room for employees to walk between the cones and the vehicle. Where this is impractical, employees must avoid the area.
- Employees working in the roadway must wear a minimum of Class 2 reflective vests.

- Employees working on the right-of-way (within 15 ft (4.57 m) of the roadway) must wear a minimum of Class 2 reflective vests.

Employees may wear other apparel (such as shirts, coveralls, jackets, rain suits) in lieu of reflective vests as long as that other apparel meets the requirements of Class 2 or Class 3 (whichever is required) and that apparel is the outermost garment being worn by the employee.

- Employees walking on the roadway and/or within 15 ft (4.57 m) of the roadway must wear a minimum of Class 2 reflective vests.
- Class 3 reflective vests are required when working at night. Class 3 reflective vests may also be required on certain projects by either state law or state DOT regulations during normal work hours.
- All roadways that are crossed during wire stringing operations must have at least one advanced warning sign posted for each direction of travel.
- Set up lane closures according to guidelines given in Part 6 the *MUTCD*. A “Be Prepared to Stop” sign may be substituted or used in conjunction with sign “B” (see Table 28-1) depending on state requirements.
- Set up temporary road closures according to Figure 6H-13 in Part 6H, “Typical Applications” of the *MUTCD*.
- When a temporary road closure is set up on a divided roadway, place advanced warning signs on both the median side and the right side of the roadway. Warning signs are those shown in Part 6 of the *MUTCD*.
- Cones used to channel traffic must be a minimum of 36 inches (0.91 m) in height.
- Cones used to channel traffic, during night work activities, must have reflective tape on the cones in accordance with *MUTCD* requirements.

When setting up cones or other devices to channel traffic, use the channel traffic taper formulas provided in Table 28-2.

Table 28-2. Channel Traffic Taper Formulas

Posted Speed	Formula
40 mph or less	$L = WS^2/60$
45 mph or greater	$L = W \times S$
Where L is the taper in feet, W is the width of offset (lane width) in feet, and S is the posted speed (or anticipated operating speed)	

When signs, signals, and barricades do not provide the necessary protection on or adjacent to a highway or street, flag persons or other appropriate traffic controls are provided.

29

Hazard Recognition

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

Job Hazard Analysis

One of the most important and effective processes in accident prevention is the Job Hazard Analysis (JHA). The following is a guide to assist personnel in developing a JHA for each type of operation. Refer to the JHA form located at the end of this chapter.

Step 1—Development

The JHA process ideally involves personnel at various levels throughout the organization. Each JHA should, to the extent possible, be developed through the cooperation and participation of the affected users.

To develop a JHA:

1. Break down each type of operation or major phase of work into a series of general steps. Briefly, describe each step or activity in the order it will be performed.
2. After each general step of the operation has been identified, identify the hazards associated with each step to the extent practicable. Ask the following questions about each step to help identify the potential hazards:
   - ❑ Can anyone come in contact with an energy source (electricity, noise, or radiant energy) or hazardous materials (chemicals or dust)?
   - ❑ Can anyone be struck by a moving, falling, or flying object?
   - ❑ Can anyone strike against a stationary or moving object?
   - ❑ Can anyone be caught in, under, or between anything?

- ❑ Can anyone slip, trip, or fall?
- ❑ Will there be any lifting, pushing, or pulling of heavy objects or materials?
- ❑ Will anyone have limited visibility caused by dust, smoke, or low light conditions?
- ❑ Will there be any fire hazards?
- ❑ Will there be any environmental hazards (rain, lightning, or darkness)?

3. Identify appropriate controls to eliminate, mitigate, control, or reduce the accident-producing potential of the hazards. If the hazards cannot be eliminated from the job steps, list the protective measures to be implemented and/or provide other forms of protection (PPE, training, and so on) to reduce the hazard to employees.

Step 2—Implementation

Before starting a new operation and before the next step of an on-going operation, review the JHA in tailgate safety training attended by all the employees who will be potentially exposed to the hazards.

Instruct new or transferring employees using the JHA developed for the operations to which those employees will be assigned.

Step 3—Review

Periodically review each JHA to evaluate the effectiveness of the controls in eliminating or reducing hazards identified in each operation.

Reevaluate each step and amend the JHA to incorporate the latest and most effective methods of performing the work.

Job Task Safety Analysis

General

The Job Task Safety Analysis (JTSA) is an additional tool used in the overall job hazard analysis process. The JTSA is a daily practice that recognizes the hazards associated with the tasks performed that day, identifies the corrective measures to be implemented, and communicates this information to employees. One of the greatest opportunities in accident prevention is recognizing the physical hazards and potentially dangerous work practices associated with each job. Often the hazards associated with the job being performed are not considered until after an accident or serious injury has occurred.

One way to prevent workplace injuries is to establish proper job procedures and train all employees in safe and more efficient work methods. A Job Task Safety Analysis (JTSA) is one way of establishing proper job procedures. The JTSA is a documented procedure used to review job methods and to uncover hazards that might have been overlooked. Performing a JTSA can reduce accidents by carefully studying and recording the steps of each task, identifying existing or potential job hazards (both safety and health), and determining the best way to perform the job to reduce or eliminate these hazards. Refer to the JTSA forms located at the end of this chapter.

JTSA forms can also document workplace changes. Some solutions to potential hazards might involve physical changes that eliminate or control the hazard or modified job procedures that help eliminate or minimize the hazard. In addition, improved job methods can reduce costs resulting from employee absences and worker injuries and can often lead to increased productivity.

Complete the JTSA at the jobsite before the start of the daily work assignment. Complete another JTSA whenever significant changes that might affect the safety of the employees occur during the course of the work. Significant changes include changes in the scope of the work, work assignments, crew leadership, environmental conditions, or when other hazards (not originally noted) are determined to be present in the workplace.

- The foreman (person in charge) and the members of the crew will identify the hazards of the job. The crew will identify appropriate controls to eliminate, mitigate, control, or reduce the accident-producing potential of the hazard.
- If the hazards cannot be eliminated from the job step, the JTSA should list how the hazards can be mitigated, controlled, or reduced. This may be done by:
  - Dedicated assignment of work responsibilities.
  - Methods to isolate or control the hazard.
  - Other forms of protection (PPE, training, others) to reduce the hazard to the employees.

All employees must be trained in hazard identification and recognition. The training shall also include the proper use and care of PPE that is necessary to reduce the exposure level to the employees.

Job Selection

The Company requires that all job tasks be analyzed.

Employee Involvement

Train all employees in using JTSA procedures. Discuss the procedures with the employee performing the job and explain that the training is for the purpose of studying the job and analyzing potential risk associated with the job.

Involve employees in all phases of the analysis, from reviewing the job steps to discussing potential risks and recommended solutions. No one knows more about a job than the employee who performs it every day.

Recommended Solutions

The final step of the JTSA should develop ways to eliminate, reduce, or guard against the hazards observed. Eliminate each identified hazard, if possible (consider new methods or equipment). If the hazard cannot be eliminated, control it by using safe work methods, guarding, or protective equipment.

Program Review

Monitor the JTSA procedures to determine their effectiveness in reducing or eliminating injuries. Observe whether employees are following the analysis when performing the job. If so, evaluate the effectiveness. If not, investigate the reasons.

The jobsite safety supervisor and safety personnel will audit the Job Task Analysis procedures and suggest corrections as necessary.

Sample 29-1. Job Hazard Analysis

Job Hazard Analysis

List Task	List Hazards Associated with Task	List Safe Procedure and/or Safeguard(s)

Version 1, 09/01

Sample 29-2. Job Task Safety Analysis—Commerical, Industrial, and Residential Electrical Workers

Job Task Safety Analysis - Commercial, Industrial & Residential Electrical

Company Name:	Date:	Time:	Job #:
Location:		City:	State:
Describe job task:			
Competent Person Trenching/Excavation:		Soil Classification:	
Person responsible for First Aid / CPR:			
Name and Location of Emergency Medical Facility:			
Location of the AED:		Emergency Contact Number: 911	

SAMPLE

PPE Required (Yes / N/A)
- Hardhat
- Safety Glasses/Goggles
- Hearing Protection
- Leather Gloves
- Boots/Foot Protection
- Face Shield
- Welding Hood
- Chemical Gloves
- Dielectric Gloves
- Protective Sleeves
- Air Test (Electrical PPE)
- Class 2 Reflective Vest
- Class 3 Reflective Vest
- Respirators

Fall Protection
- Competent Person
- Guardrails
- Safety Nets
- Full Body Harness/Lanyard
- Positioning Device
- Warning Line
- Safety Monitor
- Barricaded/C...
- Falling O...
- Daily I... ...ns

Aerial L...
- Quali...
- Daily...
- Groun...
- Warning L...
- Controls Labeled
- Whe... ...ks

Ladder...
- Daily...
- Warn... ...Affix.
- 3 Feet Above Landing
- Ladder Secured

Confined Space (Yes / N/A)
- Competent Person
- Permitted/Non-Permitted
- Calibrated Monitor
- Continous Monitoring
- Hole Watch
- Man Hole Guard
- Forced Ventilation
- Rescue Equipment
- Resc. Team/Serv. Identified
- Hot Work Permit
- Warning Signs
- Written Program on Hand
- Contractors Notified
- Confined Space Log Book

Excavations
- Competent Person
- Utilities Located
- Integrity of Adj... ...s
- Soil Classific...
- ...ocation of Sp...
- ...rhead Loa...
- ...ter in Tren...
- ...ders/Ramp...
- ...ers Secur...
- ...g/Bench...
- ...g Syste...
- ...ed Da...
- ...ere T...
- ...odic... ...tion
- ...yste...
- E... .../Rescue Equip.
- Log Book

Sanitation
- Water (Marked as Potable)
- Single Use Cups
- Clean Restrooms
- Hand Wash Station

Traffic Control (Yes / N/A)
- Traffic Control Plan
- Right/Left Lane Closed
- Sign - Flagman Ahead
- Sign - Construction Ahead
- Arrow Board
- Message Board
- Traffic Control Zone
- Advance Warning Area
- Transition Area
- Buffer Space
- Work Area
- Termination Area
- Barricades/Cones
- Stop/Slo...

Cra...
- C...
- A... ...specti...
- I... ...ection
- C... ...nal...
- C... ...on
- C...
- R... ...quipment Inspecte...
- Q... Riggers
- V... Signal/Light
- I... ...rts
- F... ...om Susp. Loads

Me...
- Trained CPR/FA Employees
- First Aid Kit
- Bloodborne Pathogen Kit
- Occupation Med List
- Hospital Location

Arc Flash Protection
- FR Clothing
- FR Flash Suit
- Arc-rated Face Shield
- Insulated Blankets
- Protective Barrier

Electrical (Yes / N/A)
- Daily Inspection of Tools/Cords
- GFCI/Assured Grounding
- Energized Work Permit
- Insulated Tools
- Voltage Tested
- Elevated Structures Inspected
- Minimum Safe Distances
- Energized/Dee... ...d

Lockout/T...
- ...edure
- Meter
- ...ng E... ...t
- ...

G...
- ...pright
- ...aps in Place
- 20 F... ...Fuels
- ...beled
- ...ling
- ...ertificates
- ...ored Away from Heat
- Proper Ventilation
- Warning Signs

Scaffolding
- Competent Person
- Daily Inspections
- Access Ladders
- Secured/Braced
- Guardrails
- Supported Scaffolding
- Suspension Scaffolding

Administrative Issues
- OSHA Poster
- MSDS Manual
- Written Safety Program
- Permits
- Daily AED Check

Work assignments not addressed above shall be outlined below

All employees must print and sign their names below

Printed Name	Signature	Printed Name	Signature
1.		6.	
2.		7.	
3.		8.	
4.		9.	
5.		10.	

Foreman Signature ____________ Safety Rep. Signature ____________

NOTE: Additional Job Briefing will be required when scope of work changes and/or conditions change

1. Have overhead lines been located and have proper precautions been identified?
2. Have all employees received and are qualified to perform the tasks to which they have been assigned?
3. List injuries, incidents, first aid and near miss cases that occur at the job site during the course of the day:

Sample 29-3. Job Task Safety Analysis—Gas/Pipeline

Job Briefing - Gas/Pipeline

Company Name:	**Date:**	**Time:**	**Job #:**
Location:		**City:**	**State:**
Describe job task:			
Competent Person Trenching / Excavation:		**Soil Classification:**	
Person responsible for First Aid / CPR:			
Name and Location of Emergency Medical Facility:			
Location of the AED:		**Emergency Contact Number:** 911	

(Each item has Yes / N/A check boxes.)

PPE Required
- Hardhat
- Safety Footwear
- Natural Fiber Clothing
- Leather Work Gloves
- Safety Glasses
- Face Shield
- Welding Hood
- Goggles
- Hearing Protection
- FR Flash Suit
- Air-supplied Hood
- Full-face Respirator
- Half-mask Respirator
- Disposable coveralls
- FR Coveralls
- Chemical Resistant Suit
- Full Body Harness
- Lifeline/Lifting Equipment
- Personal Flotation Device
- Class 2 Reflective Vest
- Class 3 Reflective Vest
- Pipe Bonding/Groun
- Fire Extinguishers
- Fog Nozzle
- Rain Gear
- Abrasive Blastin
- Rubber Boots
- Equipment Guards
- Metatarsal Covers

H2S
- Residual Liquid
- Air Check for H

Ladders
- Daily Inspection
- Warn./Usage Labels Affixed
- 3 Feet Above Landing
- Ladder Secured

Confined Space
- Competent Person
- Permitted/Non-Permitted
- Calibrated Monitor
- Continous Monitoring
- Hole Watch
- Man Hole Guard
- Forced Ventilation
- Rescue Equipment
- Resc. Team/Serv. Identified
- Hot Work Permit
- Warning Signs
- Written Program on Hand
- Contractors Notified
- Confined Space Log Book

Excavations
- Competent Person
- Utilities Located
- Integrity of Adj. Structu
- So cation
- L poil Bank
- d Protecti
- h
- ers (Circle
- ers
- ing/
- aily/Period ction
- Warning System
- Emergency/Rescue Equip.
- Log Book

Sanitation
- Water (Marked as Potable)
- Single Use Cups
- Clean Restrooms
- Hand Wash Station

Traffic Control
- Traffic Control Plan
- Right/Left Lane Closed
- Sign - Flagman Ahead
- Sign - Construction Ahead
- Arrow Board
- Message Board
- Traffic Control Zone
- Advance Warning Area
- Transition Area
- Buffer Space
- Work Area
- Termination Area
- Barricades/C
- Sto /Slow

Digg rks
- ified
- al In
- Insp
- Extin
- ified ion
- ified
- ing E t Inspected
- e Sig ted
- ing ght
- Ch
- ection from Susp. Loads

Medical
- Trained CPR/FA Employees
- First Aid Kit
- Bloodborne Pathogen Kit
- Hospital Location
- Daily AED Check

HDD
- Dielectric Boots
- Dielectric Gloves
- 2-way Radio Communication
- SLD
- Strike Alert Operational

Hazard Exposures
- Falling Objects
- Flying Dust Particles
- Petroleum Vapors
- Suspended Loads
- Radiation X-Ray
- Temperature Extremes
- Hot Metal
- Moving Ma
- Static E
- Workin er
- Elevate
- Inadequ
- Chemic
- Pipe C
- Purging d
- Venting d
- Pot Hol
- Hand D
- zen
- d
- bestos
- Natural Gas

Gas Cylinders
- Stored Upright
- Valve Caps in Place
- Oxygen 20 Feet From Fuels
- Containers Labeled
- Properly Secured
- Inspections/Certificates
- Stored Away from Heat
- Proper Ventilation
- Warning Signs

Locates
- **Have all utilities been located and verified?**
- **Is Locate Number on-site and current?**

Work assignments not addressed above shall be outlined below

All employees must print and sign their names below

Printed Name	Signature	Printed Name	Signature
1.		5.	
2.		6.	
3.		7.	
4.		8.	

Foreman Signature ____________ **Safety Rep. Signature** ____________

NOTE: Additional Job Briefing will be required when scope of work changes and/or conditions change

1. Have overhead power lines been located and have proper precautions been identified?
2. Have all employees received proper training and are qualified (OQ) to perform the tasks to which they have been assigned?
3. List injuries, incidents, first aid and near miss cases that occur at the job site during the course of the day:

Sample 29-4. Job Task Safety Analysis —Horizontal Directional Drilling (HDD)

Job Task Safety Analysis - Horizontal Directional Drilling (HDD)

Company Name:	**Date:**	**Time:**	**Job #:**
Location:		**City:**	**State:**
Describe job task:			
Competent Person Trenching / Excavation:		**Soil Classification:**	
Person responsible for First Aid / CPR:			
Name and Location of Emergency Medical Facility:			
Location of the AED:		**Emergency Contact Number:** 911	

PPE Required (Yes / N/A)
- Hardhat
- Safety Glasses/Goggles
- Hearing Protection
- Leather Gloves
- Rubber Boots
- Metatarsal Covers
- Face Shield
- Welding Hood
- Chemical Rubber Gloves
- Class 2 Reflective Vest
- Class 3 Reflective Vest
- Full-face Respirator
- Half-mask Respirator
- Fire Extinguisher
- Personal Flotation Device
- Disposable coveralls
- FR Coveralls

Confined Space (Yes / N/A)
- Competent Person
- Permitted/Non-Permitted
- Calibrated Monitor
- Continous Monitoring
- Hole Watch
- Man Hole Guard
- Forced Ventilation
- Rescue Equipment
- Resc. Team/Serv. Identified
- Hot Work Permit
- Warning Signs
- Written Program on Hand
- Contractors Notified
- Confined Space Log Book

Traffic Control (Yes / N/A)
- Traffic Control Plan
- Right/Left Lane Closed
- Sign - Flagman Ahead
- Sign - Construction Ahead
- Arrow Board
- Message Board
- Traffic Control Zone
- Advance Warning Area
- Transition Area
- Buffer Space
- Work Area
- Termin…
- …arrica…
- …op/Sl… …les

Electrical (Yes / N/A)
- Daily Inspec. Tools, Cords
- GFCI/Assured Grounding
- Survey of Daily Conditions
- Minimum Safe Distances
- Energized/Deener…
- Groundi…

HDD Sa…
- Permit… …eted
- 2-way… …ommunications
- Soil A…
- Blue …
- …ore …
- …t H… …pleted
- …nderground Lines Identified
- Hazards Identified
- SLD
- Warning Signs Posted
- Drill Barricaded
- Dielectric Boots (Tested)
- Dielectric Gloves
- Grid System In Place
- Operator's Manual Review
- Equipment/Tools Inspected
- Equipment Grounded
- Strike Alert Operational
- Emergency Plans
- Employees Trained

…ical
- …mploy… …/CPR
- …rst Ai…
- …oodb… …ogen Kit

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- … Person
- …cated
- …te… Adj. Stru…
- …oil … …ation
- …ocat… …ool Ba…
- Overh… …d Prote…
- …
- …/Circ…
- …
- Sloping/…
- Shoring System
- Tabulated Data
- Atmos[here Tested
- Daily/Periodic Inspection
- Warning System
- Emergency Rescue Equip.
- Log Book

Ladders
- Daily Inspection
- Warn./Usage Labels Affix.
- 3 Feet Abov… …ing
- Ladder Se…

Administrative Issues
- OSHA Poster
- MSDS Manual
- Written Safety Program
- Permits
- Logs
- Daily AED Check

Sanitation
- Water (Marked as Potable)
- Single Use Cups
- Clean Restrooms
- Hand Wash Station

Locates
Have all utilities been located and verified?
Is Locate Number on-site and current?

Power Lines
Power Company notified when work is conducted near ANY electrical source.
Yes
N/A

Work assignments not addressed above shall be outlined below

All employees must print and sign their names below

Printed Name	**Signature**	**Printed Name**	**Signature**
1.		6.	
2.		7.	
3.		8.	
4.		9.	
5.		10.	

Foreman Signature ______________ **Safety Rep. Signature** ______________

NOTE: Additional Job Briefing will be required when scope of work changes and/or conditions change

1. Have overhead power lines been located and have proper precautions been identified?
2. Have all employees received proper training and are qualified to perform the tasks to which they have been assigned?
3. List Injuries, incidents, first aid and near miss accidents that occur at the job site during the course of the day?

Sample 29-5. Job Task Safety Analysis —Power

Job Task Safety Analysis - Power

Company Name:	**Date:**	**Time:**	**Job #:**
Location:		**City:**	**State:**
Describe job task:			
Competent Person Trenching / Excavation:		**Soil Classification:**	
Person responsible for First Aid / CPR:			
Name and Location of Emergency Medical Facility:			
Location of AED:		**Emergency Contact Number:** 911	

PPE Required (Yes / N/A)
- Hardhat
- Safety Glasses/Goggles
- Hearing Protection
- Leather Gloves
- Dielectric Overshoes
- Face Shield
- Welding Hood
- Chemical Gloves
- Dielectric Gloves
- Protective Sleeves
- Air Test (Electrical PPE)
- Class 2 Reflective Vest
- Class 3 Reflective Vest
- Respirators

Fall Protection
- "Buck Squeeze"
- Full Body Harness/Lanyard
- Climbing Belt
- Qualified Cl
- 100 % wer
- Warn
- Safe itor
- Bar Control Zone
- Fall
- Dail

Aerial Li
- Qualified Operato
- Wheel ocked
- Gr B
- W
- Cont
- Lower Controls Operational

Ladders
- Daily Inspection
- Warn./Usage Labels Affixed
- 3 Feet Above Landing
- Ladder Secured

Confined Space (Yes / N/A)
- Competent Person
- Permitted/Non-Permitted
- Calibrated Monitor
- Continous Monitoring
- Hole Watch
- Man Hole Guard
- Forced Ventilation
- Rescue Equipment
- Resc. Team/Serv. Identified
- Hot Work Permit
- Warning Signs
- Written Program on Hand
- Contractors Notified
- Confined Spa Book

Excavations
- Competent
- Utilities L
- Integrity o S res
- oil Classi n
- ocation o E
- erhead ro
- ter in T
- lders/B Cir
- ers S
- g/B g
- g S
- ed Data
- mosphere Tested
- Daily/Periodic Inspection
- Warning System
- Emergency/Rescue Equip.
- Log Book

Sanitation
- Water (Marked as Potable)
- Single Use Cups
- Clean Restrooms
- Hand Wash Station

Traffic Control (Yes / N/A)
- Traffic Control Plan
- Right/Left Lane Closed
- Sign - Flagman Ahead
- Sign - Construction Ahead
- Arrow Board
- Message Board
- Traffic Control Zone
- Advance Warning Area
- Transition Area
- Buff
- icades
- /Slow

/Di ricks
- tor
- ection
- Inspections
- Extinguisher
- lified Signal Perso
- igger Pads
- ection from Susp. Loads
- ind Sock
- Warning Signal/Light
- Load Charts
- Rigging Equipment Inspected
- Qualified Riggers
- Crane Signals Posted

Medical
- Trained CPR/FA Employees
- First Aid Kit
- Bloodborne Pathogen Kit

Administraive Issues
- OSHA Poster
- MSDS Manual
- Written Safety Program
- Permits
- Daily AED Check

Electrical (Yes / N/A)
- Daily Inspection of Tools/Cords
- GFCI/Assured Grounding
- Energized Work Permit
- Survey of y Conditions
- age ______
- ures Inspected
- Safe Distances
- nergized/Deenergized
- rc-rated Shield
- ed
- al Potential Zone
- ive Line Tools Tested
- lankets d
- loser"
- unded
- "Dead"

Lockout/Tagout
- Competent Person
- Lockout Procedure
- Electrical Flow Tester
- Voltage Tested

Gas Cylinders
- Stored Upright
- Valve Caps in Place
- Oxygen 20 Feet From Fuels
- Containers Properly Labeled
- Secured to Prevent Falling
- Inspections/Certificates
- Stored Away From Heat
- Proper Ventilation
- Warning Signs

Clearance Issued (Yes / N/A)
#: ______
Time: ______
By: ______

SAMPLE

Work assignments not addressed above shall be outlined below

All employees must print and sign their names below

Printed Name	Signature	Printed Name	Signature
1.		6.	
2.		7.	
3.		8.	
4.		9.	
5.		10.	

Foreman Signature ______ **Safety Rep. Signature** ______

NOTE: Additional Job Briefing will be required when scope of work changes and/or conditions change

1. Have all overhead lines (parallel, crossings, etc) been located and have proper precautions been identified?
2. Have all employees received training and are qualified to perform the tasks to which they have been assigned?
3. List injuries, incidents, first aid and near miss cases that occur at the job site during the course of the day:

Sample 29-6. Job Task Safety Analysis —Telecommunication/Cable

Job Task Safety Analysis - Telecommunications/Cable

Company Name:	Date:	Time:	Job #:
Location:		City:	State:
Describe job task:			
Competent Person Trenching / Excavation:		Soil Classification:	
Person responsible for First Aid / CPR:			
Name and Location of Emergency Medical Facility:			
Location of the AED:		Emergency Contact Number: 911	

PPE Required	Yes	N/A
Hardhat		
Safety Glasses/Goggles		
Hearing Protection		
Leather Gloves		
Boots/Foot Protection		
Face Shield		
Welding Hood		
Chemicla Gloves		
Di-electric Gloves		
Air Test (Electrical PPE)		
Reflective Vest		
Respirators		
Fire Retardent Clothing		
Personal Flotation Device		
Chainsaw chaps		
Fall Protection		
"Buck Squeeze"		
Full Body Harness/L[illegible]		
Climbing Be[illegible]		
Qualified [illegible]		
Warning[illegible]		
Safety [illegible]		
Barrica[illegible]		
Falling [illegible]		
Daily Insp[illegible]		
Aerial Lifts		
Qualified Op[illegible]tor		
Wheel[illegible]		
Lower [illegible]		
Warning [illegible]		
Controls La[illegible]		
Outrigger Pads		
Ladders		
Daily Inspection		
Warn../Usage Labels Affixed		
3 Feet Above Landing		
Ladder Secured		

Confined Space	Yes	N/A
Competent Person		
Permitted/Non-Permitted		
Calibrated Monitor		
Continuous Monitoring		
Hole Watch		
Man Hole Guard		
Forced Ventilation		
Rescue Equipment		
Resc. Team/Serv. Identified		
Hot Work Permit		
Warning Signs		
Written Program on Hand		
Contractors Notified		
Confined Space L[illegible]		
Excavations		
[illegible]etent Person		
[illegible]s Located		
[illegible] of Adj. S[illegible]		
[illegible]sification		
L[illegible] of Spoil [illegible]		
O[illegible] Load P[illegible]		
W[illegible]ench		
L[illegible]ps (C[illegible])		
[illegible]red		
[illegible]ing		
Shor[illegible]		
Tabul[illegible] Data		
Atmosphere Tested		
Daily/Periodic Inspection		
Warning System		
Emergency/Rescue Equip.		
Log Book		
Sanitation		
Water (Marked as Potable)		
Single Use Cups		
Clean Restrooms		
Hand Wash Station		

Traffic Control	Yes	N/A
Traffic Control Plan		
Right/Left Lane Closed		
Sign - Flagman Ahead		
Sign - Construction Ahead		
Arrow Board		
Message Board		
Traffic Control Zone		
Advance Warning Area		
Transition Area		
Buffer S[illegible]		
Work[illegible]		
Term[illegible]		
Barri[illegible]nes		
Stop/[illegible]dles		
[illegible]nes/[illegible]		
Quali[illegible]		
Annu[illegible]		
Daily [illegible]ns		
Fire E[illegible]her		
Dedic[illegible]al Person		
Quali[illegible]al Person		
Riggi[illegible]ment Inspected		
Wheel Chocks		
Warning Signal/Light		
Load Charts		
Protec. from Susp. Loads		
Qualified Riggers		
Outrigger Pads		
Crane Signals Posted		
Medical		
First Aid Kit		
Bloodborne Pathogen Kit		
HDD		
Dielectric Boots		
Dielectric Gloves		
2-way Radio Communication		
SLD		
Strike Alert Operational		

Electrical	Yes	N/A
Daily Inspection of Tools/Cords		
GFCI/Assured Grounding		
Hot Work-Authorized Person		
Survey of Daily Cond[illegible]		
Operating [illegible]		
Eleva[illegible]d		
Mini[illegible]istances		
Energ[illegible]nergized		
Lockout		
Com[illegible]		
Lock[illegible]		
Volta[illegible]		
Grou[illegible]uipment		
Elect[illegible]		
Gas Cyl[illegible]		
[illegible]tored		
[illegible]alve[illegible]Place		
[illegible]xygen 20 Feet From Fuels		
Containers Properly Labeled		
Secured to Prevent Falling		
Inspections/Certificates		
Stored Away from Heat		
Proper Ventilation		
Warning Signs		
Miscellaneous		
Fire Extinguisher		
RF Exposure		
Laser Exposure		
Daily AED Check		

Power Lines	Yes	N/A
Power Company must be notified when work is conducted near ANY electrical power line.		

SAMPLE

Work assignments not addressed above shall be outlined below

All employees must print and sign their names below

Printed Name	Signature	Printed Name	Signature
1.		5.	
2.		6.	
3.		7.	
4.		8.	

Foreman Signature ______________________ Safety Rep. Signature ______________________

NOTE: Additional Job Briefing will be required when scope of work changes and/or conditions change

1. Have overhead lines been located and have proper precautions been identified?
2. Have all employees received training and are qualified to perform the tasks to which they have been assigned?
3. List injuries, incidents, first aid and near miss cases that occur at the job site during the course of the day:

Sample 29-7. Job Task Safety Analysis—Tree Trimming

Job Task Safety Analysis - Tree Trimming

Company Name:	**Date:**	**Time:**	**Job #:**
Location:		**City:**	**State:**
Describe job task:			
Person responsible for First Aid / CPR:			
Name and Location of Emergency Medical Facility:			
Location of the AED:		**Emergency Contact Number: 911**	

PPE Required (Yes / N/A)
- Hardhat
- Safety Glasses/Goggles
- Hearing Protection
- Leather Gloves
- Boots/Foot Protection
- Face Shield
- Chainsaw Chaps
- Chemical Gloves
- Dielectric Gloves
- Protective Sleeves
- Air Test (Electrical PPE)
- Class 2 Reflective Vest
- Class 3 Reflective Vest
- Respirators
- Fire Extinguisher

Fall Protection
- Full Body Harne[illegible]
- All equipment i[illegible]d?
- Competent Pe[illegible]
- Boatswain Ch[illegible]
- Ropes Inspecte[illegible]
- Climbers body be[illegible]
- Warning Line
- Safety Monitor
- Barricaded/C[illegible]ne
- Falling Object[illegible]

Aerial Lifts
- Lower Controls Operational
- Qualified Operator
- Daily Inspection
- Outrigger Pads
- Barricaded
- Warning Labels
- Controls Labeled
- Whhel Chocks

Equipment Used (Yes / N/A)
- Chainsaw
- Chipper
- Chipper Guard in Place?
- Hand Saw
- Pruning Saw
- Pole Gaffs (inspected)
- Tree Gaffs (inspected)
- Climbing Rope
- Ladders

[illegible]
- [illegible]tion
- [illegible] Labels [illegible]
- [illegible]anding
- [illegible]
- [illegible] Po[illegible]
- [illegible] Re[illegible]
- Hand Wa[illegible]ation

Medical
- Occupation Med Center List
- Hospital Location
- Trained CPR/FA Employees
- First Aid Kit
- Bloodborne Pathogen Kit

Traffic Control (Yes / N/A)
- Traffic Control Plan
- Right/Left Lane Closed
- Sign - Flagman Ahead
- Sign - Construction Ahead
- Arrow Board
- Message Board
- Traffic Control Zone
- Advance W[illegible]
- Transit[illegible]
- [illegible]uffer[illegible]
- [illegible]
- [illegible]on
- [illegible]
- [illegible]

[illegible]
- [illegible]tor
- [illegible]ion
- [illegible]ns
- [illegible]er
- [illegible]
- Outrigger Pads
- Rigging Equipment Inspected
- Wheel Chocks
- Warning Signal/Light
- Load Charts
- Protection from Susp. Loads
- Qualified Signal Person
- Qualified Riggers
- Crane Signals Posted

Electrical (Yes / N/A)
- Daily Inspection of Tools/Cords
- GFCI/Assured Gr[illegible]
- Hot Wo[illegible]son
- Su[illegible]
- En[illegible]ergized
- Vol[illegible]
- Mi[illegible]
- Po[illegible]identified

Locko[illegible]
- Co[illegible] Person
- Lo[illegible]cedure
- Vol[illegible]
- Gro[illegible]
- Ele[illegible]

[illegible]
- Are pesticides being used?
- Is there an MSDS available?
- Employees understand hazard?
- Are respirators necessary?

Administrative Issues
- OSHA Poster
- MSDS Manual
- Written Safety Program
- Permits
- Logs
- Daily AED Check

Clearance Issued (Yes / N/A)
#: ___________
Time: ___________
By: ___________

Work assignments not addressed above shall be outlined below

All employees must print and sign their names below

Printed Name	Signature	Printed Name	Signature
1.		6.	
2.		7.	
3.		8.	
4.		9.	
5.		10.	

Foreman Signature ______________________ **Safety Rep. Signature** ______________________

NOTE: Additional Job Briefing will be required when scope of work changes and/or conditions change

1. Have overhead lines been located and have proper precautions been identified?
2. Have all employees received training and are qualified to perform the tasks which they have been assigned?
3. List injuries, incidents, first aid and near miss cases that occur at the job site during the course of the day?

30

Hand and Power Tools

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

General Rules for Safe Tool Use

Observe the following rules when using hand or power tools:

- Select and use the proper tool for the job to be performed.
- Follow all manufacturer recommendations for the safe use of its product.
- Maintain all hand and power tools in a safe condition. Wooden handles must be tight and free from cracks or splinters. Impact tools must not have mushroomed heads.
- Ensure that power tools are equipped with the proper guards and are used as intended.
- Guard all moving parts of machinery if the operator is exposed to contact.
- Ensure that operators wear PPE if there is a danger of falling, flying, abrasive, or splashing objects or harmful dusts, fumes, mists, vapors, or gases.
- Do not use compressed air for cleaning unless the pressure is reduced to less than 30 psi, effective chip guarding is used, and proper PPE is worn.
- Ensure that powder-actuated tools are operated only by trained personnel wearing proper personal protective equipment (PPE). All operations must be in accordance with the standard practices.
- Attach safety guard to all abrasive wheels and tools.
- All equipment that produces dust, fumes, mists, vapors, or gases in concentrations that are harmful upon exposure to employees must have exhaust ventilation.

- Ground all tools that are not double insulated.
- Do not use power tools in damp or wet locations.
- Keep all pedestrians and visitors at a safe distance from work area.
- Store tools in dry, high, or lock-up places when they are not in use.
- Wear safety glasses with side shields at all times. Other eye and face protection may be required if cutting operation is dusty.
- Never carry tools by their cords or yank them to disconnect them from the receptacle. Keep cords away from heat, oil, and sharp edges. Remove cord from service if damaged.
- Keep tools clean for best and safest performance. Follow instructions for lubricating and changing accessories.
- Disconnect tools when not in use, before servicing, and when changing accessories such as blades, bits, cutter, and so on.
- Remove keys and adjusting wrenches from a tool before turning it on.
- Keep cutting tools, such as saws, knives, and chisels sharp.
- Keep tools in good repair. Promptly repair or replace cracked or loose handles, out of alignment jaws, and mushroomed heads.
- Do not carry tools in pockets.
- Make sure all hand-held electric tools are double insulated or have a frame connected to ground.
- Ensure that hand-held portable electric saws have guards above and below base plate.
- Ensure that electric chainsaws, drills, tapers, fastener drivers, and reciprocating saws have constant pressure switches.
- Do not use tools with frayed cords or loose or broken switches.
- Keep work areas free of clutter.
- Dress properly so that loose clothing does not get caught in moving parts.
- Never carry tools while climbing or descending ladders. Never raise or lower power tools by the cord. Use a handline with a bucket to raise and lower the tools safely.
- Immediately remove damaged or defective tools from service. A damaged or defective tool should be identified by “red tagging” the tool with a *Do Not Operate* tag. The tool should then be removed from the work area or rendered inoperable by locking the controls until it is repaired or replaced.

Power Tools

Inspection Checklist

The following sections provide guidelines for ensuring that power and hand tools are safe for use.

Cord Sets and Extension Cords

Visually inspect cords for cuts or other damage. Examine plugs for damage to ground terminal. If ground terminal is missing, replace the plug.

Switch

Test the mechanical operation of switches with plugs disconnected and inspect for problems with secure mounting and any other obvious defects.

Chucks, Collets, or Other Tool Holding Devices

Ensure that parts are in good functional condition. Also, ensure that proper size wrenches and adjustment keys are available.

Guards

Inspect guards for proper installation. Moveable guards should function smoothly.

Housing and General Hardware

Inspect the general condition of housings for defects and damage. Replace missing hardware and tighten all loose bolts and fittings.

Blades and Bits

Inspect blades and bits for damage and defects—resharpen as required and reinstall in accordance with manufacturer's recommendations. Use only those accessories recommended by the manufacturer.

Maintenance

Follow manufacturer's recommended maintenance procedures.

Leakage Current Test

Perform this test using an approved ground fault circuit interrupter (GFCI). Perform this test per the manufacturer's instructions with the tool being in each of its modes of operation (forward or reverse). Operate the tool at no load to check and listen for unusual noise, which might indicate mechanical trouble in drive train or bearings. Immediately identify any tools that trip the GFCI as unsafe with a red tag, and ensure that these tools are repaired by qualified personnel in accordance with the manufacturer's recommendations before return to service.

Hand Tools

The use, care and operation of hand tools bears a direct relationship to the degree of hazard involved in construction operations. The Company prohibits the use of unsafe hand tools.

Safe Condition

Keep cutting tools sharp and chisels free of mushroomed points. The heads of tools (such as hammers) should fit tightly; nails or similar substitutes may not be used to wedge heads. Replace cracked or damaged heads and loose or cracked handles and keep heads and handles clean of grease, dirt, and the like to eliminate the hazard of slippage and injury during use and to protect against rust and corrosion.

Care

When not in use, store hand tools in their boxes, trays, containers, or other properly designated places in such a manner as to prevent damage to other tools and avoid hazards to persons handling them. Do not allow tools to lie near the edges of excavations or trenches where they can fall in and injure employees.

Knives

The purpose of the knife policy is to give guidelines that will help control and/or eliminate the hazards of using an approved knife.

A knife is a tool, like any other tool, that must be used correctly to be safe. A fixed or locking blade cable splicing knife and/or lineman's skinning knife has been used for various tasks in the electrical industry for many years. However, if another tool is available and is a safer alternative, then that tool should be used in place of a knife.

Approved Knives

Fixed or locking blade cable splicing or lineman's skinning knives. (Pocketknives are not approved.)

Safety Tips on the Correct Use and Care of Knives

The following safety tips should be applied and followed when attempting to use an approved knife.

- Direct the edge of the knife in the direction of the cut and away from the body.
- Confirm that no one is in the immediate vicinity while the knife is being used.
- Wear Kevlar (cut resistant) gloves to help prevent an injury while performing work using a knife.
- Keep knife sharpened and avoid excessive force.
- Keep knife closed or in a scabbard when not in use.
- Position your other hand and body parts so that they do not come in contact with the blade.
- Keep a good grip on the knife.
- Inspect knife before use.
- Only use sharpening devices designed for the task.
- Plan the task of using the knife on the JTSA.
- Do not use a knife as a pry bar, screwdriver, or any other unsafe use for which is not intended.
- Foremen shall review this policy with employees that require the use of an approved knife.

Metal and Wood Working Machines

All employees, especially the safety supervisor, must be somewhat familiar with basic machine parts and basic operating functions of the machines.

Lathe

The lathe is the most common machine in the modern machine shop. The safety inspector should know at least the following parts:

- Bed
- Headstock
- Tailstock
- Carriage
- Face plate

Types of Lathes

The common type of lathes are engine and turret lathes.

Lathe Hazards

The operations and hazards of both engine and turret lathes are similar and include the following:

- Mechanical hazards
  - Headstock—Exposed gears, belts, and pulleys
  - Lathe dog—Exposed setscrews
  - Chuck—Out of position when the machine is not in use
  - Bed ways—Tools left on the machine
- Personnel hazards
  - Shifting belts by hand
  - Changing chucks by using machine power
  - Wearing neckties, rings, and long sleeves and not tying back long hair
  - Lifting heavy chucks without assistance
  - Not wearing a face shield over goggles for protection from chips and oil splashes
  - Contracting dermatitis from oil compounds
  - Leaving chuck keys in the chuck sockets

Recommended Safeguards

The following safeguards are recommended in the use of lathes:

- Minimize the danger from flying particles of metal by using shields over the work.
- Never shift belts on cone step pulleys by hand; use a standard belt-shifting device.
- Provide a brush and metal chip pan for each machine.
- Provide lifting devices where heavy chucks of materials must be handled.
- Require racks for miscellaneous tools rather than allowing tools to be stored on the floor or placed on the bed.
- Follow the recommended OSHA lighting standards for types of work being done.
- Inspect clothes for loose cloth that may be caught in the moving parts.
- Use lock out/tag out procedures before attempting to make any adjustments or repairs
- Require safety goggles for all lathe operators.
- Require that exposed transmission parts be completely guarded.
- Wear appropriate gloves for hand protection

Milling Machine

The safety inspector should know at least the following parts of milling machines:

- Frame
- Spindle
- Knee
- Saddle
- Table

Types of Milling Machines

Types of milling machines include:

- Horizontal—The spindle is horizontal to the table
- Vertical—The spindle is vertical to the table
- Plain milling machines—Tables cannot swivel
- Universal milling machines—Tables can swivel up to 90 degrees of the normal position

Milling Machine Hazards

The hazards of milling machines include the following:

- Mechanical hazards
  - The frame—Gears, belts, and pulleys might be exposed
  - The table—Work might be only loosely clamped
- Personnel hazards
  - Workers attempting to remove chips, which can easily ruin work, by hand
  - Flying chips and cutters breaking under the strains when employees are not wearing safety goggles
  - Neckties, long sleeves, loose long hair, and rings being caught in the mechanisms
  - Dermatitis caused by contact with oil compounds and lubricants

Recommended Safeguards

The following safeguards are recommended in the use of milling machines:

- Recommend a permanent or fixed hood over the milling machine cutter, clamped to the overhead arm and adjustable to the work done.
- Review all recommended safeguards for engine lathes as most of those statements also apply to the milling machine.
- Wear face shield and/or goggles for eye and face protection.
- Wear gloves for hand protection.

Planer

The safety inspector should know the following parts of the planer:

- Bed
- Table
- Tool head
- Cross rail
- Housing

Types of Planers

Common types of planers include:

- Single-head planers
- Double-heat planers
- Open-side planers

Planer Hazards

The hazards of planers include the following:

- Mechanical hazards
    - The table—Stops at the table ends to prevent running off the ways
    - The housing—Exposed pulleys, gears, and belts
    - The bed—Unguarded openings in the bed causing a shear hazard with the moving table
    - Clearance—At least 3 ft (0.91 m) is needed at each end of the planer when the table is at maximum stroke
- Personnel hazards
    - Fingers being caught under work being set on the table or between the work and the tool
    - Workers riding on the table
    - The table and bed not being cleared of tools and other items before the planer is started
    - Chips and scale getting in the eyes as the worker watches the action of the cutting tool

Recommended Safeguards

The following safeguards are recommended in the use of planers:

- Require guard railings around the rear of the planer when there is not sufficient room between the table in its end position on the back stroke and fixed objects behind the machine.
- Never leave the planer unattended while in operation.
- Require that exposed transmission parts be completely guarded.
- Review all recommended safeguards for lathes as most of these statements also apply to the planer.
- Wear face shield and/or goggles for eye and face protection.
- Wear gloves for hand protection.

Drill Presses

The inspector should know the following parts of the drill press:

- Column
- Table
- Spindle
- Front feed mechanism
- Back gear mechanism

Types of Drill Presses

Common types of drill presses include:

- Upright drill press
- Radial drill press
- Multiple drill press

Hazards of Drill Presses

The hazards of drill presses include the following:

- Mechanical hazards
  - The spindle—Projecting setscrews or keys
  - The front feed mechanism—Exposed gears and belts
  - The back gear mechanism—Exposed gears and belts
- Personnel hazards
  - Work not being clamped to the table before drilling
  - Chuck wrenches being left in chucks or on the table
  - Neckties, long sleeves, loose long hair, and rings being caught in the mechanisms

Recommended Safeguards

The following safeguards are recommended in the use of drill presses:

- Require, where practical, a telescope guard over the drill and spindle.
- Require that exposed transmission parts be completely enclosed. Pay particular attention to bevel gears that may be exposed at the top of the spindle.
- Recommend that hairnets or caps be worn when operating this machine. Long hair is extremely hazardous when near the rapidly revolving spindle.

Swing Cut Off Saw

The inspector should know the following parts:

- Table
- Handle
- Counterweight
- Saw blade
- Gauge stops
- Rollers (if any)

Hazards of Swing Cut Off Saws

The hazards of swing cut off saws include the following:

- Mechanical hazards
  - The operator's body can be cut by the saw swinging beyond its safe limit
  - The operator can be struck by a falling counterweight coming loose
  - The operator can be cut by the saw swinging forward if the counterweight comes loose
  - The overhead fastenings of the saw supports might come loose and machinery might fall on the operator
  - Belts, gears, pulley, and so on might be exposed
- Personnel hazards
  - Fingers being cut by the saw in idling position when the operator reaches to remove work
  - Hands being struck by a saw that bounces back after being let go
  - Fingers being cut by pulling the saw into them

Recommended Safeguards

The following safeguards are recommended in the use of swing cut off saws:

- Cover the saw with a hood arranged so that the part of the saw above the table is covered to at least the root of the teeth. This hood, or a section of it, should self-adjust to the thickness of the stock and be in contact with the material being cut on the table when in its forward position with no stock in position.
- Ensure that each swing saw has a counterweight to return the saw to the back of the table when the handle is released. Rope, cord, or spring tensions are not acceptable substitutes for the counterweight. The weight must be bolted to both the bar and counterweight. Where the weight does not encircle the bar, a chain must be attached to the weight.
- Provide a limit stop or latch to limit the saw travel at both the front and back and to prevent the saw from rising above the table.
- Ensure that the saw table extends far enough on either side of the saw to give full support to any size stock. Require that the table be extended in front of the saw to a point where it is impossible to have the body struck by the saw.
- Test the saw for bounce by releasing it half way. If there is any bounce, require a latch arrangement.
- Ensure that the saw is fully guarded both beneath and on top of the table.
- Ensure that radial arm saws have anti-kickback and bottom guards, do not extend over the edge of the table, and are equipped with an automatic pull-back.
- Wear face shield and/or goggles for eye and face protection.
- Wear gloves for hand protection.

Table Saw

The inspector should know the following parts of the table saw:

- Table
- Guide
- Adjusting mechanisms (in some cases, the table is adjustable for depth of cut or for angle cut; in other cases, the saw arbor is adjustable)
- Arbor and adjustments

Types of Table Saws

Common types of table saws include:

- Rip
- Crosscut
- Dado
- All purpose combination
- Hollow ground combination (planer blade)
- "Safety cut" blade

Hazards of Table Saws

The hazards of table saws include the following:

- Mechanical hazards
    - ❑ Exposed belts or pulleys
    - ❑ Slippery floor around machine
    - ❑ Floor space obstructed by stock, waste, or finished materials
    - ❑ Improper type of blade for work
    - ❑ Cracked saw blade or missing teeth
    - ❑ Dull, improperly set, or improper saw teeth
    - ❑ Guard not automatically adjustable to the thickness of material
    - ❑ Failure to provide anti-kickback fingers or dogs
    - ❑ Failure to provide spreader
    - ❑ Failure to guard part of saw below table
- Personnel hazards
    - ❑ Body contacting the saw blade
    - ❑ Standing in position to be struck by kickback

- ❑ Body contacting other moving parts
- ❑ Handling wood (splinters, hernias, strains)
- ❑ Forcing material against the saw

Recommended Safeguards

The following safeguards are recommended in the use of table saws:

- Every circular hand-fed table saw must be guarded by a hood that completely encloses that portion of the saw above the table.
- The hood and mounting must be arranged so that the hood will automatically adjust itself to the thickness of and remain in contact with the material being cut and will not offer any considerable resistance to the material being moved.
- The saw must be provided with a spreader to prevent the material from squeezing the saw. The spreader must be of tempered saw or tool steel, slightly thicker than the saw blade itself. The spreader must be mounted directly in back of the saw at a distance of no more than 12 inches (30.48 cm) and in such a manner as to always be in line with the saw when the saw or table is tilted.
- The guards must permit necessary adjustments and changes without undue trouble.
- The operator must be able to see the cutting edge at the start of the cut.
- Anti-kickback fingers or dogs must be present to prevent stock from being thrown back.
- For narrow or thin cuts, a pusher stick is required.
- Filler places must be used for work where a fence would prevent the hood from being used because of narrow cuts being made.
- The part of the saw blade below the table must be guarded against contact with the operator.
- Wear face shield and/or goggles for eye and face protection.
- Wear gloves for hand protection.

Jointer (Buzz Planer)

The inspector should know the following parts of the jointer:

- Table
- Cutter head
- Fence
- Frame

Hazards of Jointers

The hazards of jointers include the following:

- Mechanical hazards
  - Square head on the jointer
  - Exposed cutting heat in front of or behind the fence
  - Slippery or obstructed floor surfaces
  - Exposed belts, pulleys, shafts, and so on
- Personnel hazards
  - Failing to use pusher block (or pusher stick with short stock)
  - Removing guards to make cuts
  - Brushing chips off the table with hands
  - Leaving the cutting head running when the machine is not in use
  - Trying to make one heavy cut rather than a few lighter cuts

Recommended Safeguards

The following safeguards are recommended in the use of jointers:

- Place a covering over the cutting head in front of the fence, enabling the stock to be fed through easily, yet keeping the knives covered at all times.
- Place a self-adjusting covering over the knives at the rear of the fence to give protection at all positions of the fence.
- Use a pusher block or pusher stick for short cuts.
- Wear face shield and/or goggles for eye and face protection.
- Wear gloves for hand protection.

Band Saws

The inspector should know the following parts:

- Table
- Upper band wheel
- Lower band wheel
- Saw band
- Band guide and bar

Hazards

The hazards of band saws include the following:

- Mechanical hazards
  - Open spokes in upper and lower bank wheels
  - Exposed saw blade between the table and the upper band wheel
  - Cracked or kinked blade causing the blade to run off the wheels
  - Slippery or obstructed flooring around the machine
  - Exposed belts, pulleys, chains, and sprockets
  - Improper blade tension
- Personnel hazards
  - Removing saw guards or operating with an adjusted guide
  - Forcing stock in a manner that might break the blade
  - Using an unsafe method of holding or handling stock
  - Reaching too close to the blade, making adjustments, cleaning up, and so on without shutting down the saw

Recommended Safeguards

- Ensure that both upper and lower band wheels are completely enclosed.
- Ensure that the rim of the upper wheel is made of iron or steel and has a width not less than 1/2 inch (1.27 cm) wider than the saw band blade.
- Guard the working side of the saw blade between the guide and the upper band wheel enclosure.
- Wear face shield and/or goggles for eye and face protection.
- Wear gloves for hand protection.

Areas Requiring Machine Guarding

Machine guarding is divided into three classifications.

Power Transmission

The power transmission category includes the moving parts (shafting, pulleys, belt, rope, and chain drives; gears, sprockets, friction drives, keys, setscrews, and other projections; and collars and couplings) that transmit power from the source to the working parts of the machine.

Moving Parts

The moving parts category includes the accessories to transmission (control or feeding devices, prime movers, cranks, connecting rods, tail rods, governors, moving heads, or tables) other than direct power transmission or point of operation.

Point of Operation

The point of operation category includes the part of the machine that does the work on the material or object being processed.

Chain Saws

Observe the following guidelines when using chain saws:

- The PPE requirements for chain saw use are a hard hat, safety glasses, face shield, leather gloves, chain saw chaps, and hearing protection. Do not wear baggy clothing that could get caught up in the chain.
- Chainsaw chaps should be worn when operating a chain saw on the ground.
- Each chain shall be equipped with a chain brake or a protective device that minimizes chain-saw kickback. Do not remove or otherwise disable any chain saw kickback device.
- All chain saws shall be equipped with a control that, when released, returns the saw to idling speed.
- Exhaust manifolds on gasoline motors shall be constructed and maintained so that exhaust fumes are directed away from the operator.
- Power saws shall be equipped with a clutch adjusted so that it will not engage the chain drive at idling speed.
- Remove loose material that may catch the saw.
- Power saws shall have a positive off-and-on switch.
- Power cables on electric units shall be properly insulated. Care shall be taken to ensure that cables are in the clear at all times.
- Electric saw and generator units shall be bonded together and grounded.
- The cables on electric units shall be disconnected while moving the saw through brush and thickets or where the character of the ground obstructs the free movement of the fallers.
- Inspect the saw daily to ensure that all handles and guards are in place and tight, all controls function properly, and the muffler is operative.
- Properly instruct operators on safe operation and adjustment.
- Always keep a firm grip on the saw.
- Fuel the saw only in conditions free from fire hazards.
- Start the saw at least 10 feet away from fueling area.
- Start the saw only when firmly supported.

- Do not use engine fuel for starting fires or as a cleaning solvent.
- Use proper methods to avoid kickbacks.

Air Tools

Observe the following guidelines when using air tools:

- Secure pneumatic power tools to the hose in a positive manner to prevent accidental disconnection.
- Securely install and maintain safety clips or retainers on pneumatic impact tools to prevent attachments from being accidentally expelled.
- Do not exceed the safe operating pressure specified by the manufacturer for all fittings.
- Use a safety device at the source of supply or branch line for all hoses exceeding a 1/2-inch (1.27-cm) inside diameter to reduce pressure in case of hose failure.
- Wear appropriate PPE when operating these devices.

Powder-Actuated Tools

Observe the following guidelines when using powder-actuated tools:

- Allow only trained employees to operate powder-actuated tools.
- Test all powder-actuated tools daily before use and correct all defects discovered before or during use.
- Do not load tools until immediately before use.
- Do not leave loaded tools unattended.
- Wear appropriate PPE when operating these devices.

31

Ladders and Scaffolds

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

Definitions

Extension ladder—A portable ladder that cannot support itself but is adjustable in length. This type of ladder consists of two or more sections traveling in guides or brackets arranged to permit length adjustment. The size of this ladder is indicated by the sum of the lengths of sections measured along the side rails.

Extension trestle ladder—A self-supporting, portable ladder that is adjustable in length and consists of a trestle ladder base and a vertically adjustable single ladder, with suitable means for locking the ladders together. The size of this ladder is indicated by the length of the trestle ladder base.

Ladder—An appliance usually consisting of two side rails joined at regular intervals by cross-pieces called steps, rungs, or cleats on which a person can step when ascending or descending.

Rungs—Circular or oval cross-sections of a ladder on which a person can step when ascending or descending.

Sectional ladder—A self-supporting ladder that is not adjustable in length and consists of two or more sections of ladder constructed so that the sections can be combined to function as a single ladder. The size of this ladder is indicated by the overall length of the assembled sections.

Side-rolling ladder—A semi-fixed ladder that is not adjustable in length and is supported to attachments by a guide rail, which is generally fastened to shelving. The plane of the ladder is its plane of motion.

Single ladder—A portable ladder that cannot support itself, is not adjustable in length, and consists of one section. The size of this ladder is indicated by the overall length of the side rails.

Special purpose ladder—A portable ladder that uses either a modification or combination of designs or construction features of one of the general-purpose types of ladders previously defined to adapt the ladder to specific uses.

Steps—The flat cross-pieces of a ladder on which a person can step when ascending or descending.

Stepladder—A self-supporting portable ladder, nonadjustable in length, having flat steps and a hinged back. The size of this ladder is indicated by the overall length of the ladder measured along the front edge of the side rails.

- **Type I**—Industrial stepladders, 3 to 20 ft (0.92 to 6.10 m) in length, for heavy-duty tasks performed by utility workers, contractors, and industrial workers.
- **Type II**—Commercial stepladders, 3 to 12 ft (0.92 to 3.66 m) in length, for medium- and light-duty tasks performed by painters and contractors.
- **Type III**—Household stepladders, 3 to 6 ft (0.92 to 1.83 m) in length, for light-duty tasks, such as light household use.

Trestle ladder—A self-supporting, portable ladder that is not adjustable in length and consists of two sections hinged at the top to form equal angles at the base. The size of this ladder is indicated by the length of the side rails measured along the front edge.

Trolley ladder—A semi-fixed ladder that is not adjustable in length and is supported by attachments to a track. The plane of the ladder is at right angles to the plane of motion.

Ladders

This chapter establishes minimum guidelines for the proper use, inspection, and training of Company employees whose job tasks require the use of portable ladders.

Management is responsible for ensuring that all portable ladders available to Company employees are used and maintained in safe conditions.

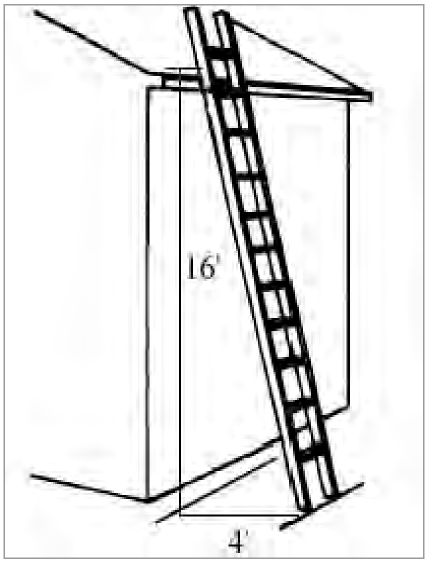
Safe Use of Ladders

To ensure maximum serviceability and safety and eliminate unnecessary damage to equipment, safe practices in the use and care of ladder equipment must be employed and the following guidelines must be observed:

- Ladders with broken or missing steps, rungs, or cleats, broken side rails, or other faulty equipment must not be used. Improvised repairs must not be made.
- Ladder rungs, cleats, and steps shall be parallel, level, and uniformly spaced when the ladder is in position for use.
- Ladders shall not be loaded beyond the maximum intended load for which they were built, or beyond the manufacturers’ rated capacity.
- Ladders shall be used only for the purpose for which they were designed. Never use a ladder in a horizontal position or as scaffolding.
- Do not place ladders on top of boxes, barrels, crates, and so on to extend the reach of the ladder.

- When ascending or descending a ladder, the climber must face the ladder and keep at least one hand free to hold onto the side rail. When working from a ladder, the employee must not work in a manner that requires both hands or lean past the side rails to reach the work. When the employee is working 6 ft (1.38 m) or more off the ground, a fall protection system must be employed.
- Only wooden or fiberglass ladders are permitted when the potential of electrical shock hazards exists.
- Portable rung and cleat ladders must, where possible, be used at such an angle that the horizontal distance from the top support to the foot of the ladder is one quarter of the working length of the ladder (the length along the ladder between the foot and top support). The ladder must be so placed as to prevent slipping, or it must be lashed or held in position. (See Figure 31-1).
- When a ladder is lashed, it must be held securely in place by a coworker. Ladders must not be used in a horizontal position as platforms, runways, or scaffolds.
- Only one employee at a time may use a ladder with rungs or steps at the front. Where use by more than one employee is anticipated, specially designed ladders with rungs or steps on both the front and back sides must be procured.
- Portable ladders must be placed so that the side rails have secure, level footing. The top rest for portable rung and cleat ladders must be reasonably rigid and have ample strength to support the applied load.
- Ladders must not be placed in front of doors opening toward the ladder unless the door is blocked, locked, or guarded.
- Ladders must not be placed on boxes, barrels, or other unstable bases to obtain additional height.
- Short ladders must not be spliced together to provide longer sections, to be used as guys, braces, or skids, or for uses other than their intended purpose. Tops of the ordinary types of stepladders must not be used as steps. The back leg braces of stepladders are designed solely for increasing stability and not for climbing.
- Portable rung ladders with reinforced rails must be used only with the metal reinforcement on the underside of the rails. Ladders must not be used to gain access to a roof unless the top of the ladder extends at least 3 ft (0.91 m) above the point of support.
- Middle and top sections of sectional ladders must not be used as bottom sections unless the ladders have been equipped with safety shoes. Portable ladders must be fitted with safety shoes when the hazard of slipping is possible. Nonslip bases are not intended as a substitute for care in safely placing, lashing, or holding a ladder that is being used on oily, metal, concrete, or slippery surfaces.
- Never use the top step of a ladder as a work platform or to gain access to a higher level.
- The ladder side rails shall extend at least 3 ft (.9 m) above the upper landing surface. When a ladder cannot be extended, then it shall be secured at its top to a rigid support that will not deflect.

Figure 31-1: Non-self-supporting Ladders



- Use extreme caution when using a ladder when ladder rungs, side rails and/or your shoes are covered with snow, ice, grease, or other slippery material.
- Table 31-1 provides the minimum overlap for the two sections in use on two-section extension ladders:

Table 31-1. Minimum Length of Ladder Overlap

Size of Ladder (ft)	Overlap (ft)
Up to and including 36	3
Over 36 and including 48	4
Over 48 and including 60	5

Training

Upon initial employment, all employees who might have cause to use portable ladders in their job tasks must be trained about these guidelines.

Inspections

Ladders must be inspected according to the following guidelines:

- Ladders must be inspected frequently, and those that have developed defects must be withdrawn from service for repair or destruction and tagged or marked with "Danger Do Not Use."
- Each ladder must receive an annual documented inspection. The date of the inspection must be marked on the ladder.
- Ladders must be maintained in good condition at all times. The joint between the steps and side rails must be tight, all hardware and fittings must be securely attached, and movable parts must operate freely without binding or undo play.

- Metal bearings of locks, wheels, pulleys, and so forth must be lubricated frequently. Frayed or badly worn rope must be replaced.
- Safety feet and other auxiliary equipment must be kept in good condition to ensure proper performance. Rungs must be kept free of grease and oil.
- If a ladder tips over, it must be inspected for side rail dents or bends, excessively dented rungs, damage to rung to side rail connections, compromised hardware connections, and shear on rivets.

Construction Requirements

Ladder construction must meet the following safety requirements:

- All wood parts must be sound, free from sharp edges and splinters, firm and free from shake, wane, no excessive wear or compression failures, decay, and other irregularities.
- Uniform step spacing must be less than 12 inches (30.48 cm). Steps must be parallel and level when the ladder is in position for use.
- The minimum width between side rails at the top, inside to inside, must be greater than 11-1/2 inches (29.21 cm). From the top to bottom, the side rails must spread at least 1 inch (2.54 cm) for each 12 inches (30.48 cm) of stepladder length.
- Each stepladder must have a metal spreader or locking device of sufficient size and strength to hold the front and back sections securely in open positions. The spreader must have all sharp points covered or removed to protect the user.
- Metal rungs must be corrugated, knurled, dimpled, coated with a skid-resistant material, or otherwise treated to minimize the possibility of slipping.

Scaffolds

General Rules

The following general rules must be observed when employees are using scaffolds to perform work tasks:

- Wear a full body safety harness and properly tie off on scaffold platforms that are not equipped with standard handrails and completed decking. Fall protection must be provided on all platforms 6 ft (1.83 m) or more above the next level. Fall protection consists of either guardrails on all open sides or a personal fall arrest system. Fall protection is required for scaffold erectors.
- Do not ride on a rolling scaffold while it is being moved. Remove or secure all tools and materials on the deck before moving the scaffold.
- Do not climb scaffold handrails, midrails, or brace members. Use ladders for access to these items.
- Erect all scaffolds level and plumb on a firm base.
- Tie off or stabilize scaffolds with outriggers when the height is more than three times the base dimension. Tie off such scaffolds horizontally every 30 ft (9.14 m).

For low scaffolds encompassing an entire room, consult the Company Safety Department for more information.

- When space permits, equip all scaffold platforms with standard 42-inch (106.68-cm) high handrails and midrails that are rigidly secured and completely decked with safety plank or manufactured scaffold decking.
- Use rigidly secured toe boards on all four sides of scaffolds where the area below the scaffold is unrestricted to personnel.
- Where personnel are required to pass underneath a scaffold, provided 1/2-inch (1.27-cm) mesh #18 gauge wire screen between the toe board and rail of the scaffold.
- Wheels or casters shall be properly designed for strength and dimensions to support four (4) times the design working load. All scaffold wheels, casters, and swivels shall be provided with a positive locking device or other means to prevent movement of the scaffold.
- Do not use adjusting or leveling screws on scaffolds equipped with wheels. Adjusting screws, where permitted, must not be extended more than 12 inches (30.48 cm) of thread.
- Never exceed safe working loads on scaffolds.
- Use rolling scaffolds only on smooth, level surfaces or restrict the wheels to wooden or channel iron runners that are level and stabilized.
- Do not make any alterations to any scaffold member by welding, burning, cutting, drilling, or bending.
- Do not stack brick, tile, block, or similar material higher than 24 inches (60.96 cm) on a scaffold deck.
- Never rig from scaffold handrails or braces.
- Keep in mind that parts and sections of patented metal scaffolding from different manufacturers are generally not interchangeable.
- Ensure that swinging stages, toothpicks, boatswain (“bos’n”) chairs, floats, and needle beams are approved by the Company Safety Department and inspected by a qualified person before use.
- Do not use scaffold (or safety) planks as skids, ramps, runways, or workbenches or for purposes other than scaffold decking.
- Before moving special scaffold materials to the site for uses other than those listed in this section, determine any restrictions from the Company Safety Department.
- Do not work on scaffolds during storms or high winds.
- Use fall protection at heights of 6 ft (1.83 m) on all scaffolds.
- Do not exceed a distance of more than 14 inches (38.10 cm) from the structure when building a scaffold around existing structures.
- Fully plank scaffolds.
- Do not erect, move, dismantle, or alter scaffolding except under the supervision of a competent person.

- Ensure that scaffolds are inspected by a competent person before each shift and after any occurrence that could affect the integrity. When problems or damage is found by the competent person, the scaffold must be immediately repaired.
- Do not work on scaffolds covered with snow, ice, or other slippery material.
- Do not allow debris to accumulate on platforms.
- When swinging loads near any scaffold, use a tag line to control the load.
- Do not use ladders or other devices on the scaffold to increase working level height.
- Use cross-bracing as part of a guardrail system if cross-bracing meets the following requirements:
  - Top rail when crossing point is between 38 and 48 inches (96.52 and 121.92 cm)
  - Midrail when crossing point is between 20 and 30 inches (20.80 and 76.20 cm)

Scaffold Capacity Requirements

A scaffold must:

- Be capable of supporting four times maximum intended load, plus its own weight.
- Use suspension ropes that support six times the maximum load.
- Be designed by a qualified person and be constructed and loaded according to the design.
- Not be erected, moved, dismantled, or altered except under the supervision of competent persons.

Platform Construction

Scaffold platforms must meet the following safety requirements:

- Scaffolds must be fully planked on all working levels.
- Spacing between planks must not exceed 1 inch (2.54 cm).
- Each platform and walkway must be at least 18 inches (45.72 cm) wide.
- The decked edge must not be more than 14 inches (35.56 cm) from the work face or 18 inches (45.72 cm) for plastering.
- The platform height shall not exceed three (3) times the smallest dimension of the base.
- Only approved scaffold grade planking may be used.
- Joined planks must overlap one another at least 12 inches (30.48 cm) or be secured at the joint. Overlap must occur at the support.
- Wood platforms must not be covered with opaque finish, that is, paint.
- Scaffold components from different manufacturers must not be intermixed unless approved by a competent person.
- Where leveling of the elevated work platform is required, screw jacks or other similar means for adjusting the height shall be provided in the base section. The screw jack shall extend into its tube leg at least 1/3 of its length, but in no case shall the exposed portion of the screw jack exceed 12 inches or have wheels.

Supporting Scaffolds

The following guidelines must be used to ensure proper scaffold support:

- Scaffolds with a height to base ratio greater than 4 to 1 (4H:1B) must be restrained from tipping.
- Guys must be installed where they support both inner and outer legs.
- Guys must be located a minimum of every 30 ft (9.14 m) horizontally and 26 ft (7.92 m) vertically.
- The top guy must not be further than the 4 to 1 ratio from the top.
- Legs must be supported by base plates, mud sills, or other firm foundations.
- Footings must be level, sound, rigid, and capable of support without settling.
- Scaffolds must be plumb and braced.
- Forklifts and loaders must not be used to support scaffolds.

Scaffold Access

Access to scaffolds must be provided according to the following guidelines:

- Access must be provided for all platforms 2 ft (0.61 m) or more above or below an access point.
- Ladders must be positioned so as to not tip the scaffold.
- Ladders must have rest platforms at intervals of no more than 35 ft (10.67 m) or 12 ft (3.66 m) for scaffold stairways.
- The first step or rung must be within 24 inches (60.96 cm) of the supporting level.

Frame Access Ladders

Frame access ladders must:

- Be designed for use as a ladder
- Have a rung length of at least 8 inches (20.32 cm)
- Have a maximum rung spacing of 16-3/4 inches (42.5 cm)
- Have uniform rung spacing except at joints

Access for scaffold erectors must be provided, but cross braces are not to be used as a means of access.

Falling Object Protection

Employees working on and around scaffold must be protected from falling objects. Toe boards are required on all platforms 6 ft (1.83 m) or more above the lower level. If material extends above the toe board, one of the following must occur:

- A screen (netting) must be installed.
- The area below must be barricaded off.
- A canopy must be installed over any walkways that must remain open.

Electrical Hazards

Inspect the area for all electrical hazards before erecting scaffolds. If an electrical hazard is present, notify the power company to de-energize or relocate the line. Minimum clearance from a power line is 10 ft (3.05 m), unless it is a high voltage line (requiring additional clearance).

Mobile Scaffolds

Observe the following safety requirements for mobile scaffolds:

- Do not construct or use mobile scaffolds that exceed a height to base ratio of 4 to 1 (4H:1B).
- Do not ride mobile scaffolds while they are moving.
- Secure or remove all materials and equipment from the platform before moving.
- Ensure that casters are pinned to the scaffold and locked at all times, except when moving.
- Use mobile scaffolds only on a firm and level surface.
- Never use side arm brackets.
- Provide diagonal bracing on the first level and at 20-ft (6.10-m) intervals thereafter.
- Provide a safe access to all mobile scaffolding.
- Restrain all joints from separation and cleat or secure all planks.

Training Requirements

Scaffold training is required:

- For all employees who will be working on scaffolds.
- For all employees erecting scaffolds.
- When work site changes present a new hazard.
- When equipment is changed.
- When trained employees demonstrate a lack of understanding.

All scaffold erectors must be trained with regard to:

- Scaffold hazards.
- Correct scaffold erection procedures.
- Load carrying capacity.
- Design and use criteria for the various types of scaffolds.

All employees working on scaffolds must be trained with regard to:

- Electrical hazards.
- Fall hazards.
- Falling object hazards.
- Use of the scaffold.

- Material handling.
- Load carrying capacities.

Scaffold Inspection and Tagging System

Scaffolds must be inspected before each use by a competent person. The competent person uses a tagging system on the scaffolds. The tagging system allows employees to know if the scaffold is safe to use, if proper fall protection has been built into the scaffold, or if the employee must wear a full body harness and lanyard to work off the scaffold. The competent person completes the Scaffold Inspection Log Form for all inspections. Refer to this form located at the end of this chapter.

Definition of Tags

Green Tag—The scaffold is complete. It has been built to conform to OSHA standards. Fall protection has been built into the scaffold.

Yellow Tag—The scaffold is complete. It has been built to conform to OSHA standards. Due to an obstruction, all fall protection could not be built into the scaffold. When working from this scaffold, it will be necessary to wear a full body harness and tie off for your fall protection.

Red Tag—The scaffold is incomplete. Do not work on a red tag scaffold. Only the trained scaffold crew involved in erection or dismantling may work on this scaffold.

Suspended Scaffolds, Platforms, and Manufactured Staging

These types of platforms are frequently found in the industrial workplace. They range in size from a one-person work platform to larger work platforms that are capable of supporting many employees. Regardless of size, they have common safety requirements that must be met. These requirements are:

- Work platforms must be load rated for capacity. On manufactured staging and suspended platforms, the load has been calculated, design tested, and approved by a testing laboratory before the load capability was stamped on the machine. When designing and building suspended platforms, each component should be load tested, and the load weight must be calculated to assign a safe working capacity. No individual component can have less than a 4:1 safety factor.
- Work platforms can be suspended by fiber or wire ropes with a 6:1 safety factor. Where acidic conditions are present or when cutting, burning, or welding is being performed, only wire rope may be used.
- Hooks, clips, and attachment devices must be load rated. Manufactured devices should be stamped with the rated working capacity and information provided from the vendor upon purchase. All attachments must have proper safety clips to avoid inadvertent detachment.
- Each worker must be protected from falling by a safety harness attached to an independent lifeline. The lifeline must be securely attached to substantial members of the structure. The attachment must be capable of supporting a minimum of 5,000 lb (2,268.00 kg) or three times the arresting load.
- In some instances, the work platform might require being securely lashed to the structure to prevent swaying.
- Before an employee may work on a suspended scaffold, platform, or manufactured staging, the foreman must provide safety instructions for its safe use. This training must be documented.

Sample 31-1. Scaffold Inspection Form

SCAFFOLD INSPECTION FORM

DATE TIME	SCAFFOLD SUPERVISOR	ERECTED BY	LOCATION	TAG #	SCAFFOLD ACCEPTABLE	CONDITION UNACCEPTABLE

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Fall Prevention and Protection Guidelines

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

Definitions

Anchorage—A secure point of attachment for lifelines, lanyards, or deceleration devices. Anchorages used for attachment of personal arrest equipment shall be independent of any anchorage being used to support or suspend platforms and capable of supporting at least 5,000 pounds per employee attached.

Cleat—Any of the following:

- A structural block used at the end of a platform to prevent the platform from slipping off its supports.
- A series of blocks used to provide footing on sloped surfaces, such as crawling boards or ramps.
- A ladder crosspiece or rectangular cross-section placed on edge and on which a person can step while ascending or descending a ladder.

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

Connector—A device used to couple (connect) parts of the personal fall arrest system and positioning device systems. The connector may be an independent component of the system, such as a carabineer, or it may be an integral component of part of the system.

Controlled Access Zone (CAZ)—An area in which certain work (leading edge) may occur without the use of conventional fall protection systems and where access is controlled.

Deceleration distance—The additional vertical distance a falling employee travels before stopping from the point at which the deceleration device begins to operate. This distance is measured as the distance between the location of an employee's full body harness attachment point at the moment the deceleration device activates (at the onset of fall arrest forces) and the location of that attachment point after the employee comes to a full stop.

Double-cleat ladder—A ladder similar in construction to a single-cleat ladder but with a center rail to allow simultaneous two-way traffic for employees ascending or descending.

Equivalent—Alternative designs, materials, or methods to protect against a hazard that can be demonstrated to provide an equal or greater degree of safety for employees than the methods, materials, or designs specified in the standard.

Failure—Load refusal, breakage, or separation of component parts. Load refusal is the point where the structural members lose their ability to carry the loads.

Fixed ladder—A ladder that cannot be readily moved or carried because it is an integral part of a building or structure.

Free fall—The act of falling before a fall arrest system applies force to stop the fall.

Free fall distance—The vertical displacement of the fall arrest attachment point on the employee's full body harness between onset of the fall and just before the system applies force to stop the fall. This distance excludes deceleration distance and lifeline or lanyard elongation but includes any deceleration device slide distance or self-retracting lifeline or lanyard extension before fall arrest forces occur.

Full body harness—Straps that are secured about the employee in a manner that distributes the fall arrest forces over the thighs, pelvis, waist, chest, and shoulders and have means for attaching the harness to other components of a personal fall arrest system.

Guardrail system—A vertical barrier consisting of, but not limited to, top rails, midrails, and posts erected to prevent employees from falling off a scaffold, platform, or walkway.

Hole—A gap or void 2 inches (5.08 cm) or more in its least dimension in a floor, roof, or other walking or working surface.

Infeasible—A term indicating that it is impossible to perform the construction work using a conventional fall protection system (guardrail, safety net, or personal fall arrest system) or that it is technologically impossible to use any one of these systems to provide fall protection.

Job-made ladder—A ladder fabricated by employees, typically at the construction site, and not commercially manufactured.

Landing—A platform installed at the end of a ladder to provide a safe location for employees to step off the ladder.

Lanyard—A flexible line of rope, wire rope, or strap that generally has a connector at each end for attaching a positioning belt or full body harness to a deceleration device, lifeline, or anchorage.

Leading edge—The edge of a floor, roof, or formwork for a floor or other walking or working surface (such as the deck) that changes location as additional floor, roof, decking, or formwork sections are placed, formed, or constructed. A leading edge is considered to be an "unprotected side and edge" during periods when it is not actively and continuously under construction.

Lifeline—A component that consists of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline) or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline) and serves as a means for connecting components of a personal fall arrest system to the anchorage.

Lower levels—The area below the level where the employee is working and to which an employee can fall. Such areas include ground levels, floors, roofs, ramps, runways, excavations, pits, tanks, and other surfaces, as well as materials, water, and equipment. The term does not include the surface from which the employee falls.

Low-slope roof—A roof having a slope less than or equal to 4V:12H (4 vertical to 12 horizontal).

Maximum intended load—The total load of all persons, equipment, tools, materials, transmitted loads, and other loads reasonably anticipated to be applied to a ladder component, scaffold, or scaffold component at any time.

Mechanical equipment—All motorized or manual wheeled equipment used for roofing work, except wheelbarrows and mop carts.

Open sides and ends—The edges of a scaffold or platform that are more than 14 inches (35.56 cm) away horizontally from a sturdy, continuous, vertical surface (such as a building wall), a sturdy, continuous horizontal surface (such as a floor), or a point of access.

Opening—A gap or void 30 inches (76.20 cm) or more high and 18 inches (45.72 cm) or more wide in a wall or partition through which employees can fall to a lower level.

Overhand bricklaying and related work—The process of laying bricks and masonry units such that the surface of the wall to be jointed is on the opposite side of the wall from the mason, requiring the mason to lean over the wall to complete the work. Related work includes mason-tending and electrical installation incorporated into the brick wall during the overhand bricklaying process.

Personal fall arrest system—A system used to arrest an employee in a fall from a walking or working level. The system consists of an anchorage, connectors, a body belt, or full body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these.

Platform—A work surface elevated above lower levels.

Positioning device system—A body belt or full body harness system rigged to support an employee on a vertical surface, such as a wall, allowing the employee to work with both hands free while leaning back against the belt or harness.

Portable ladder—A ladder that can be readily moved or carried.

Qualified—A term applicable to an individual who, by possession of a recognized degree, certificate, or professional standing, or who, by extensive knowledge, training, and experience, has successfully demonstrated an ability to solve or resolve problems related to the subject matter, work, or project.

Roof—The exterior surface on the top of a building. The roof does not include floors or formwork that, because a building has not been completed, temporarily becomes the top surface of a building.

Roofing work—The hoisting, storage, application, and removal of roofing materials and equipment, including related insulation, sheet metal, and vapor barrier work but not including the construction of the roof deck.

Rope grab—A deceleration device that travels on a lifeline and automatically, by friction, engages the lifeline and locks to arrest the fall of an employee.

Safety monitoring system—A safety system in which a competent person is responsible for recognizing and warning employees of fall hazards.

Scaffold—Any temporary, elevated platform (supported or suspended) and its supporting structure (including points of anchorage) used for supporting employees, materials, or both.

Scaffold grade lumber—Lumber graded for scaffold plank used under standards of the West Coast Lumber Inspection Bureau or deemed by the Southern Pine Inspection Bureau as suitable for a bending stress of at least 1,910 psi.

Selected grade lumber—Lumber graded under standards of the West Coast Lumber Inspection Bureau or deemed by the Southern Pine Inspection Bureau as suitable for a bending stress of 1,500 psi.

Self-retracting lifeline/lanyard—A deceleration device containing a drum-wound line that can be slowly extracted from, or retracted onto, the drum under slight tension during normal employee movement, and which, after the onset of a fall, automatically locks the drum and arrests the fall.

Single-cleat ladder—A ladder consisting of a pair of side rails connected by cleats, rungs, or steps.

Snaphook—A connector consisting of a hook-shaped member with a normally closed keeper, or similar arrangement, that can be opened to allow the hook to receive an object and, when released, automatically closes to retain the object.

Steep roof—A roof having a slope greater than 4V:12H (4 vertical to 12 horizontal).

Toe board—A low protective barrier that is designed to prevent the fall of materials and equipment to lower levels.

Unprotected sides and edges—Any side or edge (except at entrances to points of access) of a walking or working surface 6 ft (1.83 m) or higher above which there is no guardrail, safety net, or personal fall arrest system.

Unstable objects—Items whose strength, configuration, or lack of stability can allow them to become dislocated and therefore might not properly support the loads imposed on them.

Walking or working surface—Any horizontal or vertical surface on which an employee walks or works, including but not limited to scaffolds, platforms, floors, roofs, ramps, bridges, runways, formwork, and concrete reinforcing steel. Walking or working surfaces do not include ladders or vehicles.

Warning line system—A barrier erected on a low-slope roof to warn employees that they are approaching an unprotected roof side or edge and designate an area in which roofing work may occur without the use of conventional fall protection systems.

Work area—The portion of a walking or working surface where job duties are being performed.

General Requirements

These guidelines establish the minimum fall prevention and protection requirements for all employees working at or over 4 ft (1.2 m) above the ground or the next lower level. They contain requirements for fall protection from structures, ladders, scaffolds, and aerial lifts. Fall protection may be required at lower levels if employees are exposed to other hazards.

These guidelines do not apply to steel erection. These guidelines also do not apply to the construction of electrical transmission and distribution systems and structures when the work is being performed by qualified employees.

The intent of these guidelines is to prevent employees from falling off, onto, or through working levels and to provide protection from falling objects. The methods found in these guidelines are not the only methods by which protection can be achieved, and these guidelines and systems do not provide protection for every situation encountered in the workplace. Any questions about how to use these guidelines or proposals for alternative guidelines for a specific situation should be presented to the Company Safety Department.

The following guidelines for fall protection and prevention must be observed:

- The Company must determine whether walking or working surfaces can support workers safely. All required fall protection systems are to be provided and installed before beginning the work that requires the fall protection.
- Employees on walking or working surfaces with unprotected sides or edges 4 ft (1.2 m) or more above the ground or a lower level must be prevented from falling by the use of a guardrail, handrail, safety net, personal fall arrest system, or positioning device system.

  These requirements apply to all elevated walking and working surfaces, including, but not limited to, leading edges, hoist areas, holes, the face of formwork and reinforcing steel, ramps, runways and walkways, areas above or next to dangerous equipment, scaffolding, roofs, precast concrete structures, overhand bricklaying, and wall openings, where the hazard of falls is present.
- When it is infeasible or creates a greater hazard to install conventional fall protection systems to protect employees working on a leading edge or engaged in precast concrete erection or residential construction, a site-specific fall protection plan may be developed and carried out.
- When fall protection is required on low slope roofs, conventional fall protection systems may be used alone or warning lines may be used in combination with any of the following protection systems:
  - Guardrails
  - Safety nets
  - Personal fall arrest system
  - Fall Protection Plan
    - Controlled access zone
    - Warning line system
    - Safety monitoring system
- When employees are working below an elevated work area and toe boards do not provide sufficient protection from falling objects, screens, nets, mesh, or canopies must be installed for a distance sufficient to protect employees below.
- Where tools, equipment, or materials are piled higher than the top edge of a toe board, paneling or screening must be erected from the walking or working surface or toe board to the top of a guardrail system's top rail or midrail for a distance sufficient to protect employees below.
- When canopies are used as falling object protection, they must be strong enough to prevent collapse and penetration by any objects that may fall onto the canopy.

Fall Protection Systems and Practices

Guardrail Systems

When used for fall protection, guardrail systems must consist of top rails, midrails, toe boards, and posts erected or constructed according to the following requirements:

- Guardrail systems must be capable of withstanding, without failure, a force of at least 200 lb applied within 2 inches (5.08 cm) of the top edge, in any outward or downward direction at any point along the top edge.
- The surface of the guardrail system must be maintained to prevent injury to an employee from punctures or lacerations and to prevent snagging of clothing.
- The top edge height of top rails, or equivalent guardrail system members, must be 42 to 45 inches (106.68 to 114.30 cm) above the walking or working level.
- The ends of all top rails and midrails must not overhang the terminal post, except where they do not cause a projection hazard.
- The midrails must be installed at a height midway between the top edge of the guardrail system and the walking or working level.
- Midrails, screens, mesh, intermediate vertical members, solid panels, and equivalent structural members must be capable of withstanding, without failure, a force of at least 150 lb (68.04 kg) applied in any downward or outward direction at any point along the midrail or other member.
- The toe boards must be at least 3-1/2 inches (3.89 cm) in height and must be installed within 1/4 inch (0.64 cm) of the walking or working surface.
- Toe boards must be capable of withstanding, without failure, a force of at least 50 lb (22.68 kg) applied in any downward or outward direction at any point along the toe board.
- The posts must be spaced at intervals of 8 ft (2.44 m) or less.
- Several combinations of materials that can be used to construct guardrail systems. When constructed according to the preceding height, strength, and spacing requirements, the following combinations are acceptable:
    - Wooden guardrails must be made of selected grade lumber that is free of damage. The top rails and posts must be at least 2 x 4 inches (5.08 x 10.16 cm) (nominal), and the midrails must be at least 1 x 6 inches (1.25 x 15.24 cm).
    - Pipe guardrails must be made of Schedule 40 pipe. The top rails, midrails, and posts must have at least a 1-1/2 inch (3.81 cm) nominal diameter.
    - Structural steel guardrails must be made of angle iron. The top rails, midrails, and posts must have at least 2 x 2-inch (5.08 x 5.08-cm) angles.
    - Wire rope may be substituted for top rails and midrails but must be at least 1/4-inch (0.64-cm) nominal diameter or thicker. Wire rope used for top rails must be kept tight enough so that a 200-lb (90.72-kg) load will not deflect the line to less than 39 inches (99.06 cm) above the walking or working surface. Wire rope top rails must be flagged with high-visibility material at 6-ft (1.83-m) intervals.

Safety Net Systems

When used for fall protection, safety net systems must be installed or erected according to the following requirements:

- Safety nets must be installed, moved, altered, or removed under the direct supervision of a competent person.
- Safety nets must be installed as close as practicable under the walking or working surface on which employees are working, but never more than 30 ft (9.14 m) below, and the potential fall area to the net must be unobstructed.
- Safety nets must be installed with sufficient clearance under them to prevent contact with the surface or structures below, when subjected to the drop test.
- Safety nets and their installation must be drop tested at the jobsite after initial installation and before being used as a fall protection system, whenever moved, after major repair, and, if left in one place, at six-month intervals.
- The drop test must consist of a 400-lb (181.44 kg) bag of sand, 30 (plus or minus 2) inches (76.2 ± 5.08 cm) in diameter, dropped into the net from the highest walking or working surface at which employees are exposed to the fall hazard, not from less than 42 inches (106.68 cm) above that level.
- If doing the drop test is unreasonable, a competent person must certify that the net and its installation will provide sufficient clearance and absorb an impact force equal to that of the drop test before the net is used as a fall protection system. The certification must include:
  - A description of the net and its installation.
  - A statement indicating that it was installed correctly.
  - The date of installation.
  - The name and signature of the person making the certification.

A copy of the certification must be kept at the jobsite and made available for inspection.

- Safety nets and their components must be inspected by a competent person at least once per week for wear, damage, and other deterioration. An inspection also must be made after any occurrence that affects the integrity of the system.
- The maximum size of each net mesh opening must not exceed 36 in^2 (232.26 cm^2) or be longer than 6 inches (15.24 cm) on any side, and the opening, measured center-to-center of mesh ropes or webbing, must not be longer than 6 inches (15.24 cm). All mesh crossings must be secured to prevent enlargement of the openings.
- Each net must have a border rope for webbing, with a minimum breaking strength of 5,000 lb (2,268.00 kg).
- Connections between net panels must be as strong as integral net components and must be spaced not more than 6 inches (15.24 cm) apart.

- Materials, scrap pieces, equipment, and tools that have fallen into the safety net system must be removed as soon as possible and at least before the start of the next shift.
- Safety nets must extend outward from the outermost projection of the work surface as shown in Table 32-1.

Table 32-1. Minimum Requirements for Outward Extension of Safety Nets

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 ft	8 ft
More than 5 ft up to 10 ft	10 ft
More than 10 ft	13 ft

Personal Fall Arrest and Positioning Device Systems

When used for fall protection, personal fall arrest and positioning device systems must be used according to the following requirements:

- Rescue plans must be established before workers enter a walking or working surface for a prompt rescue of employees in case of a fall, unless it has been determined that employees can rescue themselves.
- Full body harnesses and all associated attachments must be labeled and must meet the requirements in ANSI Z 359.1. A body belt must not be used as part of a fall arrest system.
- Connectors must be drop forged, pressed or formed steel or made of materials of equivalent strength. They must have a corrosion-resistant finish, and their surfaces and edges must be smooth to prevent damage to other system components.
- D-rings and snaphooks must have a minimum tensile strength of 5,000 lb (2,268.00 kg). They must have been proof tested by the manufacturer to a minimum tensile load of 3,600 lb (1,632.96 kg) without cracking, breaking, or sustaining permanent deformation.
- Snaphooks must be of the locking type, sized to fit with the member to which they connect, and designed and used to prevent disengagement.
- Horizontal lifelines must be designed, installed, and used under the supervision of a qualified person as part of a complete personal fall arrest system that maintains a safety factor of at least 2:1. On work platforms where, because of an accident, a horizontal lifeline may become vertical, the device (such as a rope grab) used to connect to the lifeline can lock in both directions.
- Ropes and straps used in lanyards, lifelines, and components of body harnesses must be made from synthetic fibers. Lanyards and vertical lifelines must be protected against cuts or abrasions and have a minimum breaking strength of 5,000 lb (2,268.00 kg). When using vertical lifelines, each employee must use a separate lifeline.
- Self-retracting lifelines and lanyards that automatically limit free fall distance to 2 ft (0.61 m) or less must be capable of sustaining a minimum tensile load of 3,000 lb (1,360.80 kg) applied to the device with the lifeline or lanyard in the fully extended position.

- Self-retracting lifelines and lanyards that do not limit free fall distance to 2 ft (0.61 m) or less, ripstich lanyards, and tearing and deforming lanyards must be capable of sustaining a minimum tensile load of 5,000 lb (2,268.00 kg), applied to the device with the lifeline or lanyard in the fully extended position.
- Anchorages used for attachment of personal fall arrest equipment must be independent of any anchorage being used to support or suspend platforms and capable of supporting at least 5,000 lb (2,268.00 kg) per employee attached.
- Personal fall arrest systems must do all of the following when stopping a fall:
  - Limit maximum arresting force on an employee to 1,800 lb (816.67 kg).
  - Be rigged so that an employee cannot free-fall more than 6 ft (1.83 m) or contact any lower level.
  - Bring an employee to a complete stop and limit maximum deceleration distance an employee travels to 3-1/2 ft (1.07 m).
  - Have enough strength to withstand twice the potential impact energy of an employee free-falling 6 ft (1.83 m) or the free fall distance allowed by the system, whichever is less.
- The attachment point of a full body harness used for fall protection must be in the center of the back near shoulder level or above the head.
- Harnesses and other fall arrest equipment may never be used for hoisting materials.
- Personal fall arrest systems and components subjected to impact loading must be immediately removed from service and not used until inspected and determined to be undamaged and suitable for service by a competent person.
- Personal fall arrest systems must be inspected before each use for wear, damage, or other deterioration. Defective components must be removed from service.
- Personal fall arrest systems must not be attached to guardrail systems.
- When personal fall arrest systems are used at hoist areas, they must be rigged to allow the movement of the employee only to the edge of the walking or working surface.
- Positioning devices must be rigged such that an employee cannot free-fall more than 2 ft (0.61 m) and must be secured to an anchorage capable of supporting at least twice the potential impact load of an employee's fall or 3,000 lb (1,360.80 kg), whichever is greater.

Fall Protection Plan Option

A fall protection plan can be used only when employees are engaged in leading edge work, precast concrete erection work, or residential work and it can be proven that it is infeasible or creates a greater hazard to use conventional fall protection equipment.

If the Company determines that a fall protection plan is appropriate, the Company must document that decision.

The fall protection plan must be prepared by a qualified person and developed specifically for the site where the work is being done. The plan must be kept current. The Fall Protection Selection Matrix may be used as a guideline when preparing a site-specific plan. Refer to this document located at the end of this chapter.

At a minimum, the fall protection plan must contain the following information:

- Reasons why conventional fall protection systems are infeasible or would create a greater hazard.
- A written discussion of other measures to be taken to reduce or eliminate the fall hazard (scaffolds, ladders, aerial lifts, and so on).
- Locations where conventional fall protection measures cannot be used. These locations must then be classified as CAZs.
- The names or other methods of identifying each employee designated to work in a CAZ. Only those designated employees may enter a CAZ.

Where no other alternate measure has been carried out, a safety monitoring system must be used.

A copy of the fall protection plan must be maintained at the jobsite whenever conventional fall protection systems are not being used. A sample fall protection plan located at the end of this chapter can be used as an example of the items that should be identified in the plan. The fall protection plan must be implemented under the supervision of a competent person.

Controlled Access Zones

When CAZs are used to control access to areas where leading edge, precast concrete erection, overhand bricklaying, or related work is taking place, the CAZ must be defined by a control line or other means that restricts access.

- When used to control access to areas where leading edge and other operations are taking place, the control lines are to be erected no fewer than 6 ft (1.83 m) or more than 25 ft (7.62 m) from the unprotected or leading edge, except when erecting precast concrete members.
- When erecting precast concrete members, the control line is to be erected no fewer than 6 ft (1.83 m) or more than 60 ft (18.29 m), or half the length of the member being erected, whichever is smaller, from the leading edge.
- When used to control access on leading edge or precast concrete erection operations, the control line must:
  - Extend along the entire length of the unprotected or leading edge.
  - Be approximately parallel to the unprotected or leading edge.
  - Be connected on each side to a guardrail system or wall.
- When used to control access to areas where overhand bricklaying and related work are taking place, the control lines must be erected no fewer than 10 ft (3.05 m) or more than 15 ft (4.57 m) from the working edge.
- When used to control access to areas where overhand bricklaying and related work are taking place, the control line must extend a far enough distance to enclose the employees and be approximately parallel to the working edge.

- Control lines must consist of ropes, wires, tapes, or equivalent materials with a minimum breaking strength of 200 lb (90.72 kg) and be rigged and supported so that the line is between 39 and 45 inches (99.06 and 114.30 cm) above the walking or working surface.
- Control lines must be flagged or otherwise clearly marked with high-visibility material at intervals of not more than 6 ft (1.83 m).

Warning Line Systems

Warning line systems may be used only when employees are engaged in roofing work on low-slope roofs, and the following guidelines must be observed:

- The warning line must be erected around all the unguarded sides of the roof work area.
- Warning lines must consist of ropes, wires, or chains with a tensile strength of 500 lb (226.80 kg) supported by stanchions so that the line is between 34 and 39 inches (99.06 and 114.30 cm) above the walking or working surface. Warning lines must be flagged or otherwise clearly marked with high-visibility material at intervals of not more than 6 ft (1.83 m).
- Warning line stanchions must be erected so that they resist, without tipping over, a force of at least 16 lb (7.26 kg) applied horizontally outward against the stanchion, 30 inches (76.20 cm) above the walking or working surface.
- When mechanical equipment is not used, the warning lines must be erected at least 6 ft (1.83 m) from the roof edges. If mechanical equipment is used, the warning lines must be at least 6 ft (1.83 m) from the roof edge that is parallel to the direction of mechanical equipment operation and at least 10 ft (3.05 m) from the roof edges perpendicular to the direction of mechanical equipment operation.
- Points of access, material handling areas, storage areas, and hoisting areas must be connected to the work area by an access path formed by two warning lines. When the path is not in use, it must be closed with a warning line or barricade or be offset to prevent employees from walking directly into the work area.

Safety Monitoring Systems

Safety monitoring systems may only be used when employees are engaged in roofing activities on low-slope roofs or as part of a written fall protection plan, and the following guidelines must be observed:

- When a safety monitoring system is used, a competent person, capable of recognizing fall hazards, must be designated as Safety Monitor. The Safety Monitor’s duties include:
  - Warning employees when they are approaching the open edge unsafely.
  - Warning employees if a dangerous situation is developing that cannot be seen by the CAZ workers.
  - Making the CAZ workers aware that they are in a dangerous area.
  - Warning employees that seem unaware of a hazard or are acting unsafely.
  - Stopping the work process if communication with the CAZ workers is disrupted.

- The Safety Monitor must not have other responsibilities that could take his or her attention from these functions.
- Mechanical equipment may not be used or stored in areas where safety monitoring systems are being used to monitor employees.
- Employees working in a CAZ must be instructed to comply with fall hazard warnings from Safety Monitors.

On low-slope roofs up to 50 ft (15.24 m) in width, a safety monitoring system may be used alone.

Holes and Covers

Covers for holes in floors, roofs, and other walking or working surfaces must meet the following requirements:

- Covers located in roadways and vehicular aisles must be capable of supporting, without failure, at least twice the maximum axle load of the largest vehicle expected to cross over the cover.
- All other covers must be capable of supporting without failure, at least twice the weight of employees, equipment, and materials that may be set on the cover.
- All covers must be secured when installed to prevent accidental displacement by wind, equipment, or employees.
- All covers must be color-coded or marked with the word “HOLE” or “COVER” to provide warning of the hazard.

Training Requirements

Each employee who might be exposed to fall hazards must be trained by a competent person qualified in the following areas:

- The nature of fall hazards in the work area
- The correct procedures for erecting, maintaining, disassembling, and inspecting the fall protection systems to be used
- The use and operation of guardrails, personal fall arrest systems, safety nets, warning line systems, safety monitoring systems, CAZs, and other protection methods and equipment
- The role of employees when using a safety monitoring system
- The limitations on the use of mechanical equipment when roofing work is being performed on low-sloped roofs
- The correct procedures for handling and storage of equipment and materials and the erection of overhead protection
- The role of employees in fall protection plans
- The federal and state regulations relating to this program

A written certification record, containing the name of the employee trained, the name and signature of the person who conducted the training, and the date training was completed must be maintained.

If there is any reason to believe that an employee lacks the skill or understanding necessary for safe operation on the jobsite, the employee must receive additional training in the areas listed in this section.

Ladders

- Ladders must be of proper size, design, and condition for their intended use and must not be used as work platforms. Ladders with bent, broken, or damaged rungs or side rails must be removed from service. Side rails of job-made ladders must be constructed of dressed, selected grade lumber or the equivalent and can only have knots less than 1/2 inch (1.27 m) in diameter that appear only on the wide face and are at least 1/2 inch (1.27 m) from either edge. If side rails must be spliced to attain the required length, the splice must provide the full strength of a continuous side rail of the same length.
- Side rails of single-cleat ladders up to 16 ft (4.88 m) long must be made of 2 x 4-inch (5.08 x 10.16-cm) lumber. Side rails of single-cleat ladders from 16 to 30 ft (4.88 x 9.14 m) in length must be made of 3 x 6-inch (7.62- x 15.24-cm) lumber.
- Side rails and middle rails of double-cleat ladders up to 12 ft (3.66 m) long must be made of 2 x 4-inch (5.08 x 10.16-cm) lumber. Side rails and middle rails of double-cleat ladders from 12 to 24 ft (30.48 to 60.96 m) in length must be 2 x 6-inch.(5.08 x 15.24-cm) lumber.
- Cleats of job-made ladders must be clear, straight-grained, and free from knots of any size that appear in the narrow face. Knots appearing in the wide faces of cleats must not exceed a diameter of 1/4 inch (0.64 cm). Cleats must be uniformly spaced within 1/4 inch (0.64 cm) tolerance and not farther apart than 12 inches (3.66 m) measured from the tops of cleats.
- Cleats of job-made ladders must be inset into the edge of the side rails 1/2 inch (1.27 cm), or fill blocks must be used on the rails between the cleats. The cleats must be secured to each rail with three 10d common wire nails or other fasteners of equivalent strength. Double-head nails must not be used for ladder construction.
- Single-cleat ladders must not exceed 30 ft (9.14 m) in length between the base and top landing. If the length required exceeds these maximum lengths, two or more ladders must be used, offset with a landing or platform between each ladder. Guardrails and toe boards must be erected on the exposed sides of the platforms.
- If a job-made ladder provides the only means of access to a work area for 25 or more employees or if simultaneous two-way traffic is expected, a double-cleat ladder must be installed. Double-cleat ladders must not exceed 24 ft (7.32 m) in length.
- Single-cleat ladders must have at least 15 inches (38.1 cm), but not more than 20 inches (50.80 cm), between rails. Double-cleat ladders must have at least 18 inches (45.72 cm), but not more than 22 inches (55.88 cm), between rails.
- Portable ladders must extend at least 36 inches (91.44 cm) above the top landing or be secured at the top and equipped with a grabrail. Fixed ladders must extend at least 42 inches (106.68 cm) above the top of access.
- All portable ladders must be placed on substantial footing and be tied, blocked, or otherwise secured to prevent displacement.
- Metal ladders must not be used if there is exposure to electrical or explosive hazards.

- Extension ladders must not exceed 44 ft (13.41 m) in length when extended. When extended, the ladder sections must have the following minimum overlaps:
    - Two-section ladders—3 ft (0.91 m) for working lengths of up to 33 ft (10.06 m) and 4 ft (1.22 m) for working lengths of 33 to 44 ft (10.06 to 13.41 m)
    - Three-section ladders—4 ft (1.22 m) for each section
- Each employee using ladders must be trained, by a competent person, to recognize hazards related to ladders and must know the procedures to be followed to reduce these hazards. The training must include as applicable, the following information:
    - The nature of fall hazards in the work area
    - The correct procedures for erecting, maintaining, and disassembling the fall protection systems to be used
    - The proper construction, use, placement, and handling of ladders
    - The maximum intended load-carrying capacities of ladders
    - The federal and state regulations relating to this program
- If there is any reason to believe that an employee lacks the skill or understanding necessary for the safe operation on the jobsite, the employee must receive additional training in the areas listed in this section.

See Chapter 31, “Ladders and Scaffolds,” for additional information about ladder safety requirements.

Scaffolding

Scaffolding must meet the following safety requirements:

- The footing or anchorage for scaffolds must be sound, rigid, and capable of carrying the maximum intended load without settling or displacement. Unstable objects, such as barrels, boxes, loose brick, or concrete blocks must not be used to support scaffolds or planks.
- Scaffolds and scaffold components must be inspected by a competent person before each work shift and after any occurrence that could affect the structural integrity of the scaffold.
- Any scaffold or scaffold component identified as damaged or defective during any inspection must be immediately repaired, replaced, or removed from service until repaired.
- Scaffolds must be erected, moved, dismantled, or altered under the supervision of a competent person.
- Scaffolds and their components must be capable of supporting at least four times the maximum intended load.

- Standard guardrails are required along all open sides and ends of scaffolds and platforms of any kind that are 6 ft (1.83 m) or more above the ground or other walking or working level.
- All planking or platforms must be overlapped by a minimum of 12 inches (30.48 cm) or secured (cleated) from movement.
- Scaffold planks must extend over their end supports at least 6 inches (15.24 cm) but not more than 12 inches (30.48 cm).
- The platform width for any work level must not be less than 20 inches (50.80 cm).
- A climbing ladder or stairway must be provided for proper entry and exit. The ladder or stairway must be anchored or built into the scaffold and located so its use will not tip the scaffold. A landing platform must be provided at intervals of not more than 30 ft (9.14 m).
- A tag line is required to control materials being hoisted onto a scaffold.
- All load-carrying timber members of scaffold framing must be selected grade lumber. All planking must be scaffold grade lumber or equivalent.
- The poles, legs, or uprights of scaffolds must be plumb and securely and rigidly braced to prevent swaying and displacement.
- Employees must not ride on scaffolds while they are being moved horizontally, unless a registered professional engineer designed the scaffold for movement.
- Each employee who works on or near a scaffold must be trained by a qualified person to recognize, control, and reduce the hazards associated with the use of the type of scaffold being used. The training must cover the following information:
  - The nature of the hazards in the work area
  - The correct procedures for dealing with those hazards
  - The proper uses of the scaffold and proper handling of materials on the scaffold
  - The maximum intended load and the load-carrying capacities of the scaffold
  - Any other pertinent job information or requirements
- Each employee who is involved in erecting, disassembling, moving, operating, repairing, maintaining, or inspecting a scaffold must be trained by a competent person to recognize and control or reduce the hazards associated with the work being performed. The training must include the following information:
  - The nature of scaffold hazards
  - The correct procedures for erecting, disassembling, moving, operating, repairing, maintaining, or inspecting the type of scaffold being used
  - The design criteria, the maximum intended load and load-carrying capacity, and the intended use of the scaffold
  - Any other pertinent job information or requirements

- If there is any reason to believe that an employee lacks the skill or understanding necessary for the safe erection, use, or dismantling of scaffolds, the employee must receive additional training to increase the skill or understanding. Retraining is required in the following situations:
  - When changes at the jobsite present new hazards
  - When changes in the type of scaffold, fall protection, falling object protection, or other equipment present hazards
  - When inadequacy in an employee's work suggests that the employee has not retained the required skills or understanding

See Chapter 31, "Ladders and Scaffolds," for additional information about scaffold safety requirements.

Sample 32-1. Fall Protection Selection Matrix

FALL PROTECTION SELECTION MATRIX

	Guardrail Systems	Safety Net Systems	Personal Fall Arrest Systems	Positioning Device Systems	Fences and Barricades	Covers	Controlled Access Zones	Warning Line Systems	Toe Boards or Screens	Canopy Structures	Warning Line Plus Other System	Hard Hats	Notes
Leading Edges	●	●	●										1
Leading Edges (for Workers Not Involved in Leading Edge Work)	●	●	●										1, 2
Unprotected Sides	●	●	●										
Hoist Areas	●		●										3
Holes	●		●			●							4
Formwork and Reinforcing Steel		●	●	●									
Excavations Not Readily Seen because of Plant Growth or Other Visual Barriers	●				●								
Wells, Pits, or Shafts	●				●	●							
Dangerous Equipment	●	●	●										
Overhand Bricklaying and Related Work	●	●	●				●						5, 6
Roofing Work on Low-Sloped Roofs	●	●	●					●			●		7, 8
Steep Roofs	●	●	●										
Precast Concrete Erection	●	●	●										
Wall Openings	●	●	●										1
Walking/Working Surfaces Not Otherwise Addressed	●	●	●										
Protection from Falling Objects	●				●	●			●	●		●	

1. When it can be proven that using conventional fall protection systems is unfeasible or creates a greater hazard, the employer must develop and implement a fall protection plan.
2. If a guardrail system is chosen to provide fall protection, and a Controlled Access Zone has already been established for leading edge work, a warning line may be used in lieu of a guardrail that parallels the leading edge.
3. If a guardrail system, or portions thereof, is removed to facilitate hoisting operations, and the worker must lean through the access opening or out over the edge of the access opening, the worker must use a personal fall arrest system.
4. All holes (including skylights) must be protected by covers to prevent workers from tripping or falling into the hole and to prevent objects form falling through the hole and striking a worker.
5. When the worker reaches more than 10 in. below the walking/working surface, the use of a Controlled Access Zone is not an accepted means of fall protection.
6. Bricklaying operations performed on scaffolds are regulated by OSHA Standard 1926 Subpart L - Scaffolds.
7. A warning line system should be used with one of the following: guardrail system, safety net system, personal fall arrest system, or a safety monitoring system.
8. On roofs 50 ft or less in width, the use of a safety monitoring system is allowed.

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Sample 32-2. Fall Protection Plan Form

SAMPLE FALL PROTECTION PLAN

A fall protection plan can only be used for operations involving leading edge work, precast concrete construction work, or residential construction work, where it can be proven that using conventional fall protection systems is infeasible or creates a greater hazard. Each fall protection plan must be site specific. This sample plan outlines the elements that must be addressed in a fall protection plan.

FALL PROTECTION PLAN

This fall protection plan is specific for the following project:

Location of job	Erecting company
Date plan prepared or modified	Plan prepared by

It is the responsibility of ______________________________ to carry out this fall [illegible]otection plan. ______________________ is responsible for daily inspection of the operations [illegible] this plan. Supervisors are also responsible for inspecting and correcting any unsafe acts or con[illegible]ediately. Each employee is responsible for understanding and following the procedur[illegible] of this plan [illegible]or following the instructions of a supervisor. Employees must also report any unsafe [illegible]azardous co[illegible]ons [illegible]ts. Any changes to this fall protection plan must be approved [illegible] by ______________________________.

SAMPLE

REASONS FOR FALL PROTECTI[illegible]AN

The following is a written [illegible]tion [illegible] the [illegible]f c[illegible]tion[illegible]l protection [illegible]nfeasible or create a grea[illegible]zard.

1. Guardr[illegible]ms are [illegible] b[illegible]g [illegible]d [illegible]use:

   ____

   ____

   ____

[illegible] Pers[illegible] f[illegible] sys[illegible]s a[illegible]t be[illegible]g used because:

   ____

   ____

   ____

[illegible] S[illegible]fety net systems are not being used because:

   ____

   ____

   ____

OTHER FALL PROTECTION MEASURES CONSIDERED FOR THIS PROJECT

The following is a list of other fall protection measures considered for the project and an explanation of their limitations. If any employee sees an area that could be erected more safely using conventional fall protection measures, the supervisor must be notified.

1. Scaffolds are not being used because:

   ____

   ____

   ____

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(Fall Protection Plan Form, continued)

2. Ladders are not being used because:

3. Vehicle-mounted platforms are not being used because:

4. Crane-suspended personnel platforms are not being used because:

SPECIFIC AREAS COVERED BY THIS FALL PROTECTION PLAN

This fall protection plan addresses the use of other than conventional fall prote n at specifi as on the project. This section identifies specific activities and areas that require other s of fall pr on. E of these areas is identified as a Controlled Access Zone (CAZ). Th inc

1. Connecting activity (point of erection) at:

2. Leading edge w

3. cted s or at:

OTECTION SYSTEMS TO BE USED ON THIS PROJECT

1. CAZ System

   Each CAZ identified in Section III must comply with the following provisions:

   a. The CAZ will be defined by a control line or another means that restricts access.

   b. The control line will extend along the entire length of the unprotected or leading edge and must be approximately parallel to the unprotected or leading edge.

   c. The control line will be connected on each side to a guardrail system or wall.

   d. Control lines will consist of ropes, wires, or other materials with a breaking strength of at least 200 lb and be rigged and supported on stanchions so the line is between 39 and 45 in. above the walking/working surface.

   e. Each control line will be flagged or otherwise clearly marked with high-visibility material at intervals of 6 ft or less.

   Where CAZs are identified, only those employees necessary to safely accomplish the job will be assigned. The maximum number of workers allowed inside any one CAZ is ____________. The following trained employees are allowed to enter the CAZs and work without the use of conventional fall protection:

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(Fall Protection Plan Form, continued)

These CAZ workers will be identified by: ______________________________

2. Safety Monitoring System

   Where no other fall protection system can be used, work will be performed using a safety monitoring system. Only those employees necessary to safely accomplish the job will be assigned. The maximum number of workers to be monitored by one safety monitor is ______________________.

   The safety monitoring system assigns a competent person who is responsible for recognizing and warning employees of fall hazards. The Safety Monitor must be on the same walking/working surface and within visual contact with the monitored employees. He or she must also be close enough to speak with the employees. The Safety Monitor must not be assigned other duties that could limit his or her ability to monitor the work area. The duties of the Safety Monitor include:

   a. Warning employees when they are approaching the open edge unsafely.
   b. Warning employees if there is a dangerous situation developing that they cannot readily see.
   c. Making the CAZ workers aware they are in a dangerous area.
   d. Warning employees if they appear to be unaware of a fall hazard or are acting unsafely.
   e. Stopping the work process if communication with the CAZ workers is disrupted.

   Safety Monitor: ______________________________

   The Safety Monitor will be identified by: ______________________________

   Only the following trained employees are al[illegible]o e[illegible]e [illegible] an[illegible]rk without [illegible]se of conventional fall protection:

   ______________________ ______________________ ______________________

   ______________________ ______________________ ______________________

   [illegible]hese CAZ wor[illegible] w[illegible] ider[illegible]d[illegible] ______________________________

   [illegible]rs [illegible]tly [illegible]er t[illegible] control of the Safety Monitor for fall protection and are directed to stay [illegible]ni[illegible] 6 f[illegible] the edge.

   [illegible]he s[illegible] m[illegible]ring system will not be used when the wind is strong enough to cause loads with large [illegible]reas to swing out of radius, or to cause loss of control of the load, or when whether conditions [illegible] the walking/working surfaces to become icy or slippery.

   Employees exposed to falls of 6 ft or more to lower levels, who are not actively engaged in leading edge work or connecting activity, such as welding, bolting, cutting, bracing, guying, patching, painting, or other operations, and who are working less than 6 ft from an unprotected edge will be tied off at all times, or guardrails will be installed. Employees engaged in these activities who are more than 6 ft from an unprotected edge as defined by the control lines do not require fall protection, but a warning line or control lines must be erected to remind employees they are approaching an area where fall protection is required.

TRAINING

Only individuals with the appropriate experience, skills, and training will be identified as CAZ workers. All employees who will be working as CAZ workers under the CAZ or safety monitoring system will have been trained by a competent person and instructed in the following areas:

1. Recognition of the fall hazards in the work area.
2. Avoidance of fall hazards using work practices established for employees.
3. Recognition of unsafe practices or working conditions that could lead to a fall.

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(Fall Protection Plan Form, continued)

4. The function and use of Controlled Access Zones and safety monitoring systems.
5. The correct procedure for erecting, maintaining, and inspecting the systems being used.
6. The intended construction sequence or erection plan.
7. The specific requirements of this fall protection plan and any approved changes.

SAFETY MEETINGS

A daily safety meeting will take place before starting work covered by this Fall Protection Plan. This safety meeting will be conducted by ___________________________ and supervisors in charge of this phase of work and must be attended by all CAZ workers, members of the erection crew and crane crew, and th[illegible] supervisors of other affected employers. During the preshift safety meeting, erection procedu[illegible]uences pertinent to the day's work will be discussed thoroughly and safety practices being used th[illegible]e day will be specified. All personnel will be informed that the CAZs are off limits to [illegible]ersonnel o[illegible]han those CAZ workers specifically trained to work in that area.

ACCIDENT INVESTIGATIONS

In the event that an employee falls o[illegible]ted, [illegible] inc[illegible] oc[illegible] this [illegible] must be re[illegible]ermine whether additional practic[illegible], proced[illegible] tra[illegible]eds [illegible]men[illegible] prevent s[illegible] falls or incidents from occurr[illegible]

CH[illegible] TO PL[illegible]

[illegible] changes to this [illegible] e app[illegible] [illegible]ti[illegible] y ______________________________________ [illegible] ll be re[illegible]ved [illegible] a t[illegible] er[illegible] is [illegible] e job progresses to decide if additional practices, p[illegible] trai[illegible] be [illegible]en[illegible]d by the competent person to improve or provide additional fall p[illegible] A [illegible] n [illegible] copy of all approved changes must be maintained on the jobsite at all times.

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Environmental Guidelines

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

General Requirements

The Company recognizes the importance of safeguarding the environment wherever it conducts business as outlined in its Mission Statement and President's Policy. Therefore, in keeping with Company guiding principles, all employees are expected to:

- Be good corporate citizens and neighbors by promoting environmental compliance in all company operations.
- Comply with local, state, and federal environmental regulations.
- Conduct business operations in a manner that demonstrates respect for the quality of the environment.
- Assist in finding solutions to environmental problems.
- Respond quickly and effectively to environmental incidents involving Company facilities or equipment under Company control.
- Assist clients with their environmental control procedures and directives when working on their properties.
- Promote good environmental attitudes by training employees in sound environmental management.
- Maintain corporate environmental monitoring programs to ensure compliance with Company and governmental requirements.

- Reduce the potential of environmental liability by performing the applicable environmental assessments of any lease property or property for sale prior to the purchase or lease of that property.

Jobsite Requirements

Protection of the environment is a core value. The Company will comply with all environmental regulations. We must plan our work to eliminate spills or any other potential damage to the environment by:

- Properly disposing of any waste streams generated during Company work activities.
- Preventing contamination to storm water runoff, or any surface waters at the work site.

Spill Prevention Containment and Countermeasures Plan

Planning and Prevention

The Company will implement proper planning and preventive measures to minimize the likelihood of a spill occurring and quickly and successfully clean up a spill should one occur.

Roles and Responsibilities

The Company may designate an independent contractor who is an expert in environmental cleanup (emergency response contractor or ERC) and is responsible for remediating spills that are considered beyond the capabilities of the Company.

All subcontractors must comply with the Spill Prevention Containment and Countermeasures (SPCC) Plan.

The Company must have copies of the Safety Data Sheets (SDSs) for any hazardous chemical on the jobsite.

Spill Prevention and Mitigation Measures

The practices in the following sections must be followed during the course of all projects for spill prevention. Should a spill occur, we must work diligently to contain the spill and respond to other environmental issues.

Follow the procedures below to help reduce spills and prevent environmental damage:

- Store fuel tanks in plastic-lined, bermed areas to contain all spills.
- Store gas cans outside trailers or tool rooms in designated diked areas.
- Use extreme care to prevent spills when fueling vehicles or equipment.
- Immediately clean any spills that do occur with absorbent material.
- Do not perform equipment and vehicular oil changes on jobsites. Take extreme caution to prevent the possibility of any oil spilling onto the ground.
- Correctly dispose of all used oil.
- Dispose of all used oil as hazardous waste.

- Store materials, especially those that are hazardous or flammable, in 55-gallon drums, correctly labeled, in a separate, diked area and place the drums in storage racks equipped with drip pans, if possible. Remove any leaking drums from the jobsite immediately.
- Report any spills to a supervisor immediately.
- Use the SDS for information about what to use and what not to use to contain or clean up the spill of a specific substance.
- Comply with good housekeeping procedures on a regular basis to help reduce the possibility of an environmentally hazardous spill.
- Respond quickly to a minor spill to prevent a larger problem. Containment of the spill is of utmost importance.
- Always wear protective clothing and equipment when cleaning up a spill.
- Become familiar with and use the procedures on the enclosed spill response checklist. Refer to the Spill Response Checklist located at the end of this chapter.

Containers

Observe the following guidelines for storage containers:

- Store all containers, 55 gallons or greater, for fuel or hazardous materials in designated areas equipped with a secondary containment structure. If temporary storage is needed in the immediate work area for 55-gallon drums, store the containers for fuel or hazardous materials in polyethylene drum spill skids.
- Properly identify all fuel and hazardous chemical containers.
- During construction activities, perform leak and integrity inspections on equipment, vehicles, secondary containment areas (tank and drum storage areas), and spill response supply areas.
- Use only approved containers for storing materials. Bulk storage containers (except for drums) shall be equipped with a direct-reading level gauge. Venting capacity shall be suitable for the anticipated fill and withdrawal rates.

Secondary Containment

Secondary containment or diversionary structures are utilized to control drainage or a discharge of petroleum around bulk storage containers. Secondary containment or diversionary structures shall be provided for all bulk storage containers which store petroleum products.

The capacity of the secondary containment shall be a minimum of 125% of the largest container within the storage area. Make earthen, secondary containment areas impervious to spills by lining the area with 40-mil plastic sheeting.

The entire containment system, including walls and floor, shall be capable of containing petroleum and shall be constructed so that any discharge from a primary containment system (such as a tank or drum) will not escape the containment system before cleanup begins.

The following may be utilized for secondary containment systems:

- Dikes, berms or retaining walls sufficiently impervious to contain petroleum
- Curbing
- Culverts, gutters or other drainage systems

- Weirs, booms or other barriers
- Spill diversion ponds
- Retention ponds
- Absorbent materials

No loose combustible material, rubbish or trash shall be permitted within secondary containment areas or diversionary structures.

Diversionary ponds and catch basins shall not be located in areas subject to periodic flooding.

Fuels and Hazardous Materials Handling

Materials are at a higher risk of spilling during the transport or servicing of equipment. Therefore, precautionary measures must be taken to prevent spills when such tasks are performed. Refueling of equipment or hazardous material transfer must occur in designated areas only. Refueling or hazardous material transfer must not occur within 100 ft (30.48 m) of any stream, wetland, body of water, spring, or well. Where conditions require that construction equipment (for example, barge-mounted backhoes or trenching dewatering pumps) be refueled within 100 ft (30.48 m) of bodies of water, sufficient supplies of oil and fuel containment booms and barrier materials must be available to allow the rapid containment and recovery of any spills. Each construction crew and refueling vehicle must also have sufficient supplies of absorbent and barrier materials to allow the rapid containment and recovery of any spill.

Spill Response Procedures

Initial Spill Management

Immediately upon learning of any fuel, oil, or hazardous material spill, the person discovering the situation must initiate actions to contain the spill and eliminate the source of the spill.

In the event of a spill, notify the site safety manager immediately. The site safety manager must determine if the spill notification requirements for the appropriate federal, state, and local agencies apply. If the spill containment and cleanup is beyond the capabilities of the Company, use a qualified Emergency Response Contractor. Refer to the Spill Notification Requirements located at the end of this chapter.

Spill Containment and Cleanup

It is the objective of the Company to restore the land to its original preconstruction condition. Use the following procedures for containment and cleanup of spills:

- Clean up and remove any small (less than 25 gallons) spills. Collect soil and spilled materials until no visible evidence of spilled materials remains. The type of material quantity released must be identified, and appropriate PPE must be worn as recommended by the product-specific SDS.
- Containment of a spill may include constructing earthen dikes around the spill area, installing available absorbent materials, or utilizing commercially available spill kits.
- Store contaminated soil and spilled material in appropriate containers and provide proper labels for the containers.

- If a spill enters surface water, place booms to contain the spilled material and vacuum the product with a vacuum truck if necessary.
- Large spills (greater than 25 gallons) shall be remediated by a qualified Emergency Response Contractor.

Remediation and Restoration

Visible petroleum discharges shall be promptly corrected, including removing accumulations of discharged petroleum in diked areas.

Countermeasures for discharge discovery, response and cleanup include the use of spill kits to clean up minor spills. Large spills shall be handled by the designated clean-up contractors.

Adequate absorbent materials shall be provided in spill kits located strategically throughout all facilities that store petroleum or have equipment that uses petroleum to operate.

When a leak occurs, do not enter the area until it has been determined that it is safe to do so. Once the area is declared safe to enter, remediation can begin.

All material including soil, water and absorbent material contaminated with discharged materials shall be removed and put into containers for proper disposal. The disposal of recovered materials shall be in accordance with all local, state and federal requirements.

All personnel exposed to harmful materials shall be decontaminated as needed.

Material Disposal and Solid Waste Management

Spilled materials and contaminated soils require proper handling. These materials can be contaminated soil or liquids (for example, water, oils, paint wastes) absorbents, and other debris. The Company must properly dispose of contaminated soil or water, absorbents, and other debris associated with spill containment and cleanup. The company will:

- Properly store and dispose of all waste streams generated at the project/work site.
- Classify waste streams into either industrial Non-hazardous or Hazardous waste.
- Keep industrial and non-industrial waste streams separated.
- Recycle used oil.
- Properly label and assign accumulation start dates to all hazard waste streams being accumulated on the project or facility.
- Use only licensed state vendors for approved waste disposal and recycling companies to ensure the proper disposal of waste streams.
- Keep records documenting proper disposal.

Division of Responsibility

The Operating Company Management Team is responsible for environmental compliance at all Operating Company facilities and project sites. The Management Team may designate someone to assist with compliance for Spill Prevention. Responsibilities for compliance are:

- Providing regulatory instruction and assistance.
- Acting as a regulatory agency liaison.
- Assisting with characterizing project or facility waste streams.
- Assisting with reporting requirements.
- Auditing and updating waste disposal facility contact list.
- Complying with all local, state, and federal waste disposal regulations.
- Keeping treatment systems in good working condition.
- Maintaining records.
- Submitting reports.

Storm Water Runoff Plan

Water Pollution Prevention

Fresh water is only a small percentage of the total water on earth; 97% of the Earth's water is contained in saline seas and oceans and 2% is locked in ice caps and glaciers. Of the remaining 1%, a little over half is stored as groundwater. The rest is distributed as soil and atmospheric moisture and surface water.

Fresh water is absolutely necessary to life. Indeed, the human body is over 90% water. We consume water in most food and drinks. We also use water for cleaning and bathing, and water is an important ingredient in many forms of recreation, such as swimming and fishing. We seem to take it for granted that this water will be uncontaminated.

Fresh water is used regularly in Company work processes. Water used in industrial processes becomes industrial wastewater when it is contaminated (or potentially contaminated) and cannot be or is not reused. Examples of industrial wastewater produced at various Company facilities include cooling water, used machine coolant/water mixtures, steam cleaning water, and other wash water.

Company management understands the importance of properly managing industrial wastewater to protect the Earth's water resources. Therefore, all Company facilities must comply with the requirements in this chapter, as well as the local, state, and federal regulations. Wastewater is not discharged without adequate treatment to remove contaminants to meet the national or local environmental protection standards.

In states where the Company has operations, a permit is required to discharge industrial wastewater directly to any ditch, stream, or other body of water or the ground.

A permit or authorization may be required to discharge industrial wastewater to a municipal or other public or private wastewater treatment facility. Although the wastewater is going to a facility that will treat it to remove pollutants before discharge, the permit or authorization usually requires some pretreatment to meet certain pollutant concentration limits before the water is discharged.

Two situations where wastewater is generated but no permit is required are:

- All of the wastewater is treated and recycled and none is discharged.
- The wastewater is contained and transported off-site for disposal.

In the second case, the wastewater is considered an industrial waste and must be carefully managed as outlined in the Company environmental procedure.

Division of Responsibility

The Operating Company Management Team is responsible for environmental compliance at all Operating Company facilities and project sites. The Management Team may designate someone to assist with compliance for Storm Water Runoff. Responsibilities for compliance are:

- Providing regulatory instruction and assistance.
- Acting as a regulatory agency liaison.
- Assisting with characterizing project or facility waste streams.
- Assisting with reporting requirements.
- Auditing and updating waste disposal facility contact list.
- Complying with all local, state and federal waste disposal regulations.
- Keeping treatment systems in good working condition.
- Maintaining records.
- Submitting reports.

Direct Discharge Permits

No facility may discharge wastewater directly into any stream or body of water (including ditches) or the ground without first obtaining a permit or authorization from the appropriate regulatory agencies. In certain locations, there may not be a permit requirement. Facilities operating in such locations must still meet Company environmental protection standards. Wastewater must be adequately treated to remove contaminants before it is discharged.

Permit Application

The Company may utilize an environmental consultant and/or outside vendor to assist with the preparation of permit applications and renewals. Regulations in most localities are very specific about the permit application requirements. The permit application asks for information about the chemicals used in the processes and a description of each process that contributes pollutants to the wastewater discharge. The applicant must also provide information about the volumes of water used, its source, and where it is discharged. A significant number of chemical analyses on samples of the wastewater to be discharged may be required as well.

Permit Compliance

Permit compliance requirements can be nonspecific or very detailed. The detailed permits can specify the following:

- How often samples must be taken at each individual discharge point
- What analyses must be performed
- What concentration limits are acceptable
- Specific sampling points from which the samples must be taken

Generally, an outside laboratory performs the analysis. The Company facility should contract with a laboratory that performs adequate quality assurance so that the data can be relied on as accurate.

Permits define terms and specify standard permit conditions. Supervisors and employees should carefully read the permit so that they understand all of the conditions and can comply. Examples include:

- Required frequency of submitting reports
- Specific methods to be used for analysis
- A listing of what documentation and records must be retained and for how long
- When and to whom to report any instances of noncompliance with terms of the permit
- When and how to amend a permit
- Notification that the permitting authority has the right to enter the property and inspect the facilities relating to water treatment and discharge
- Requirements to maintain treatment facilities and instrumentation in good operating condition

Some permits can contain additional requirements, specific to a particular industry or facility that is not covered in the standard conditions. For example, rainfall runoff from the facility might have to be sampled to determine if it has become contaminated on the property.

Permit Changes

A wastewater discharge permit remains in effect for a set period, such as five years, but only if the facility conditions described in the permit application do not change. If conditions change during the life of the permit, the permit must be amended or modified. For example, permit changes might be required when new processes or different chemicals used in current processes increase the amount of wastewater to be discharged or the amount or type of pollutants in the wastewater.

Supervisors must keep those responsible for permit compliance informed of all proposed changes. This information should be communicated as early as possible and always before any changes are made. The regulations and permit conditions require a permit to be modified before any changes occur in the characteristics of the wastewater.

Indirect Discharge Permits

Some facilities discharge wastewater to a municipal or other public wastewater treatment plant. The municipal treatment plant then treats the wastewater before discharging it. In this case, the first facility is called an indirect discharger. Municipal treatment plants might not be designed to accommodate certain industrial pollutants so, in most cases, the industrial facility must apply for a permit or authorization to discharge from the governing body and must meet certain limitations. The permit limits might require pretreatment of the wastewater.

Permit Application

Many of the permit application requirements can be the same as those for obtaining a direct discharge permit, but specific requirements vary for each location. In general, the permit application asks for information on chemicals used in the processes, a description of each process contributing pollutants to the wastewater, and estimates of the volumes of wastewater discharged. The applicant also must provide information about how the wastewater will be treated to reduce pollutants before it is discharged.

Permit Compliance

An indirect discharge or pretreatment permit typically remains in effect for five years, depending on the applicable federal, state, or local regulatory agency.

Permit Changes

A wastewater discharge permit remains in effect for a set period of time only if the facility conditions described in the permit application do not change. If conditions change during the life of the permit, the permit must be amended or modified. For example, permit changes can be required when new processes or different chemicals used in processes increase the amount of wastewater to be discharged or the amount or type of pollutants in the wastewater.

Supervisors must keep those responsible for permit compliance informed of all proposed changes. This information should be communicated as early as possible and always before any changes are made. Regulations and permit conditions generally require a permit to be modified before any changes occur in the characteristics of the wastewater.

Rainwater (Storm Water) Runoff

Rainwater or melting snow (either of which may be referred to as storm water) running off industrial facilities can carry pollutants from on-site activities. For example, oil or chemicals that leak from containers or tanks stored outside or heavy metals that leach from stored items could be washed into ditches or receiving streams.

In the United States, industrial facilities are required to obtain a permit for storm water that is discharged from a facility due to rain or melting snow.

Although an actual permit for storm water discharges might not be required at many Company facilities, all facilities must adhere to the following Storm Water Pollution Prevention practices.

Storm Water Pollution Prevention

Each facility should form a Pollution Prevention Team of employees who can develop a comprehensive Pollution Prevention Plan. The Pollution Prevention Team should consist of persons who have knowledge of the facility operations, chemicals used, potential for spills and spill history, and site drainage characteristics. In preparing the Pollution Prevention Plan, the team should develop a site drainage map, prepare an inventory of hazardous materials stored on-site, identify past spills and leaks, and carefully evaluate all storm water discharges for nonstorm water.

The Pollution Prevention Plan must incorporate management practices such as good housekeeping, preventive maintenance, regular visual inspections, and spill prevention and response measures.

The following items also should be included in the Pollution Prevention Plan, and training should be provided to all employees to ensure that they can observe these practices at all times:

- Employees must never pour anything—including oil, solvents, chemicals, or even wash water—into floor drains, yard drains, or sumps.
- No wastewater is to be discharged to any storm drain or onto the ground.
- Waste oil, solvents, and chemicals must be segregated and placed in containers for proper disposal. Never mix different substances in the same container.
- Employees must not place any waste material on the ground, on concrete slabs, or on roads. Waste must be placed in proper containers, as soon as it is generated. Any materials, liquid or solid, that are spilled or inadvertently released must be cleaned up and placed in containers as soon as possible.
- Employees must not perform steam cleaning or other cleaning operations where the wastewater is allowed to flow into a storm drain or onto the ground.
- Employees must keep work areas clean of litter and debris, including rubber and wood scraps, blasting grit, old pallets, scrap metal, metal bands, metal chips, Styrofoam cups, gloves, paper, and so on.
- Employees must immediately report to their supervisor or to the facility Environmental Coordinator any instance where there is a potential or suspected potential for pollutants to enter storm drains or floor drains.

Recordkeeping

A copy of each wastewater discharge permit or authorization must be retained and readily available to the persons responsible for compliance, for as long as the permit or authorization remains in effect. All records required by permits or authorizations must be retained at the facility in accordance with the national or local environmental regulatory requirements. Records must be stored in such a manner that they remain legible, identifiable, and readily retrievable for inspection by a representative of the regulating authority. Records that must be retained include:

- Copies of all reports submitted to the regulatory agency.
- Copies of any correspondence to the regulatory agency regarding the wastewater discharges, including any letters explaining noncompliance.
- Laboratory analysis records of wastewater discharges.
- Quality assurance documentation for laboratory analysis.

- All raw data, such as instrument recording charts.
- Documentation of preventive or other maintenance on treatment systems or measurement instrumentation.

Underground Storage Tanks

Over one million underground storage tank systems (USTs) in the United States contain petroleum or hazardous substances regulated by the U.S. Environmental Protection Agency (EPA). Many of these USTs have leaked or are currently leaking. More USTs will leak unless owners and operators ensure their USTs meet the regulatory requirements described by the EPA. Releases from USTs—from spills, overfills, or leaking tanks and piping—can cause fires or explosions that threaten human safety. Releases from USTs can also contaminate the groundwater that many of us depend on for the water we drink.

Properly managed, USTs will not threaten our health or environment. Federal legislation, therefore, directed the EPA to develop the UST regulations described in this section. Regulations require owners and operators of USTs to detect and prevent releases from USTs and correct the problems created by releases from USTs. In addition, the regulations require owners and operators of USTs to demonstrate their ability to pay for correcting the problems created if their USTs do leak.

Company management understands the importance of properly managing any underground storage tanks that may be located at our facilities. Therefore, all Company facilities must comply with the requirements in this section, as well as the local, state, and federal regulations as it pertains to the management of USTs.

In states where the Company has operations, it is required that the locations determine the existence or current use of USTs.

Division of Responsibility

The Operating Company Management Team is responsible for environmental compliance at all Operating Company facilities and project sites. The Management Team may designate someone to assist with compliance for Underground Storage Tanks (UST). Responsibilities for compliance are:

- Providing regulatory instruction and assistance.
- Acting as a regulatory agency liaison.
- Assisting with characterizing project or facility waste streams.
- Assisting with reporting requirements.
- Auditing and updating waste disposal facility contact list.
- Complying with all local, state, and federal waste disposal regulations.
- Keeping treatment systems in good working condition.
- Maintaining records.
- Submitting reports.

Waste and Drum Management

Effective waste and drum management begins before the waste is generated and the chemical is purchased. The management of waste and drums can reduce environmental and regulatory exposure, as well as reduce cost.

Types of Waste and Disposal Options

Liquid Waste Generated Directly From Oil and Gas Operations

These wastes are exempt from hazardous waste regulations. This is waste that comes from the wellbore or has come into direct contact with the oil or gas stream, such as, but not limited to:

- Produced water
- Tank bottom settlement and water
- Scrubber fluids
- Used dehydration fluids such as triethylene glycol
- Dehydration vent fluids
- Emulsified fluids
- Petroleum precipitants
- Drilling fluids

Disposal Options:

- Reuse
- Treatment facility
- Injection into a well permitted for that use
- Evaporation pit
- Land farming
- Road spreading (by permit only)

Liquid Waste Generated Indirectly From Oil and Gas Operations

This waste is non-exempt and could possibly fall under hazardous waste regulations. This is waste that is generated from the oil and gas operation but has not come from the wellbore or has come into direct contact with the oil or gas stream such as, but not limited to:

- Used lubricating oil
- Used antifreeze
- Used cleaning solvents
- Chemicals that cannot be utilized in any way

Disposal options

- Recycle
- Incineration at a facility permitted to incinerate the waste
- Treatment facility

Do not mix Exempt and Non-Exempt waste. A simple oilfield waste can be classified as hazardous if mixed with non-exempt waste.

Industrial (Residual) Solid Waste

This is any non-hazardous industrial solid waste such as, but not limited to:

- Lube-oil-contaminated filters, pads, rags, and soil
- Glycol-contaminated filters, pads, rags, and soil
- Petroleum-contaminated pads, pillows, booms, or rags
- Brine-contaminated pads, pillows, booms, or rags
- Everyday trash

Disposal options:

- Landfill at a facility permitted to take non-hazardous, industrial waste
- Incineration at a facility permitted to incinerate the waste

Contaminated Soil (soil that is contaminated by produced fluids or exempt waste)

Disposal options:

- Remediate the soil onsite by:
  - Land farming
  - Bioremediation
  - Soil washing
  - Incineration (Permit required)
- Landfill the soil at an approved non-hazardous, industrial waste landfill

Chemicals Stored in Drums

- Chemicals should be stored in their original containers until the drum is completely empty.
- After a determination has been made that a chemical cannot be used, then it becomes a waste and should be properly disposed of as soon as possible.
- Chemicals will be disposed of under the hazardous waste regulations.
- When a chemical is stored or used over an extended period of time, steps should be taken to protect the chemical from the weather.
- Water intrusion into a drum can ruin the chemical and cause rust.
- When a drum is badly rusted and/or has holes in it, extreme care shall be taken if the drum must be moved. If needed:
  - Place the drum in an over-pack drum
  - Transfer the chemical into another drum

Empty Drums

- Drums cannot be considered empty until completely emptied of their contents.
- Empty drums should be stored in a central location.
- Empty drums should be stored on their side to prevent accumulation of rain water into the drums.
- If the drum is disposed of, steps must be taken to reasonably ensure the drum is safe by:
  - Cleaning the drum
  - Removing the top and bottom of the drum

Toxic and Hazardous Substances

General Statement of Intent

It is the intent of the Company to provide the information in this guideline as an awareness of the hazard from toxic and hazardous substances that might be present on its jobsites. It is not a written program for working with those exposures. When these hazards are present in your workplace, Company management must determine what action will be taken to proceed with the work activities.

If there is a question about whether any material contains a hazardous or toxic substance, stop—do not proceed—report to your supervisor immediately. The Company does not want any worker exposed to these hazardous materials. If these materials are present, the Company will make the determination whether to utilize the services of a qualified subcontractor to remediate the hazard or properly train our employees on how to safely work with the hazard.

Asbestos Awareness

General Requirements

Consideration is given to the use of effective engineering controls to eliminate or reduce asbestos exposure to levels that are as low as reasonably achievable. At a minimum, the Company ensures that no employee is exposed to asbestos at concentrations greater than the OSHA required PEL of 0.1 fiber per cubic centimeter of air (0.1 f/cc) as an eight-hour TWA or an excursion limit value of 1.0 f/cc as averaged over a sampling period of 30 minutes. The quality of the air is determined from samples of the breathing zone air. Engineering controls may include such things as exhaust systems for hand tools, wet work methods, and using HEPA vacuums for cleanup.

When feasible engineering controls are not effective for exposure control, employees must use appropriate PPE and respiratory protection equipment provided by the Company at no charge.

Written Plan

Company management must develop a written exposure control plan for the specific asbestos hazards at each site/facility. The written plan must address the following issues:

- Establishment of regulated areas

- Contaminant-specific hazard communication
- Exposure assessment
- Exceeding the TWA and/or Excursion limit
- Monitoring observation procedures
- Engineering and work practice controls
- Respiratory protection
- Protective work clothing and equipment
- Housekeeping
- Hygiene facilities and practices
- Medical surveillance and medical removal program
- Record keeping and documentation
- Emergency situations
- Information from regulatory appendices

Explanation of Terms

Asbestos—Includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that have been chemically treated or altered.

Asbestos-containing material (ACM)—Any material containing more than 1% asbestos.

Authorized person—Any person authorized by the employer and required by work duties to be present in regulated areas.

Employee exposure—Exposure to airborne asbestos that would occur if the employee was not using respiratory protective equipment.

Excursion limit—An airborne concentration of asbestos equal to 1.0 f/cc as averaged over a sampling period of 30 minutes as determined by the method prescribed in OSHA regulations.

Fiber—A particulate form of asbestos 5 µm or longer, with a length-to-diameter ratio of at least 3 to 1.

High-efficiency particulate air (HEPA) filter—A filter capable of trapping and retaining at least 99.97% of 0.3-µm diameter mono-disperse particles.

Permissible exposure limit—An airborne concentration of asbestos of 0.1 f/cc as an eight-hour TWA as determined by the method prescribed in OSHA regulations.

Forms and Uses

Asbestos is a naturally occurring family of minerals formed by combinations of magnesium and silicon. These minerals take the form of hollow, microscopic fibers that are nearly indestructible and can be densely packed, making a tough, flexible, and very useful material.

The forms of asbestos covered by the OSHA standards include:

- Amosite (brown asbestos)—Used as insulation, fireproofing, and soundproofing

- Chrysotile (white asbestos)—Used in high friction applications such as brake shoes and clutches
- Crocilodite (blue asbestos)—Not as common as the other two forms
- Compounds of “asbestiform” minerals—Bond chemically with asbestos

Since its earliest use, asbestos-surfacing material was applied for decorative and acoustical purposes in buildings and was later applied as insulation coating to protect structural steel during fires.

Potential Locations

Asbestos can be found in many places in a building or in-work places, including:

- Thermal system insulation material on furnaces, ducts, boilers, and hot water pipes.
- Sprayed-on or troweled-on surfacing materials on ceilings and walls.
- Resilient asphalt and vinyl flooring.
- Suspended ceiling tiles.
- Fireproof drywall.
- Fireproof drapes and curtains.
- Roofing felts and shingles.
- Exterior siding shingles.
- Sprayed-on fireproofing on metal beams and columns.
- High-temperature gaskets and valve insulation.
- Heat-resistant clothing.
- Automotive brake and clutch lining.
- Asbestos pipe wrap material.
- Cement pipe.
- Fire-resistant drywall.
- Inside crawl spaces and between walls.

Health Effects

When bonded, asbestos fibers pose little hazard. But when they are released from their bonding material, these fibers can break down into microscopic fibers as small as five microns (five millionths of a meter) in length.

These tiny fibers are what make asbestos so dangerous. If inhaled, the fibers can enter the lungs and lodge in tiny air sacs called alveoli. It is through these air sacs that oxygen enters the blood and carbon dioxide is removed.

When asbestos fibers enter the alveoli, they irritate the thin alveoli membrane, leaving scar tissue that oxygen cannot penetrate. This condition is called asbestosis. As more and more of the alveoli are affected, oxygen starvation sets in, resulting in severe disability or death.

Exposure to asbestos has been shown to cause lung cancer, asbestosis, mesothelioma, and cancer of the stomach and colon. There are no warning signs or symptoms that asbestos is causing health problems. In fact, many of the harmful effects do not appear for 20 years or more.

Smoking can increase the risk from asbestos exposure. Asbestos fibers can irritate the lungs, making them more sensitive to the risk of cancer from cigarette smoke. In fact, smokers who have worked with asbestos face a risk of cancer up to 90 times greater than nonsmokers.

Smokers who work with asbestos can stop smoking and reduce their chances of getting lung cancer by 50% in just five years.

Recognizing Hazards

Thermal System Insulation (TSI) and surfacing ACM are potentially more friable, are much more common, and have more maintenance and repair activities performed on them than other ACM. Remember, every removal activity involving these materials is capable of releasing friable airborne fibers at hazardous levels.

Avoid contact with ACM that:

- Disturbs its position or arrangement.
- Disrupts its matrix or renders it friable.
- Generates any visible debris.

Visibly damaged, degraded, or friable ACM in the vicinity is an indicator that surface debris or dust could be contaminated with asbestos. OSHA standards require workers to assume that such dust or debris contains asbestos fibers.

Sources of damage resulting in fiber release include:

- Impact from other objects.
- Exposure to the elements.
- Vibration.
- Fans and blowers.
- Chemical spills, leaks, or fumes.

Direct contact with asbestos is not required for exposure. Workers can also be exposed to asbestos by working in a building that contains the material.

The risk of exposure increases if:

- The work area contains friable asbestos, such as sprayed-on insulation.
- The work is near a construction or renovation area that contains asbestos.
- The job involves maintenance or custodial activities in areas containing asbestos.

Report any deterioration of ACM to your supervisor immediately

PPE

When the need for PPE is determined, its use shall be mandatory. PPE may include, but is not limited to:

- Protective coveralls.
- Foot coverings.
- Head coverings.
- Gloves.
- Face shields.
- Respirators.
- Vented goggles.

Protecting Yourself

To better protect yourself from asbestos inhalation, observe the following rules:

- Never hang plants or other objects from insulated pipes or otherwise cut through pipe insulation.
- Never drill holes or hammer nails in ceilings or surfaced walls.
- Wear proper PPE when removing ceiling tiles or light fixtures from suspended ceiling grids.
- Never install curtains, drapes, or blinds in a way that damages any potential ACM.
- Avoid scraping floor tiles, walls, or ductwork when moving furniture.
- When removing ventilation system filters, do not shake the filters to remove dust.
- Do not dust, sweep debris, or vacuum carpets in areas that contain asbestos-contaminated waste.
- Notify the employer of any suspect material found.
- Heed the labels on asbestos products or asbestos waste that warn against causing dust and breathing airborne fibers.

Controlling Exposure

Employee training is a vital component of any successful program to control exposure to asbestos.

- Employees will receive training prior to initial assignment.
- Employees will receive annual refresher training.
- Training shall include the health effects associated with exposure to asbestos.
- Written materials relating to the employee training program and asbestos exposure will be readily available to employees.

The Asbestos Awareness Program helps employees to:

- Understand OSHA rules and work practices for asbestos.

- Protect themselves and others against unnecessary exposure to airborne asbestos fibers.

The Company is required to notify employees if they are at risk from exposure to asbestos and take certain steps to protect workers. However, all employees have the responsibility to work with their supervisors in identifying potential exposure risks and protecting themselves by:

- Following workplace safety procedures and paying attention to warnings in the work area.
- Always heeding the labels on asbestos products or asbestos waste that warn against causing dust and breathing airborne fibers.
- Following good housekeeping practices that are effective in reducing exposure to asbestos.

Warning signs and labels, required by OSHA, will be posted in regulated work areas.

Benzene Awareness

General Requirements

“Benzene" means liquefied or gaseous benzene. It is a clear, colorless liquid with a pleasant, sweet odor, not soluble in water, and flammable. It does not include trace amounts of unreacted benzene contained in solid materials. Consideration is given to the use of effective engineering controls to eliminate or reduce benzene exposure to levels that are as low as reasonably achievable. At a minimum, the Company ensures that no employee is exposed to benzene at concentrations greater than the OSHA required PEL of one part of benzene per million parts of air (1 ppm) as an 8-hour time-weighted average.

When feasible engineering controls are not effective for exposure control, employees must use appropriate PPE and respiratory protection equipment provided by the Company at no charge.

Written Plan

Company management must develop a written exposure control plan for the specific benzene hazards at each site or facility. The written plan must address the following issues:

- Employee information and training
- Contaminant-specific hazard communication
- Exposure assessment
- Monitoring observation procedures
- Engineering and work practice controls
- Respiratory protection
- Protective work clothing and equipment
- Housekeeping
- Hygiene facilities and practices
- Medical surveillance
- Medical removal program
- Recordkeeping and documentation
- Information from regulatory appendices

- Knowledge of benzene presence in work areas
- Emergency/Contingency Plan

Potential Employee Exposures

Employees can be exposed to benzene from the following sources:

- Process sampling
- Petroleum refining site
- Petroleum tanks—when open, filled, unloaded, or gauged
- Field maintenance
- Steam vapors
- Pipeline and refining operations
- Laboratory exposures

Explanation of Terms

Short-term exposure limit (STEL)—The maximum average concentration to which workers can be exposed for a short period (usually 15 minutes).

Time-weighted average limit (TWA)—An average value of exposure to a hazardous substance over the course of an 8-hour work shift.

Health Effects

Benzene can affect your health if you inhale it or if it comes in contact with your skin or eyes. Benzene is also harmful if swallowed. During short-term (acute) overexposure to high concentrations of benzene, well above the levels where its odor is first recognizable, you may feel breathless, irritable, euphoric, or giddy; you may experience irritation in eyes, nose, skin, and respiratory tract. You may develop a headache, feel dizzy, nauseated, or intoxicated. Severe exposures may lead to convulsions and loss of consciousness. Long-term (chronic), repeated, or prolonged exposure to benzene, even at relatively low concentrations, may result in various blood disorders, ranging from anemia to leukemia, an irreversible, fatal disease. Many blood disorders associated with benzene exposure may occur without symptoms.

Protecting Yourself

Personal protective clothing and equipment shall be worn where appropriate to prevent eye contact and limit skin exposure to liquid benzene. The Company will provide free protective clothing and equipment to the employee and the company shall ensure its use where appropriate. Boots, gloves, sleeves, protective aprons, and eye and face protection shall meet OSHA requirements.

Controlling Exposure

(1) TWA—No employee shall be exposed to an airborne concentration of benzene in excess of one part of benzene per million parts of air (1 ppm) as an 8-hour time-weighted average. During suspected long-term exposures, the company will employ engineering controls to eliminate employee exposure to benzene vapor hazards.

(2) STEL—No employee shall be exposed to an airborne concentration of benzene in excess of 5 ppm as averaged over any 15 minute period. The Company will establish a regulated area whenever the airborne concentration of benzene exceeds or can reasonably be expected to exceed the short-term exposure limit of 5 ppm for 15 minutes. Access to regulated areas shall be limited to authorized persons who have completed respiratory training.

Smoking

Smoking is prohibited in areas where benzene is used or stored. Smoking is only allowed in designated areas.

Fire Protection

The following guidelines must be observed regarding use of fire extinguishers:

- Each person must be instructed on where the nearest fire extinguisher is located.
- Fire extinguishers should be located within 30 feet of each open flame operation.
- Fire extinguishers must be readily available in areas where benzene is used/stored.
- Fire extinguishers must be recharged or replaced promptly after use.
- Each person shall receive training on the uses and limitations of fire extinguishers, general principles of proper use, hazards associated with their use, and the types of fire on which each type of fire extinguisher may be used. Initial training will be provided prior to job assignment and annually thereafter.
- Extinguishers must be visually inspected on a monthly basis and must have an annual maintenance inspection. Documentation of each inspection should be available on the extinguisher.

Monitoring Exposure

The Company shall monitor each workplace or work operation to determine accurately the airborne concentrations of benzene to which employees can be exposed.

Determinations of employee exposure shall be made from breathing zone air samples that are representative of each employee's average exposure to airborne benzene.

Representative 8-hour TWA employee exposures shall be determined based on one or more samples representing the full shift exposure for each job classification in each work area.

Determinations of compliance with the STEL shall be made from 15-minute employee breathing zone samples measured at operations where there is reason to believe exposures are high, such as where tanks are opened, filled, unloaded, or gauged; where containers or process equipment are opened; and where benzene is used for cleaning or as a solvent in an uncontrolled situation. The Company can use objective data, such as measurements from brief period measuring devices, to determine where STEL monitoring is needed.

An informed and well-trained work force with a positive work attitude is critical when working with toxic materials.

Cadmium Awareness

General Requirements

Cadmium is a toxic metal used in industry. It is a byproduct of zinc, lead, and copper refining. Consideration is given to the use of effective engineering controls to eliminate or reduce cadmium exposure to levels that are as low as reasonably achievable. At a minimum, the Company ensures that no employee is exposed to cadmium at concentrations greater than the OSHA required PEL of five micrograms per cubic meter of air (5 $\mu g/m^3$), calculated as an eight-hour time-weighted average exposure.

When feasible engineering controls are not effective for exposure control, employees must use appropriate PPE and respiratory protection equipment provided by the Company at no charge.

Written Plan

Company management must develop a written exposure control plan for the specific cadmium hazards at each site or facility. The written plan must address the following issues:

- Employee information and training
- Contaminant-specific hazard communication
- Exposure assessment
- Monitoring observation procedures
- Engineering and work practice controls
- Respiratory protection
- Protective work clothing and equipment
- Housekeeping
- Hygiene facilities and practices
- Medical surveillance
- Medical removal program
- Recordkeeping and documentation
- Information from regulatory appendices

Explanation of Terms

Action level (AL)—An airborne concentration of cadmium of 2.5 micrograms per cubic meter of air (2.5 $\mu g/m^3$), calculated as an 8-hour time-weighted average (TWA).

Authorized person—Any person authorized by the employer and required by work duties to be present in regulated areas or any person authorized by OSHA or its regulations to be in regulated areas.

Employee exposure—The level to which an employee is exposed if the employee were not using respiratory protective equipment.

High-efficiency particulate air [HEPA] filter—A filter capable of trapping and retaining at least 99.97 percent of mono-dispersed particles of 0.3 micrometers in diameter.

Permissible Exposure Limit (PEL)—The employer shall ensure that no employee is exposed to an airborne concentration of cadmium in excess of five micrograms per cubic meter of air (5 $\mu g/m^3$), calculated as an 8-hour time-weighted average exposure (TWA).

Regulated area—An area demarcated by the employer where an employee's exposure to airborne concentrations of cadmium exceeds, or can reasonably be expected to exceed, the permissible exposure limit (PEL).

Protecting Employees

To protect employees better, the Company believes the following preventive measures will reduce employee exposure to cadmium hazards:

- **Air monitoring**—The Company shall conduct air monitoring to determine worker exposure to cadmium.
- **Additional monitoring**—The Company shall also institute additional exposure monitoring whenever there has been a change in the raw materials, equipment, personnel, work practices, or finished products that may result in additional employees being exposed to cadmium at or above the action level or in employees already exposed to cadmium at or above the action level being exposed above the PEL, or whenever the employer has any reason to suspect that any other change might result in such further exposure.
- **Regulated areas**—The Company shall establish a regulated area wherever an employee's exposure to airborne concentrations of cadmium is, or can reasonably be expected to be, in excess of the permissible exposure limit (PEL).
- **Respiratory protection**—Each person entering a regulated area shall be supplied with and is required to use a respirator.
- **Compliance program**—Where the PEL is exceeded, the Company shall establish and implement a written compliance program to reduce employee exposure to or below the PEL through engineering and work practice controls.
- **Protective work clothing and equipment**—If an employee is exposed to airborne cadmium above the PEL, or where skin or eye irritation is associated with cadmium exposure at any level, the Company shall provide, at no cost to the employee, and ensure that the employee uses appropriate protective work clothing and equipment that prevents contamination of the employee and the employee's garments.
- **Change rooms**—The Company shall ensure that employees remove all protective clothing and equipment contaminated with cadmium at the completion of the work shift. Employees must do so only in appropriate change rooms.
- **Communication of cadmium hazards to employees**—The Company will provide communications concerning cadmium hazards, including, but not limited to, the requirements concerning warning signs and labels, SDSs, and employee information and training.

Controlling Exposure

Employee training is a vital component of any successful program to control exposure to cadmium.

The Company will train all employees who are potentially exposed to cadmium, ensure employee participation in the program, and maintain a record of the contents of such program. Training must be provided prior to or at the time of initial assignment to a job involving potential exposure to cadmium and at least annually thereafter. The training program must ensure that each employee is informed of the following:

- The health hazards associated with cadmium exposure
- The quantity, location, manner of use, release, and storage of cadmium in the workplace and the specific nature of operations that could result in exposure to cadmium, especially exposures above the PEL
- The engineering controls and work practices associated with the employee's job assignment
- The measures employees can take to protect themselves from exposure to cadmium, including modification of such habits as smoking and personal hygiene, and specific procedures the employer has implemented to protect employees from exposure to cadmium such as appropriate work practices, emergency procedures, and the provision of personal protective equipment
- The purpose, limitations, proper selection, fitting, and use of respirators and protective clothing
- The purpose and description of the medical surveillance program
- The employee's rights of access to medical and air monitoring records

Chromium (VI) Awareness

General Requirements

Chromium (VI) can be found in several forms. Exposure can occur from natural or industrial sources. It can be found in metals, dyes and pigments, pesticides, welding rods, wood preservatives, and portland cement. Consideration is given to the use of effective engineering controls to eliminate or reduce chromium exposure to levels that are as low as reasonably achievable. At a minimum, the Company ensures that no employee is exposed to chromium (VI) at airborne concentrations greater than the OSHA required PEL of 5 micrograms per cubic meter of air (5 $\mu g/m^3$), calculated as an 8-hour time-weighted average.

When feasible engineering controls are not effective for exposure control, employees must use appropriate PPE and respiratory protection equipment provided by the Company at no charge.

Written Plan

Company management must develop a written exposure control plan for the specific chromium (VI) hazards at each site or facility. The written plan must address the following issues:

- Employee information and training
- Contaminant-specific hazard communication
- Exposure assessment
- Monitoring observation procedures
- Engineering and work practice controls
- Respiratory protection
- Protective work clothing and equipment
- Housekeeping
- Hygiene facilities and practices

- Medical surveillance
- Medical removal program
- Recordkeeping and documentation
- Information from regulatory appendices

Explanation of Terms

Action level—A concentration of airborne chromium (VI) of 2.5 micrograms per cubic meter of air (2.5 $\mu g/m^3$) calculated as an 8-hour time-weighted average (TWA).

Chromium (VI)—[Hexavalent chromium or Cr(VI)] means chromium with a valence of positive six, in any form and in any compound.

Employee exposure—The exposure to airborne chromium (VI) that would occur if the employee were not using a respirator.

High-efficiency particulate air [HEPA] filter—A filter that is at least 99.97 percent efficient in removing mono-dispersed particles of 0.3 micrometers in diameter or larger.

Permissible exposure limit (PEL)—Airborne concentration of chromium (VI) in excess of 5 micrograms per cubic meter of air (5 $\mu g/m^3$), calculated as an 8-hour time-weighted average (TWA).

Protecting Employees

To protect employees better, the Company believes the following preventative measures will reduce employee exposure to chromium (VI) hazards:

- **Exposure monitoring**—The Company will determine the 8-hour TWA exposure for each employee exposed to chromium (VI). The Company shall perform initial monitoring to determine the 8-hour TWA exposure for each employee based on a sufficient number of personal breathing zone air samples to accurately characterize a full shift.
- **Compliance program**—Where the PEL is exceeded, the Company shall establish and implement a written compliance program to reduce employee exposure to at or below the PEL through engineering and work practice controls, respiratory protection, protective work clothing and equipment, and hygienic areas and practices.

  Respirators must be used when engineering and work practice controls cannot eliminate employee exposure, during work operations where engineering/work practice controls are not feasible, and during emergencies.
- **Medical Surveillance**—The Company will make medical surveillance available at no cost to the employee, and at a reasonable time and place, for all employees:
  a. Who are or may be occupationally exposed to chromium (VI) at or above the action level for 30 or more days a year.
  b. Experiencing signs or symptoms of the adverse health effects associated with chromium (VI) exposure.
  c. Exposed in an emergency.
- **Personal Protective Equipment**—The Company will provide PPE when there is a hazard.
- **Hygiene Facilities**—Workers must wash their hands, faces, and any other potentially exposed skin before eating, drinking, or smoking.

Controlling Exposure

Regulated areas must be established when an employee's exposure is at or is expected to be in excess of the PEL. Regulated areas shall be marked with warning signs to alert other employees. Access to regulated areas is restricted to "authorized persons."

The Company shall maintain and make available an accurate record of all employee exposure monitoring, medical surveillance, and training records.

Employee training is a vital component of any successful program to control exposure to chromium (VI).

The Company will train all employees who are potentially exposed to chromium (VI), ensure employee participation in the program, and maintain a record of the contents of such program. Training must be provided prior to or at the time of initial assignment to a job involving potential exposure to chromium (VI) and annually thereafter. The training program shall ensure that each employee is informed of the following:

a. The hazards of chromium (VI)
b. The purpose and description of the medical surveillance program
c. The methods that protect the worker from exposure to chromium (VI)

Housekeeping

Surfaces shall be maintained as free as is practical of accumulation of chromium. All spills and releases of chromium shall be cleaned promptly. Methods of cleaning include HEPA filtered vacuums, dry or wet sweeping, shoveling, or other methods to minimize exposure.

Lead Awareness

General Requirements

Lead is a pigment and/or additive that was used in paints for many years. Consideration is given to the use of effective engineering controls to eliminate or reduce inorganic lead exposure to levels that are as low as reasonably achievable. At a minimum, the Company ensures that no employee is exposed to lead at concentrations greater than the OSHA required PEL of 50 micrograms per cubic meter of air (50 $\mu g/m^3$) averaged over an eight-hour period.

When feasible engineering controls are not effective for exposure control, employees must use appropriate PPE and respiratory protection equipment provided by the Company at no charge.

Written Plan

Company management must develop a written exposure control plan for the specific lead hazards at each site or facility. The written plan must address the following issues:

- Employee information and training
- Contaminant-specific hazard communication
- Exposure assessment
- Monitoring observation procedures
- Engineering and work practice controls
- Respiratory protection
- Protective work clothing and equipment

- Housekeeping
- Hygiene facilities and practices
- Medical surveillance
- Medical removal program
- Record keeping and documentation
- Information from regulatory appendices

Explanation of Terms

Action level—Employee exposure, without regard to the use of respirators, to an airborne concentration of lead of 30 $\mu g/m^3$ calculated as an eight-hour TWA.

Competent Person—Means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions and who has the authorization to take prompt corrective measures to eliminate them.

Lead—Metallic lead, all inorganic lead compounds, and organic lead soaps. Excluded from this definition are all other organic lead compounds.

Permissible exposure limit—The Company must ensure that no employee is exposed to lead at concentrations greater than 50 $\mu g/m^3$ averaged over an eight-hour period.

Responsibilities

Supervisor—The jobsite supervisor (in charge of the worksite) will ensure that these procedures are followed by any personnel performing work exposed to lead. The supervisor will ensure that protective equipment (PPE) requirements outlined in this plan are followed pertinent to the job at hand.

Competent Person—The jobsite will have a designated “competent person”. The Competent Person is responsible for assuring that all employees performing work involving potential lead exposures have been trained in the content of this program and are capable of implementing and performing safe work procedures.

Description of Operations

If the Company is involved in an operation that emits lead, the Company is required to write a narrative report in which the following items are noted:

- Type of equipment used
- Type of material involved
- Employee job responsibilities
- Operating procedures
- Maintenance practices

This operation narrative also must specify how compliance will be achieved by focusing on issues such as:

- Technology considered in meeting the PEL
- Engineering controls required
- Administrative controls used

- Type of PPE required
- Housekeeping and hygiene practices used to protect employees
- Methods used to inform other contractors of potential lead exposure

Training

All employees will be trained prior to the time of their job assignments for any work involving exposure to lead.

Employees will also receive refresher training annually after the initial training has been conducted.

Training requirements shall meet and/or exceed all federal and/or state licensing requirements for lead removal.

The employees shall be informed of the specific nature of work operations which could result in exposure to lead above the action level; the purpose, proper selection, fitting, use, and limitations of respirators; engineering controls; the purpose and description of medical surveillance program; and the medical removal program.

Lead awareness training should be documented, including dates of training, employee name, and name of person conducting the training.

Sources of Lead

Possible sources of lead are:

- Leaded paints
- Leaded gasoline
- Pipes
- Batteries
- Circuit boards
- Solder
- Cathode ray tubes
- Leaded glass
- Older underground electrical and telecommunication cables
- Demolition/salvage materials

Health Effects of Lead Exposure

Common symptoms of acute lead poisoning are loss of appetite, nausea, vomiting, stomach cramps, constipation, difficulty in sleeping, fatigue, moodiness, joint or muscle aches, and anemia. Long term (chronic) overexposure to lead may result in severe damage to the blood-forming, nervous, urinary, and reproductive systems.

Respiratory Protection

For employees who use respirators required by this section, the company must provide respirators that comply with OSHA requirements. Respirators must be used during:

- Periods necessary to install or implement engineering or work-practice controls.
- Work operations for which engineering and work-practice controls are not sufficient to reduce employee exposures to or below the permissible exposure limit.
- Periods when an employee requests a respirator.

The company must implement a respiratory protection program when respirators are worn. Please refer to Chapter 41 “Respiratory Protection Program” for more information.

Respirator Selection

Once typical worker exposures are determined for specific work activities, proper respirator selection will be made according to the exposure levels for the task to be performed.

Other Personnel Protective Equipment

If an employee is exposed to lead above the PEL, without regard to the use of respirators or where the possibility of skin or eye irritation exists, the company shall provide at no cost to the employee and assure that the employee uses appropriate protective work clothing and equipment such as, but not limited to:

- Coveralls or similar full-body work clothing
- Gloves, hats, and shoes or disposable shoe coverlets
- Face shields, vented goggles, or other appropriate protective equipment

Medical Surveillance

The company shall institute a medical surveillance program for all employees who are or may be exposed above the action level for more than 30 days per year. The company shall assure that all medical examinations and procedures are performed by or under the supervision of a licensed physician. The company shall provide the required medical surveillance including multiple physician review without cost to employees and at a reasonable time and place.

The company shall make available biological monitoring in the form of blood sampling and analysis for lead and zinc protoporphyrin levels to each employee who was or may have been exposed above the action level for more than 30 days per year on the following schedule:

- At least every 6 months
- At least every 2 months for each employee whose last blood sampling and analysis indicated a blood lead level at or above 40 ug/100 g of whole blood? This frequency shall continue until two consecutive blood samples and analyses indicate a blood lead level below 40 ug/100 g of whole blood
- At least monthly during the removal period of each employee removed from exposure to lead due to an elevated blood lead level.

Whenever the results of a blood lead level test indicate that an employee's blood lead level exceeds the numerical criterion for medical removal, the company shall provide a second (follow-up) blood sampling test within two weeks after the company receives the results of the first blood sampling test.

Access To Medical Records

Within 5 working days after the receipt of biological monitoring results, the employer shall notify in writing each employee whose blood lead level exceeds 40 ug/100 g of that employee's blood lead level and that the standard requires temporary medical removal with Medical Removal Protection benefits when an employee's blood lead level exceeds the numerical criterion for medical removal.

The company shall provide for decontamination, changing and hygiene facilities in accordance with OSHA requirements. Warning signs that are in accordance with OSHA requirement for lead hazards shall be posted in the work area. Signs shall be durable and shall not be removed or defaced.

Medical Removal

An individual shall be temporarily removed from work:

- Whenever periodic and blood sampling test indicates that his/her blood level is at or above 40 ug/100 g of whole blood
- Whenever a final medical determination places the individual at increased risk of medical impairment to health from exposure to lead

Return to Work

Personnel may return to their former job status as long as the following conditions are met:

- Whenever 2 consecutive blood level tests indicate that the individual’s blood level is at or below 30 ug/100g
- Whenever a subsequent final medical determination no longer places the individual at risk of medical impairment to health from lead exposure

Exposure Assessment (Air Monitoring)

Before the work begins, the Competent Person, Site Supervisor and/or Safety Department will evaluate the lead exposure activities and schedule monitoring if appropriate. Client data, if available, may be used during this determination process.

Worker exposure monitoring will be conducted if previous baseline monitoring data for similar work has not been established.

The company will work with the client company to monitor the potential employee lead exposure by using individual and fixed monitoring devices before and during work activity where lead exposure is known or suspected.

Exposure monitoring will be performed in accordance with OSHA regulations. For defining monitoring requirements, worker exposure is that exposure that would occur if the worker were not wearing respiratory protection.

The action level of 30 micrograms per cubic meter of air (30 ug/m3) or greater is the exposure assessment level that warrants the use of engineering controls and/or respiratory protection.

Frequency of exposure monitoring shall be as follows:

- Monitoring during the first day of work to establish the worker exposure levels and verify the appropriate respiratory protection requirements.

- Once personnel lead exposures are determined to be below the action level of 30 ug/m3, further monitoring is not necessary unless there is a change in the work environment, process or procedures. Proper documentation requires two consecutive samples taken during the same work activity, taken at least 7 days apart, give results less than 30 ug/m3.
- If personnel exposures are determined to be between 30 ug/m3 and 50 ug/m3, monitoring shall be conducted quarterly until 2 consecutive samples collected during the same work activity, collected at least seven days apart are less than 50 ug/m3 and greater than 30 ug/m3. Then monitoring will be conducted every six months.
- If personnel exposures are found to be above 50 ug/m3, monitoring shall be conducted quarterly.
- For abrasive blasting, additional monitoring for respirable dust/particulate matter should be conducted.

If employees working immediately adjacent to a lead abatement activity are exposed to lead because of a breach to the enclosure, their employer shall either remove the employees from the area until the enclosure breach is repaired or perform an initial exposure assessment.

Access To Exposure Monitoring Results

All personnel whose exposures are monitored will be notified of their results within 5 working days of the receipt of the results by the Company.

When results indicate that, without respirators, the worker was or would have been exposed to airborne levels at or above the permissible exposure limit (PEL) of 50 ug/m3, we will assure that the monitored worker is informed of the results. In addition, a written description of corrective action taken (additional engineering controls, administrative controls or respiratory protection equipment requirements) to be taken to reduce exposures below the PEL will be provided.

Change Areas

Change areas must be provided with separate storage facilities for protective work clothing and street clothing which prevent cross contamination between the two.

Protective clothing cannot be worn outside the work place or into designated eating or smoking areas.

Hand Washing & Showering Facilities

Adequate hand washing and showering facilities must be provided.

All employees must decontaminate their body by adequately washing the hands, body and face at the end of each work period.

Barricades and Warning Signs

For all lead abatement work, the area shall be barricaded and signs posted so that other employees not involved in the work will not be exposed to lead. The signs shall be illuminated and cleaned so as to remain visible.

Airborne lead content less than 30 ug/m3:

No requirements.

Airborne lead greater than 30 ug/m3:

Signs must be posted stating "Warning. Lead Work Area, Poison, No Eating, Drinking or Smoking" in work areas where other employees are working such as in an operating unit.

Where employees could be exposed to lead because of the lead abatement work, the lead abatement work area must be contained. In remote areas, such as tank farms, containment may consist of the ground around the lead abatement area.

Summary

The Company believes the following preventative measures will reduce employee exposure to a potential lead hazard:

- Refusal to work in areas with a high concentration of lead exposure since the Company is not a lead abatement contractor
- Use of PPE, including respirators, eye protection, and proper work clothing
- Engineering controls, such as washing the face and hands after each break
- Wet or dry sweeping or vacuuming of contaminated particles where possible
- Use of air movers and respirators when welding or cutting in confined spaces
- Good housekeeping
- Administrative controls, such as job rotations
- Monitoring of areas where prior measurements, observations, or employee complaints indicate an exposure attributable to lead
- Prohibition of eating, drinking, smoking, or cosmetic application in the work area
- Regular inspection of jobsite work practices, equipment, and material by a competent person
- Labeling and signs as required
- A comprehensive employee training and education program

Mercury Awareness

Potential Hazard

Mercury can be found in three different chemical forms. Each has its own varying degree of toxicity:

- Organic mercury (alkyl compounds- most toxic)
- Mercury vapor
- Elemental (inorganic) mercury

Mercury can be found in some residential type regulators used by the natural gas industry. In addition, mercury maybe found in the following electrical equipment:

- Circuit switches
- Communication/radio cabinets
- Lights/Lighting Ballast

- Switches
- Thermostats
- Relays/switches on printed circuit boards
- Position sensors

General Requirements

Mercury is the only metal which remains in liquid state at room temperature. In the environment, mercury is found in three forms: metallic mercury, inorganic mercury salts, and organic mercury compounds. Regardless of its form, mercury seems always to be in a state of constant conversion—and its degree of toxicity varies accordingly. Because of this tendency, elemental mercury, when heated or spilled, has the potential to create a hazardous situation.

Mercury vapors are heavier than air and will collect in areas close to the ground.

Mercury commonly enters the body through inhalation, skin absorption, or consumption. For these reasons, contact with mercury should be avoided and appropriate PPE used as required.

Explanation of Terms

ACGIH Action Level - 0.025 milligrams per cubic meter (mg/m3) for an 8 hour time weighted average, (TWA) with no allowable short-term exposure limit (STEL).

OSHA Ceiling limit (one-time exposure never to be exceed during an 8-hour shift) for any form of Mercury is 1.0mg/10m^3

Immediately Dangerous to Life & Health (IDLH) ceiling limit is 28 mg/m3 with a warning that mercury is easily absorbed through the skin

Training

All employees shall be trained in accordance with the applicable local, state, and Federal safety standards and regulations prior to commencing work activities.

All affected employees shall receive initial and annual training on the removal of mercury regulators and "Mercury Awareness" training before commencing work activities associated with the removal, storage, and transportation of mercury regulators.

Training shall include, but is not limited to:

- Advising affected employees of the signs and symptoms of overexposure to mercury
- Instructing affected employees to advise their supervisors or other management representative of the development of the signs and symptoms of overexposure to mercury
- Informing employees of the specific nature of operations which could result in exposure to mercury above the permissible exposure limit, as well as safe work practices for the handling, use, release, storage, or disposal of the mercury or its compounds in normal operations
- Instructing employees in proper housekeeping practices, decontamination procedures in the event of a mercury or mercury compound spill, and fire emergency procedures
- Emphasizing the possibility of ingesting mercury by hand-to-mouth contact when good personal hygiene is not practiced

- Informing employees of measures necessary to protect them from exposures in excess of the permissible exposure limit. The wearing and turning-in of protective clothing should be stressed.
- Instructing employees as to the purpose, proper use, and limitations of respirators
- Providing employees with a description of, and explain the purposes for, the medical surveillance program
- Informing employees where written procedures and hazard information are available at the work site

Personal Protective Equipment

The following personal protective equipment shall be worn when an exposure hazard to mercury is present.

- Disposable polyethylene lined coveralls (i.e. Tychem CPF 2 or 3)
- Safety glasses with side shields
- PVC , PE (silver shield) Polyethylene or nitrile gloves and boots
- Personal items (e.g., rings, watches, wallets, combs, etc.) shall be removed and stored where direct contact with mercury will be avoided.
- Protective clothing should be kept free of oil and grease and be inspected and maintained regularly to preserve its effectiveness.
- Protective clothing may interfere with the body's heat dissipation, especially during hot weather or during work in hot or poorly ventilated work environments. Extra caution should be shown when working in these environments.
- The removal of mercury fume or dust from protective clothing by blowing or shaking is prohibited.
- All contaminated personal clothing shall be laundered, maintained, and disposed of in accordance with applicable environmental guidelines.
- In the event personal clothing is contaminated, contaminated personal clothing shall be removed as soon as possible, double bagged, sealed, and tagged or otherwise marked as containing contaminated clothing. To prevent further contamination, it is very important to check clothing prior to work completion for contamination. Contaminated clothing should not be worn from the work site.
- Check footwear for possible contamination. If footwear is contaminated, it shall be treated as mercury contaminated material and not worn from the work site. Upon completion of work at the residence or building, contaminated PPE shall be double bagged, sealed, tagged with a label affixed indicating "contaminated material," and placed in a pail with the lid affixed and marked or tagged as contaminated. Notify your Field Support Manager. The Field Support Manager will make arrangements for cleaning/disposal.

Monitoring

Personal Monitoring

- Personal air sampling shall be conducted with a representative sample of employees placed in a job or position with a potential for exposure to mercury vapor.

- The method of monitoring and analysis shall be in accordance with NIOSH Method Number 6009 of the NIOSH Manual of Analytical Methods.
- Employee exposure measurements should represent the actual breathing zone exposure conditions for the employee.
- All exposure samples should be calculated on an 8-hour TWA, assuming a 40-hour work week, to arrive at the permissible exposure limit.
- If sampling results indicate exposures below permissible exposure limits, subsequent monitoring shall be performed on a periodic basis.
- Remonitoring shall occur whenever there has been a production, process, or control change which can result in an increase in the airborne concentration of mercury vapor or there is any other reason to suspect an increase in the airborne concentrations.
- If sampling indicates mercury exposures above permissible exposure limits, new operational and safety procedures require development. In such cases, the provisions of this procedure would no longer apply.

Vehicle Monitoring

If Company vehicles are used in the transport of mercury contaminated waste products, then monitoring of the vehicle may be required.

- Initial representative air sampling inside company transport vehicles shall be conducted to ensure the effectiveness of procedural requirements. Sampling shall be based on an 8-hour TWA.
- The method of monitoring and analysis shall be in accordance with NIOSH Method Number 6009 of the NIOSH Manual of Analytical Methods.
- If sampling results indicate exposures below permissible exposure limits, subsequent monitoring shall be performed on a periodic basis as needed to ensure employee safety. If sampling indicates mercury exposures above permissible exposure limits, new operational and safety procedures require development. In such cases, the provisions of this procedure would no longer apply.
- Remonitoring shall occur whenever there has been a production, process, or control change which may result in an increase in the airborne concentration of mercury vapor or there is any other reason to suspect an increase in the airborne concentrations.

Medical Surveillance

Medical surveillance shall be conducted with the exception that pre-placement medical evaluations and subsequent surveillance and examinations will be provided to all employees placed in a job or position with a potential for exposure to mercury vapor.

Housekeeping and Personal Hygiene

All food, beverages, tobacco products, nonfood chewing products, and unapplied cosmetics are prohibited in areas where regulator removal and handling activities occur.

Contact lenses shall not be worn in areas where regulator removal and handling activities occur.

If the employee suspects that he/she may have come into contact with mercury, the employee shall immediately wash the affected area with soap and water and notify his/her supervisor.

Employees who work in areas where regulator removal and handling activities occur shall use soap and water to thoroughly wash their hands, forearms, face, and neck before each occasion of eating, drinking, smoking, or applying cosmetics, and at the end of each work shift. Additionally, employees shall wash their hands with soap and water before using toilet facilities.

All exposed surfaces shall be maintained free of accumulation of mercury which, if dispersed, would result in airborne concentrations in excess of the permissible exposure limit or in a visible dust cloud.

Spill Response & Containment

1. Evacuate the area.
2. Wear PPE.
3. Secure the spill area.
4. Contact your customer Environmental department.

Don’ts with a Mercury Spill

- Never use a vacuum cleaner to clean up mercury. The vacuum will put mercury into the air and increase exposure. The vacuum appliance will be contaminated and need to be disposed of.
- Never use a broom to clean up mercury. It will break the mercury into smaller droplets and spread them.
- Never pour mercury down a drain. It might lodge in the plumbing and cause future problems during plumbing repairs. If discharged, the mercury can cause pollution of the septic tank or sewage treatment plant.
- Never wash mercury-contaminated items in a washing machine. Mercury may contaminate the machine and pollute sewage.
- Never walk if your shoes might be contaminated with mercury. Contaminated clothing can also spread mercury.

Packaging Mercury for Storage and Transportation

All mercury-containing products or containers of mercury should be placed inside a larger container with a tight fitting lid.

Kitty litter or oil-absorbent matter should be placed around the product to protect it from breaking or sudden shocks.

Clearly label storage container as "Mercury — DO NOT OPEN."

PCB Awareness

Forms and Use

Polychlorinated biphenyls (PCBs) are a class of chemical compounds that, until the mid-1970's, found considerable use in industry because of their chemical stability and excellent heat absorption qualities. They have been used world-wide primarily as insulating fluids in transformers and capacitors, as hydraulic fluids and lubricants, petroleum additives, heat transfer fluids in carbonless copy paper and plasticizers.

Health Effects

The most commonly reported finding attributed to PCBs in worker studies is skin rash, particularly chloracne, a skin condition resembling juvenile acne. This finding has been reported among PCB workers over the years and is a well-known distinguishing characteristic of over-exposure to PCBs. Although more difficult to treat then juvenile acne, chloracne usually can be cured by proper therapy and prevention of further exposure. A less frequently reported condition, which is usually transient and not associated with symptoms, is elevation of certain enzyme levels in the blood that, though not an illness, is considered possible evidence of transient effects of excessive PCB exposure on the liver. PCBs may have another effect also related to the liver, namely, the ability to speed up the rate at which the liver breaks down certain body substances, such as hormones and certain environmental chemicals that find their way into the body. The significance of this effect is not known. Several studies have also reported an elevation of triglycerides in the blood of PCB workers, but other studies have not shown this change. It is important to emphasize that none of these adverse health effects have been reported in Americans whose exposure to PCBs has been confined to consumption of commercially available foods.

Potential Locations

Since 1979, PCB production and use has been prohibited. In the years that have followed, PCBs and materials and containers holding PCBs have been removed from service. Even though this effort has effectively reduced the amount of PCBs in the work place, some of the material and containers storing or comprised of PCBs are still in use. Materials and items that may contain PCBs in the electrical transmission and distribution include, but are not limited to, the following:

- Cable insulation
- Thermal insulation material including fiberglass, felt, foam, and cork
- Voltage regulators, switches, reclosers, bushings, and electromagnets
- Electronic equipment, switchboards, and consoles
- Transformers, capacitors, and electronic equipment with capacitors and transformers inside
- Surface contamination of parts of equipment from past leaking equipment

Recognizing Hazards

PCBs are difficult to distinguish without using analytical methods. Field screening techniques can test for the presence of chlorine, but laboratory analysis is necessary to identify PCBs and PCB concentrations. The difficulty in identifying PCBs emphasizes the importance of properly labeling equipment and materials that contain them.

Any of the above items manufactured through 1979 and those without a "No PCBs" label should be assumed to contain PCBs.

Two to three ounces of PCB contaminated oils/fluids may meet or exceed the EPA limit of 500 ppm and be considered PCB containing.

PCB Container Identification

Current owners of PCB containers must label any containers not labeled by the original manufacturers. If labels are missing, contact your customer representative to determine the likelihood of the presence of PCBs.

Aged labels on electrical equipment may not accurately represent the PCB concentration of the equipment's contents. For example, sealed transformers labeled as containing non-PCB oil may become contaminated with PCBs during servicing. Other reasons for erroneous labeling include:

1. Improper sampling and/or analysis at the time of original labeling

2. Equipment alterations that may have caused a change in PCB concentration since the labeling

3. Confusion over the difference between federal and state definitions of the non-PCB classification

Hence, electrical equipment, including sealed transformers originally labeled as non-PCB and maintained in service as non-PCB, should be managed cautiously. The electrical equipment is required to be evaluated for PCBs and proper PCB classification when it is removed from service. If in doubt, contact your customer representative/inspector.

Visual Inspection of the Equipment

Look for indications that the equipment may be leaking, such as:

- Oil stains near the equipment
- Weep marks on the equipment
- Gross physical damage

Protecting Yourself and Controlling Exposure

Depending on the condition of the equipment you are removing, it will be necessary to don the proper personnel protective equipment. Regardless of equipment conditions, employees shall don the following personal protective equipment:

1. If direct contact with PCBs is anticipated (gross equipment damage, evidence of leaks/spills) employees shall don:

   Neoprene gloves, overshoes and rubberized outer clothing.

   Face shields with safety glasses with side-shields.

2. Equipment integrity is maintained and there is zero indication of leaks/spills employees shall don the following:

   Neoprene gloves

   Face shields with safety glasses with side-shields

Any questions regarding PCB exposure should be directed to the Regional Safety Manager or Customer Environmental Health and Safety representative.

Containerizing/Labeling of PCB Waste

Materials associated with transfer of PCBs such as clothing, absorbent, or rags should be treated as hazardous waste. Arrangements should be made with your company representative to provide drum liners (40 ml plastic) and drums for the proper containerizing of PCBs containing materials.

Labeling

PCB labels should be fixed on PCB storage tanks, barrels, and transformers.

Storage and Disposal

At no time will any Operating Unit project site, work crew, or facility accept for storage any PCB containing materials. Containerized materials will be given to the customer for proper storage and disposal.

Spill Response

- Prevent the spill from entering any drainage, sewer, and so on, by surrounding the perimeter of the spill with absorbent materials such as absorbent pads, booms, pigs, earthen berm, and so on.
- Contact the customer representative with the following information:
  1. Location
  2. Approximate amount of spill
  3. Proximity to waterway or surface
  4. Impacted waterway
  5. Injuries
- Contact your Operating Unit EHS department to report the spill.
- Do not attempt to clean up the spill yourself, use a qualified Emergency Response Contractor.

Silica Awareness

General

Consideration is given to the use of effective engineering controls to eliminate or reduce silica exposure to levels that are as low as reasonably achievable. At a minimum, the Company ensures that no employee is exposed to silica at concentrations greater than the OSHA required PEL.

When feasible engineering controls are not effective for exposure control, employees must use appropriate PPE and respiratory protection equipment provided at no charge by the Company.

Written Plan

Site or facility management must develop a written exposure control plan for the specific silica hazards at each site or facility. The written plan must address the following issues:

- Employee information and training

- Establishment of regulated areas
- Contaminant-specific hazard communication
- Exposure assessment
- Monitoring observation procedures
- Engineering and work practice controls
- Respiratory protection
- Protective work clothing and equipment
- Housekeeping
- Hygiene facilities and practices
- Medical surveillance and medical removal program
- Recordkeeping and documentation
- Emergency situations
- Information from regulatory appendices

Explanation of Terms

Crystalline silica—Silicon dioxide (SiO_2). "Crystalline" refers to the orientation of SiO_2 molecules in a fixed pattern as opposed to a nonperiodic, random molecular arrangement defined as amorphous. The three most common crystalline forms of free silica encountered in industry are quartz, tridymite, and cristobalite. Micro- and cryptocrystalline varieties of free silica are composed of minute grains of free silica cemented together with amorphous silica and include tripoli, flint, chalcedony, agate, onyx, and silica flour. Other forms of free silica that, upon analysis, are found to have a crystalline structure as part of their compositions are also subject to consideration as silica.

Identification of Silica

Employees must be aware of the hazards of silica exposure and the types of construction activities that generate silica hazards.

Silica is found in both sand and rock. Sand contains silica crystals; beach sand is an example of almost pure silica. Rocks such as quartz, granite, shale, and sandstone contain silica.

When working around materials that contain silica crystals, certain construction activities can cause the silica crystals to become airborne and create a hazard to unprotected workers. When performing the following activities, it is important to monitor the exposure level and take the appropriate measures to ensure that all workers are protected. The following construction activities can generate silica exposure:

- Sandblasting
- Cutting
- Drilling
- Grinding
- Hammering
- Dumping rock

- Chipping
- Demolition
- Sawing

Workers can be protected in many ways. Protection is determined from the level of exposure. Types of protection may include:

- Respiratory protection.
- Protective clothing.
- Wet-method removal.
- Vacuuming.
- Showering facilities.
- Air filtration and exhaust.
- Engineering controls to eliminate exposure.

Employees must be aware of the hazards of silica exposure that exist when these activities are performed. When it becomes necessary to conduct these activities on materials that contain silica, the supervisor should contact Company management and the Safety Department. The work activity will be preplanned to minimize the silica exposure and determine the level of protection necessary for the affected employees.

Sample 33-1. Spill Response Checklist

Spill Response Checklist

_______ Report Spills immediately.

_______ Evacuate the area if you are not responsible for spill cleanup.

IF YOU ARE RESPONSIBLE FOR CLEANING UP A SPILL:

_______ Check the Material Safety Data Sheet of the substance for hazards, reactivity, proper protective equipment, and so on.

_______ Put on protective clothing.

_______ Stop the source of the spill, if possible.

_______ Cover drains or other possible escape routes.

_______ Patch holes.

_______ Contain the spill by:

- Building a dike using on-site equipment
- Repairing the leaking container
- Putting the leaking container in one that will not leak
- Channeling the spill to a place where the spill will not spread
- Placing an empty container under the leak
- Rotating or shifting the position of the container to stop the leak

_______ Soak up or solidify the spill with absorbent materials.

_______ Push the absorbent-liquid mixture into an approved container for proper disposal.

_______ Decontaminate protective clothing or dispose of it properly before going into a clean area.

Complete a written report on major spills.

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Sample 33-2. Spill Notification Requirements

SPILL NOTIFICATION REQUIREMENTS

United States Coast Guard National Response Center
National Response Center (800) 424-8802

Notify immediately for a spill of Federal Reportable Quantity.

Environmental Protection Agency
Regional Response Center (214) 665-6444
Dallas, Texas

Notify immediately for a spill of Federal Reportable Quantity.

State Emergency Response Centers
General Land Office (GLO) (800) 832-8224

Report any spill or release of oil into the environment in coastal areas.

Texas Natural Resources Conservation Commission (TNRCC)
Regional Office (Amarillo) (806) 353-9251

Report any spill or release of oil into the environment in noncoastal areas.
Report spills and accidental discharges of hazardous substances, wastes, or other Substances.

Texas Emergency Response Center (TERC)
24 Hours (512) 463-7727
(512) 239-2507

Report any spill or release of oil into the environment in noncoastal areas.
Report spills and accidental discharges of hazardous substances, wastes, or other substances.

Texas Railroad Commission (TRC)
Regional Office (Pampa) (806) 665-1653

Report fires, leaks, or breaks in tanks or pipelines where oil or gas are escaping or have escaped.

Texas Department of Public Safety (DPS) (512) 465-2850

Report all transportation incidents involving releases of reportable quantities of hazardous materials on public roads or railroads.

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Sample 33-3. South Gate Pipeline Project

(CPS Job)

South Gate Pipeline Project

Spill Response

Trojan Vacuum Trucks
Phone: (830) 277-1031

Liquid Disposal

K & W Disposal
Phone: (830) 569-3600

Solid Waste Hauling

Stella Materials
Phone: (830) 622-5658

Hazmat Disposal Landfill

Covel Gardens
Phone: (210) 623-8800

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34

Security Measures

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

General Requirements

Security must be maintained at each project site to prevent unauthorized entry to the work area. This action helps prevent loss of tools, equipment, material, and employee personal items.

Site security provided by the Company must be established on a project basis in accordance with the requirements of that particular project. The establishment of the Company site security procedure is the joint responsibility of the Safety Department and Company management.

The following security guidelines are recommended:

- Fence in the areas as soon as possible at the start of the project.
- Place signs with the following wording in areas that are visible to all personnel entering and exiting the project site:

  All personnel and vehicles are subject to inspection on entering or leaving the construction area. Only authorized personnel are allowed to enter the project.
- Review the project site security procedure at the kick-off meeting.
- Use a bonded security service.
- Post a letter outlining the requirement of the site security procedure for the project on a bulletin board.
- Establish lockup procedures for all offices, vehicles, equipment, tool trailers, and warehouse areas. Assign keys and record assignments on the security log.

- When it is necessary to park vehicles and equipment overnight at a jobsite or in a construction right-of-way, make every effort to secure those vehicles away from the general public by the use of gates, chains, or other physical barriers. Lock all vehicles and equipment storage bins; remove all keys.
- Establish a liaison with local police authorities before beginning a project, if necessary.

Security Orientation

During the site-specific safety orientation, discuss the jobsite security measures with each employee.

Information Asset Security

Management retains primary responsibility for identifying, classifying, and protecting information and computer assets within the assigned area of management control.

Managers are responsible for the education and awareness of all persons reporting to them, regarding the need for data security. Management must advise employees that compliance with this policy and all supporting documentation is mandatory.

Workplace Violence

Workplace violence and threats of violence can be internal from coworkers or external from clients or other individuals.

Acts or threats of violence against persons or property are not tolerated. Acts of intimidation, harassment, or other inappropriate behavior that causes fear for personal safety are included in this policy. These acts or threats are cause for serious disciplinary action and possible criminal charges.

Possession, use, or threat of use of a firearm, explosive, or other dangerous weapon by the following individuals is prohibited:

- Any employee on Company or customer work sites
- Anyone in a Company-owned or -leased vehicle
- Anyone in privately owned vehicles on official business

Management ensures that policies and procedures to prevent and respond to workplace violence are implemented at all work sites. All employees must be made aware of these policies and procedures. Employees share a responsibility for preventing, reporting, and responding to threats or acts of violence in the workplace and must report all threats or acts of violence to management. Report emergencies directly to local security or law enforcement officials.

When Violence Occurs

Report all emergency events directly to local law enforcement or site security officials. Dial 911 or a workplace emergency number. Seek shelter from the event.

35

Contraband Policy

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

General Requirements

In the interest of its employees, the client, and the public, management is committed to providing a safe, healthful, and productive work environment. Company management intervenes when there is reasonable cause to believe an employee is in possession of contraband items while on Company premises or outside Company premises on Company business.

Definitions

Company premises—For the purposes of this manual, company premises is defined as Company offices, Company sites, Company transportation of all types, private vehicles used on Company business and at Operating Unit offices, and facilities and project sites or other areas where work is being performed. The policy applies to offices, facilities, land, structures, fixtures, installations, automobiles, trucks, and all other vehicles and equipment whether they are owned, leased, or rented by the Company or used on Company business.

Contraband—For the purposes of this manual, contraband is defined as firearms, guns, knives, other weapons, explosives, and ammunition or other similar items. Alcoholic beverages, illegal drugs, controlled substances, and drug paraphernalia are also considered contraband, but these items are covered in the Company Drug & Alcohol Policy.

Policy

Possession

The possession of explosives, firearms, or other weapons either on Company premises or elsewhere while on Company business is prohibited. Violations may result in termination and may be reported to law enforcement authorities if appropriate.

Exception: Circumstances may arise that warrant Company approval for the possession of firearms on Company premises or in Company transportation. Approval may be deemed necessary by officers of Company management.

Searches

When Company management concludes it has reasonable cause to believe that an employee is in possession of contraband items, management may authorize searches or inspections of employees, their work areas, their personal effects, Company transportation, and private vehicles on Company or client premises to determine whether the employee is in possession of contraband. Refusal to submit to search procedures is grounds for termination.

Subcontractors and Visitors

Any subcontractor, employee, or visitor found in violation of the Company contraband policy are refused entry onto or removed and permanently barred from Company premises. Such persons are reported to law enforcement authorities if appropriate.

Compliance

Compliance with this contraband policy is a condition of employment. If an employee fails to comply with the policy, that employee is subject to termination. The Company administers this policy in a balanced manner, including the use of appropriate administrative safeguards to ensure that the rights and privacy of all individuals are respected.

Guidelines

The following contraband guidelines have been developed to ensure consistent application of the Company contraband policy. While contributing to the safe and productive conduct of the business, Company management respects the rights and privacy of its employees.

Procedure

Pre-employment

Candidates for employment are made aware that, as a condition of employment, they are expected to read and understand this contraband policy and comply with its provisions.

Searches

The Company will, with reasonable cause, conduct searches to the extent necessary to ensure safe Company operations. Entry onto Company premises, including parking areas, is considered as giving consent to an inspection of person, vehicle, and personal effects at any time while entering, occupying, or leaving the property.

The authority to invoke searches is vested with the most senior manager or supervisor of the facility where the search is to occur. The authorizing individual coordinates in advance with the corporate Safety Department. A search procedure is based on one of more of the following considerations:

- Reasonable cause—Reasonable cause constitutes a belief based on information or reasonable suspicion that contraband might be present.
- Employee refusal—Employees who refuse to cooperate are not forcibly searched but are informed that submission to a search is a condition of continued employment and that failure to comply is grounds for termination.
- Search procedure—Searches may be conducted by a member of management who is designated by the department manager and is accompanied by a witness. Searches may also be conducted by a third party hired by the Company and under the direct supervision of management.

  Searches may include lockers, vehicles, personal effects from pockets or handbags, and so on and are conducted with as much privacy and confidentiality as reasonably possible. There is no direct physical contact with the employees being searched.

  An employee found to have contraband in his or her possession during the search is suspended without pay. An investigation of the incident is conducted, and in the absence of extenuating circumstances, the employee is terminated.
- Disposition of seized property—When appropriate, contraband items are impounded by a qualified employee of an approved search company hired by the Company. A chain of evidence must be maintained on all seized property, including receipts and a log of dates and individuals involved in custody transfers. Seized property that is determined through investigation to be the employee’s proper possession is returned and a receipt obtained.

Interpretation

Should situations develop that are not expressly covered in the policy or contraband guidelines, the Corporate Safety Department, Human Resources Department, or Company legal counsel will be consulted as appropriate.

36

Competent Person Designation

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

Definitions

Authorized person—One who has the authority to perform specific duties under certain conditions or who is carrying out orders from a responsible authority.

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

Designated person—See authorized person.

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

General Requirements

Governmental regulations require the Company to designate construction personnel to perform certain functions. OSHA construction standards require that various jobsite personnel who are “authorized,” “designated,” “competent,” or otherwise qualified be appointed to oversee various construction operations based on their skills or training. They must regularly inspect the jobsite, materials, and equipment used at a specific work site to identify existing hazards or dangerous conditions. Additionally, they must take prompt corrective measures to eliminate any unsafe conditions observed.

Designated Activities

There are numerous areas where competent personnel are required to supervise or oversee specific operations or tasks. Company management must designate a competent person to be responsible for any of the following areas:

- Accident prevention, responsibility, and training
- Medical services and first aid
- Excavations, trenching, and shoring
- Scaffolding erection and ladders
- Lockout/tagout procedures and assured grounding program
- Cranes and lifting equipment
- Assigning qualified equipment operators
- Rigging equipment inspection—Slings, wire rope, and so on
- Fire protection and prevention
- Personnel hoists and powered manlifts
- Power hand tools
- Respiratory protection
- Fall protection
- Welding and cutting
- Confined spaces
- Industrial hygiene exposure and atmospheric testing
    - Asbestos
    - Heavy metals (lead, cadmium, and so on)
    - Toxic chemicals
    - Flammability tests
    - Oxygen deficiency
    - Carbon dioxide monitoring
- Demolition exposure

Designation Authority

All competent person designations must be approved by the Safety Department and Company management. The Company Safety Department recommends reviewing and updating the “Competent Person Assignment” list as necessary. Refer to this form located at the end of this chapter.

Sample 36-1. Competent Person Assignment

Type Company Name Here

Competent Person Assignment

Project No. ______________________ Project Location ____

Client Date ______________________

Fill in designated person's name or n/a if not applicable.

The following personnel are assigned as the competent persons for the activities listed below on this specific jobsite:

Activity Description	Personnel Assigned
Accident Prevention Responsibility and Training:	
Medical Services and First Aid:	
Excavations, Trenching, and Shoring:	
Scaffold Erection:	
Ladders:	
Lockout/Tagout Procedure:	
Assured Grounding Program:	
Cranes and Lifting Equipment:	
Assigning Qualified Operators:	
Rigging Equipment Inspection:	
Fire Protection and Prevention:	
Personnel Hoist and Manlifts:	
Power Hand Tools:	
Respiratory Protection:	
Fall Protection:	
Welding and Cutting:	
Confined Space:	
Industrial Hygiene and Atmospheric Testing:	
Demolition Exposure:	
(Other)	
(Other)	
(Other)	

Project Manager ____

Project Safety Supervisor ____

Distribution Original—Jobsite File Copy—Corporate Safety Department

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37

Hearing Conservation Policy

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

General Requirements

The Company has prepared these guidelines to limit the exposure of employees to occupational noise and protect employees from hearing loss. These guidelines are based on an employee noise exposure limit that equals or exceeds an 8-hour, TWA sound level of 90 decibels (dB) measured on the A scale (slow response).

Monitoring

Monitoring is conducted with the assistance of the insurance provider, Company personnel, or a consulting firm when necessary.

Strategies are developed with these organizations to address the mobile nature of employees and the variable sound levels they experience throughout the day. Affected employees are given an opportunity to observe monitoring procedures. Monitoring is repeated whenever there is a change in working conditions that might impact noise levels. Each employee exposed to noise above 90 dB (TWA) is given a copy of monitoring results, and the results are filed at the jobsite.

The Company will examine the noise generated as a result of the work that we are performing. Because of the nature of our business, we periodically work inside industrial facilities, power plants, pulp and paper, and process plants. The Company places some reliance on those facilities to monitor the background noise within the facility and post appropriate warning signs as required.

Adherence to all posted warning signs is mandatory.

Audiometric Testing Program

Where necessary, the licensed healthcare provider (audiometrist) conducts audiometric testing, which includes baseline and annual audiograms. Testing and employee notification are performed as required by and in compliance with regulatory guidelines.

Hearing Protectors and Attenuation

Appropriate hearing protectors are supplied to all employees. A hearing attenuation evaluation is conducted for each hearing protector. Attenuation is reevaluated when noise exposure increases.

The two most common types of hearing protection used are:

- Ear plugs
- Ear muffs

Hearing protection devices must be worn properly to provide the maximum protection available. Hearing protection must also be kept clean to avoid ear infections.

Training

All employees receive training on the following topics:

- Effects of noise
- Hearing protection
- How to properly care for and use of hearing protectors

Each employee exposed to noise at or above 90 dB (TWA) receives additional training on the following topics:

- The purpose of audiometric testing
- Regulations applicable to hearing protection
- Company Hearing Protection Program

Training shall be initially, prior to job assignment, and annually thereafter.

Recordkeeping

The exposure measurements and audiometric tests are filed at the Company’s Safety Office. Noise measurement records are kept for two years, and audiometric test results are kept for the duration of employment. Records of the sound level test rooms are provided by the health center and filed with other noise exposure records. All records are available upon request.

Hearing Protection Guidelines

Observe the following guidelines to protect hearing:

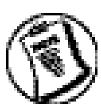
- Wear ear protection when there is a possibility of hearing damage, which can occur during continuous exposure to noise or impulse exposure to loud impact noise.

- Minimum permissible noise exposure limits are given in Table 37-1. If these limits are exceeded, proper ear protection must be worn. As a guideline, if normal conversation can be understood from about 2 ft (0.61 m) away, the noise level is probably less than 90 dB. Protection must be worn anytime the employee is exposed to impact noise of more than 140 dB, for example, noise similar to a rifle or shotgun.
- Specific areas where the noise level is greater than 90 dB is identified for each project and time limits stated. Employees must wear proper protective devices when exposed to noise that exceeds posted limits.
- Proper ear protection includes any of the following: earmuffs, earplugs, molded ear protectors, or wax earplugs. Plain cotton is not acceptable. Ear protective devices must be worn properly to provide the required protection and kept clean to reduce the possibility of ear infection.

For additional information concerning noise, contact the Company Safety Department.

Table 37-1 Permissible Noise Exposures

Duration Per Day (Hours)	Sound Level—Slow Response (dB)
8	90
6	92
4	95
3	97
2	100
1 ½	102
1	105
½	110
¼ or less	115



Exposure to excessive noise can cause a gradual decay in hearing ability. Advancements are being made in the reduction of noise, but during the interim period, employees must wear proper ear protection when exposed to excessive noise.

High Noise Equipment

Evaluation of construction equipment under general use has determined that hearing protection might be required when employees are involved in the tasks or are working with the equipment listed in Table 37-2. This list of tasks and tools is representative only and is not meant to be all-inclusive.

Table 37-2. High Noise Tasks and Equipment

Chain saws	Concrete cut-off saws
Table saws	Skill saws
Air grinders	Pavement breakers
Electric grinders	Pneumatic chipping tools
Bull dozers	Concrete pumpers
Impact wrenches	Arc gouging torches
Air compressors	Cherry pickers
Pile drivers	Welding machines
Ground tampers	Powder-actuated tools
Vibratory Plow Tractors	Trenchers
Blasting operations	Hammer drills
Horizontal Directional Drilling (HDD) operations	Excavation equipment
Locate equipment (water jetting and vacuum truck)	Jackhammers
Wood Chippers	

Program Evaluation

The Company shall evaluate the effectiveness of the Hearing Conservation Program on an annual basis. The review shall include the following:

- Types of hearing protection devices provided to employees
- Effectiveness of the Training program
- Non-compliance issues of the past year
- Review of audiometric test results to see if any employees experienced a threshold shift in hearing.

Should threshold shifts have occurred within the past year, a medical evaluation may be necessary.

38

Railroad (Roadway Worker) Protection

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

Definitions

Adjacent tracks—Two or more tracks with track centers spaced less than 25 ft (7.62 m) apart.

Controlled track—Track on which the rules require that all movements of trains must be authorized by a control operator.

Control operator—A railroad employee in charge of a remotely controlled switch or detail, interlocking control point, or segment of controlled track.

Employee in charge—A person who has successfully completed all required training for EIC and has demonstrated proficiency in and has been authorized to perform the duties of a particular position or function. An employee in charge (EIC) must be qualified on Operating and On-Track Worker rules and physical characteristics.

Exclusive track—A method of establishing working limits on controlled track in which movement authority of trains and other equipment is withheld by the control operator or restricted by flagger.

Flagger—A railroad employee designated to direct or restrict the movement of trains past a point on a track to provide on-track safety for roadway workers, while engaged solely in performing that function.

Foul time—A method of establishing working limits on a controlled track in which a roadway worker is notified by the control operator that no trains will operate within a specified segment of controlled track until the roadway worker reports clear of the track.

Fouling a track—Placement of an individual or a piece of equipment in such proximity to a track that the individual or equipment could be struck by a moving train or on-track equipment or, in any case, is within 4 ft (1.22 m) of the nearest rail of any track.

Inaccessible track—Method of establishing working limits on noncontrolled track by physically preventing entry and movement of trains and equipment

Individual train detection—Procedure by which a lone worker acquires on-track safety by physically preventing entry and movement of trains and equipment.

Lone worker—An individual roadway worker (employee of a railroad) who is not being afforded on-track safety by another roadway worker, not a member of a roadway work group, and not engaged in a common task with another roadway worker.

Lookout—A railroad employee designated to provide warning to roadway workers of approaching trains or on-track equipment.

Noncontrolled track—Track on which trains are permitted by railroad rule or special instruction to move without receiving authorization from a control operator.

On-track safety—A state of freedom from the danger of being struck by a moving train or equipment, provided by operating and safety rules that govern track occupancy by personnel, trains, and on-track equipment.

Roadway machine—A machine used on or near the track for maintenance, repair, construction, or inspection of track, bridges, roadway, signal, communications, or electric traction systems. Roadway machines can be on-track, off-track, or both. This definition includes hy-rails, motor cars, roadway machines, work equipment, and other forms of track cars.

Roadway work group—Two or more roadway workers organized to work together on a common task.

Roadway worker—An employee of a railroad or any employee of a contractor to the railroad with the potential to foul a track.

Train approach—A method of establishing on-track safety by warning roadway workers of the approach of trains in ample time for them to move or remain in a place of safety.

Train approach warning system—A method of establishing on-track safety by the use of an automatic warning system as a control point. The warning system consists of a siren and blue strobe light mounted on the side of a warning hut or signal house. When the system is activated, the siren sounds and the blue strobe light turns on when an approaching train is between the first approach signal and the absolute signal.

Working limits—A segment of track with definite boundaries. The boundaries should be established in accordance with Operating Rules for trains and engines. Only a roadway worker who has control over that segment of track can authorize the movement of trains and engines.

Work zone—The area around a roadway machine that must not be entered without first communicating with the operator to establish safe work procedures.

General Requirements

The Federal Railroad Administration (FRA) promulgated Roadway Worker Protection rules in 1997. These on-track safety requirements apply to railroads regulated by the FRA and contractors working on railroad property. The purpose of on-track safety is to prevent accidents and injuries that result from railroad cars, locomotives, and roadway machines striking workers and machines. For the purpose of this document, roadway worker means any employee of a railroad, any employee of a contractor to the railroad, or any contractor or subcontractor with the potential of fouling a track.

This guideline is an overview of the rules developed by the FRA.

General Rules

While performing work on railroad property, observe the following rules:

- Never stand or place your feet on a rail.
- Never mount, dismount, or cross over moving equipment.
- Inspect tools and equipment before use.
- Promptly report any unusual or suspicious activity, including vandalism or any other condition that would or could cause any disruptions or in any way adversely affect the safety of the railroad operation.

Personal Protective Equipment

Employees must wear the following PPE:

- Steel-toed safety shoes or boots (minimum of 6 inches with laces).
- Hardhats (on many railroads, orange hardhats are required).
- Safety glasses with side shields.
- Minimum of Class 2 highly visible orange reflective safety vests.
- Any other PPE required by the railroad or by the hazards of the work being performed as identified by the Job Task Safety Analysis (JTSA).

Fouling the Track

Every roadway worker has the responsibility to ascertain that on-track safety is provided before fouling a track. On-track safety applies to every roadway worker or roadway machine with the potential of fouling a railroad track. A roadway worker or machine is fouling a track when the nearest rail of any track is within 4 ft (1.22 m) of the worker or machine. It is the responsibility of every roadway worker to verify the need and establishment of on-track safety with the railroad personnel in charge of the scene.

Contractors and other non-railroad employees who potentially foul a track must be trained in the on-track safety procedures to be followed. Contractors or other non-railroad employees must not be allowed to foul a track unless:

- They have received on-track safety training.
- A railroad employee who is trained and qualified as a lookout, flagger, or employee in charge is present at the work site.

Preplanning

Job Briefing Requirement

A job briefing or JTSA must be conducted before any roadway worker fouls any track. A job briefing is complete when each roadway worker has acknowledged understanding of the on-track safety procedures and instructions. All information related to on-track safety must be given in the job briefing to every roadway worker who will foul the track. In addition to other safety issues, minimum on-track safety information must include the:

- Designation of the employee in charge.
- Type of on-track safety provided.
- Track limits and time limits of track authority.
- Tracks that might be fouled.
- On-track safety provided on adjacent tracks, if any.
- Procedure to arrange for on-track safety on other tracks if necessary.
- Means of warning when on-track safety is provided by a lookout.
- Designated place of safety where workers clear for trains.
- Designated work zone around machines.
- Safe working and traveling distance between machines.
- Determination as to whether fouling the track is truly necessary for the work to be conducted safely.

Follow-up job briefings must be conducted whenever:

- Working conditions or procedures change.
- Other workers enter the working limits.
- On-track safety is changed, extended, or about to be released.

Job Briefing for Lone Workers

Each lone worker must participate in a job briefing with his or her supervisor or other designated employee at the beginning of each shift.

This job briefing includes the lone worker's planned itinerary and the procedures that will be applied to establish on-track safety. Lone workers who cannot contact their supervisor or designated employee must verify the method of on-track safety according to rules of their railroad.

On-Track Safety Guidelines

Determining When Authority and Protection are Required

The flagger or employee in charge of the appropriate railroad determines when on-track safety is required, is responsible for obtaining the proper type of on-track safety, and leads the job briefing describing the on-track safety method and instructions to roadway workers. Each roadway worker is responsible for contacting the railroad flagger or employee in charge to obtain on-track safety instructions and conduct a job briefing before fouling a track.

Types of On-Track Safety

The following are examples of on-track safety methods:

- Exclusive track occupancy (track and time, track warrant, track permit, Form B Track Bulletin, removing track from service)
- Foul time

- Inaccessible track
- Individual train detection
- Train approach warning by lookout
- Train approach warning system
- Working limits
- Lineups
- Flag protection

The type of on-track safety to be used must be determined by the employee in charge of the roadway group. The type of on-track safety selected must comply with all of the appropriate railroad operating rules, orders, bulletins, and requirements.

On-Track Safety on Adjacent Tracks

On-track safety may also be established on adjacent tracks. All roadway workers must obtain authority from the employee in charge before fouling a track adjacent to a live track. The employee in charge or railroad flagger determines the type of on-track safety to use and obtains authority to occupy the track in accordance with the appropriate railroad operating rules. As trains approach, the employee in charge is responsible for stopping any equipment that, when operating, fouls the adjacent track. Certain work may continue while a train passes. If the equipment does not foul the adjacent track, the equipment may continue to work if the employee in charge has instructed the passing trains to pass at the appropriate speed for track conditions.

Coordinators

The employee in charge may divide the crew at many locations over an extended distance into subgroups with a responsible person who acts as a coordinator for that subgroup. The employee in charge notifies the subgroup coordinators when a train is approaching on an adjacent track.

Each coordinator then warns subgroup employees and notifies the employee in charge when the subgroup employees have stopped work operations and secured their equipment. Only qualified employees may act as coordinators.

To warn subgroup employees of a train approaching on an adjacent track, the coordinator:

- Identifies the warning method in the job briefing.
- Gives a distinctive, clear, and unquestionable warning.
- Makes sure that workers can detect the warning regardless of noise or work distractions.
- Does not require workers to look in a particular direction.

The coordinator then notifies the employee in charge when all subgroup members have stopped work between the tracks and stopped operating equipment that will foul the adjacent track. To clear a train on an adjacent track to pass the red flag or light, the employee in charge:

- Uses a system to positively confirm that all coordinators have reported that their subgroup members have stopped work between the tracks and stopped operating equipment that will foul the adjacent track.
- Instructs the train to pass the red flag or light according to speed restriction requirements.

- Notifies each coordinator when the train clears the work limits and ensures that each coordinator specifically acknowledges that the information was received and understood.

Stopping Work While a Train is Passing

Roadway workers must stop work under the following conditions:

- They are working on the middle of the track of three or more main tracks, and trains are passing on both adjacent tracks at the same time.
- A train is allowed to pass at a higher speed than those specified in the operating rules.

The employee in charge must:

- Ensure that all work has stopped before permitting the train to pass the work location.
- Ensure the passing train has cleared the work area before issuing instructions to resume work.
- Use appointed coordinators as necessary to communicate with workers.

When stopping work, roadway workers must:

- Stop the equipment.
- Secure the equipment against movement.

When working on a single track using Individual Track Detection (ITD) or Train Approach Warning (TAW), you must have a predetermined place of safety and be in that location at least 15 seconds before the train passes.

Movement Within Working Limits

When operators or roadway machines encounter a red flag, they must stop at the red flag and not proceed unless authorized by the employee in charge of the working limits. When working limits are occupied by other workers or equipment, roadway machines must not exceed 20 mph unless the employee in charge of the working limit authorizes a higher speed. This requirement is in addition to the requirement of being able to stop in half the distance the track is seen to be clear.

Audible Warning from Trains

Trains must sound their locomotive whistle and ring their bells when approaching roadway workers on or near the track, regardless of local whistle prohibitions. To give trains advance notice of roadway workers on or near the track, each roadway worker fouling the track must:

- Wear approved fluorescent orange safety vests and hardhats.
- Ensure that “Track Worker” whistle signs have been placed 1/4 mile in advance of their working limits.

Responsibilities

Railroads

The railroads must:

- Provide proper training for every roadway worker.
- Guarantee each employee the absolute right to challenge, in good faith, whether the on-track safety procedures to be applied at the work location comply with operating rules and to remain clear of the track until the challenge is resolved.
- Follow outlined resolution procedures to promptly and fairly resolve challenges to on-track safety procedures.

Roadway Worker

Each roadway worker must:

- Follow all railroad on-track safety rules and procedures.
- Avoid fouling a track except when necessary to perform his or her duties.
- Wear all required PPE.
- Ascertain that on-track safety is being provided before fouling a track.
- Refuse any directive to violate on-track safety rules.
- Promptly notify the employee in charge when making a good faith determination that on-track safety provisions to be applied at the work location do not comply with operating rules.

Contractors

Contractors whose employees perform services on any railroad property are responsible for implementing procedures to protect their workers, complying with applicable regulations, and complying with all railroad rules and procedures. It is the ultimate responsibility of the contractors to ensure that all employees involved on the project receive on-track safety training.

Roadway Machines

An individual must be qualified to operate a roadway machine. Before operating the machine, any employee intending to operate a roadway machine must:

- Receive required railroad training.
- Be informed of the safety procedures that apply to persons working near the machine.
- Inform the employee in charge that you fully understand the safety procedures.
- Keep the operator’s manual with the machine.
- Be familiar with the information in the operator’s manual before operating the machine.
- Follow the manual’s instructions for safe operation.
- Be qualified to operate the machine.

Spacing of On-Track Equipment

When on-track equipment is being used, workers and machine operators must follow the guidelines below for maintaining safe distances to prevent machines from contacting other machines and workers. When machines must be spaced closer than guidelines recommend because of work or travel conditions, the machine operators and the employee in charge must have a thorough understanding of:

- The specific task.
- The conditions under which the task will be done.
- How the task will proceed.

Work Zones around Machines

Roadway workers must not enter a machine's work zone without first communicating with the operator to establish safe work procedures.

Unless a different work zone is established in the job briefing process, this work zone extends from a point 15 ft (4.57 m) in front of the machine to a point 15 ft (4.57 m) behind the machine. Certain machines, such as cranes, require lateral or side clearance to ensure the safety of roadway workers. For machines with an extended reach, the work zone extends 10 ft (3.04 m) beyond the maximum reach of any extended portion of the machine in any direction.

Lateral work zone limits will be established in the job briefing. If a machine is approaching roadway workers who are fouling the track, the operator must communicate with the roadway workers before coming closer than 15 ft (4.57 m).

Safe Working Distance between Machines

Unless a different distance is specified in the job briefing, the minimum distance between machines while working is 50 ft (15.24 m).

Backup Movements by Roadway Machines

Before making a backup move, the machine operator must verify that a backup alarm is activated and/or the appropriate horn or whistle signal is sounded on applicable machines and observe that the track is clear of workers and machines.

Safe Distance before Crossing Tracks

Do not cross tracks within 25 ft (7.62 m) of standing cars or other equipment.

Safe Traveling Distance between Machines

On-track equipment must remain at least 300 ft (91.44 m) behind other on-track equipment while traveling to or from a work location. The only exception to this requirement is when machines must "bunch" to make movements over grade crossings, movable structures, and control points when the procedure is established in the job briefing. Machines must be at least 50 ft (15.24 m) apart during such movements.

Tying up Machines

In addition to operating rules regarding equipment tie-up, follow these procedures:

- After all brakes, booms, locks, and hooks have been secured, dismount the machine on the field side of the track, away from live traffic. If the track is between live tracks, dismount on the side designated in the job briefing

- Stand beside the machine and direct the next roadway machine to a stop. Do not move between machines until all machines have come to a stop or the employee in charge has given permission.

Slowing or Stopping Machines

When slowing or stopping on-track equipment, the operator must use a radio or hand signals to signal the operator of the following machine.

If using a radio, the lead operator must ensure that the following operator has received and understood the message transmitted.

If using hand signals, the lead operator must give a continuous signal until the following operator has acknowledged that the signal was observed and understood.

If machines will be “bunched” when stopped, all employees must remain clear of the track until the entire movement has stopped unless otherwise instructed by the employee in charge. After stopping, the lead machine operator must:

- Dismount the machine.
- Assume a position that is visible to the following machine operator and anyone who could step into the path of the next approaching machine.
- Spot the following machine using hand signals.

Each successive operator must follow this procedure to spot the next machine.

Track Protection

Track protection prevents roadway workers from being struck by a moving train or other equipment.

Track protection keeps:

- Trains away from the roadway workers.
- Roadway workers away from the trains.

Determining the correct type of protection has several key factors, such as:

- Type of track.
- Type of work.
- Number of workers involved.

Each roadway worker group must have an employee in charge (railroad employee), and each employee in charge must have access to a working radio.

Training

On-track safety training must be conducted before any new employee works on the roadway. Refresher training is required annually for all roadway workers. These are generic guidelines that apply to all railroads. Employees will be trained according to the procedures established for the railroad on which they are working.

The Company must submit a list of trained personnel to the railroad and provide updates as necessary.

39

Tree-Trimming Procedures

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

Definitions

Cant hook—A combination hook and lever tool for rolling and positioning of logs.

Chain guard—A device that protects the user from the blade in case of kickback of the chain saw.

Clearing—The process of removing undergrowth and saplings from an area with a chain saw.

Climbers—Equipment attached to the lower legs that enables an employee to climb a tree.

Climbing rope—A minimum of 1/2-inch (1.27-cm) diameter rope, made of synthetic fiber, with a nominal breaking strength of 5,400 lb (2,449.44 kg), and identified by the manufacturer as suitable for tree climbing.

Contract employer—An employer, other than the host employer, who performs electrical transmission and distribution work.

Crotched—The process of securing the loose end of the climbing rope with a shackle (clevis) for fall protection.

Deadman controls—Controls on equipment that prevent the operator from locking the equipment in the "on" position.

Felling—The process of cutting down a tree and causing it to fall to earth.

High wind—A wind of such velocity that one or more of the following hazards would be present:

1. The wind could blow an employee from an elevated location,

2. The wind could cause an employee or equipment that is handling material to lose control of the material, or
3. The wind could expose an employee to other hazards.

High wind is normally considered as winds exceeding 40 miles per hour (64.4 kilometers per hour) or 30 miles per hour (48.3 kilometers per hour) if the work involves material handling unless precautions have been taken to protect employees from the hazardous effects of the wind.

Host employer-An employer that operates, or that controls the operating procedures for an electric power generation, transmission or distribution installation on which a contract employer is performing work.

Gaff—The sharp metal protrusion at the end of climbers designed to stick into the wood and allow climbing up or down a tree.

Limbing—The process of cutting limbs from a felled tree.

Personal fall arrest system—A system used to arrest an employee in a fall from a working level.

Pruning—The process of trimming branches on a living tree.

Qualified line-clearance tree trimmer—A tree worker who, through related training and on-the-job experience or both, is familiar with the special techniques and hazards involved in line clearance tree trimming. A line-clearance tree trimmer is **not** considered to be a qualified person (qualified employee) for the performance of electrical work.

Qualified line-clearance tree trimmer trainee—A worker regularly assigned to a line-clearance tree trimming crew and undergoing on-the-job training who, in the course of such training, has demonstrated the ability to perform the duties safely at the current level of training and who is under the direct supervision of a line-clearance tree trimmer is considered to be a line-clearance tree trimmer for the performance of those duties.

Qualified person—

- A person who is familiar with the construction and/or operation of electrical power generation, transmission, and distribution lines and equipment and who is fully aware of the hazards involved through knowledge, training, and experience; or
- A person who has passed a journeyman's examination for the particular branch of the electrical trade with which he or she is connected; or
- A person who has successfully demonstrated his or her ability and is recognized by management as qualified to perform the duties to which he or she has been assigned.

Taut-line hitch—A hitch, consisting of either one or two wraps over two wraps, that is used for securing all workers aloft to their climbing line. All wraps in a taut-line hitch should be in the same direction.

Training

Each line-clearance tree trimmer who is not a qualified electrical worker shall also be trained and competent in:

- The skills and techniques necessary to distinguish exposed live parts from other parts of electrical equipment,
- The skills and techniques necessary to determine the nominal voltage of exposed live parts, and

- The skills and techniques necessary to determine the minimum approach distances corresponding to the voltages to which the qualified employee will be exposed and the skills and techniques necessary to maintain those distances.

General Requirements

When performing operations related to tree trimming, observe the following guidelines:

- When tree trimming, tree felling, brush loading, or brush disposal operations are under way on a street, highway, or any other area accessible to the public, use required signs, cones, red flags or flares, barricades, and other warning devices (or combinations thereof) to protect vehicular and pedestrian traffic.
- Use climbers with tree gaffs when climbing trees. Do not use pole gaffs when climbing trees.
- Do not use dead or rotted limbs, regardless of size, for support.
- Securely tie in or belt off to the tree before beginning any work in the tree.
- Crotch the climbing rope in such a manner as to prevent it from “working out” on a lateral limb.
- When working in a multiple-trunked tree, crotch the climbing rope around a main trunk other than the one on which the climber is working.
- Crotch climbing ropes in two places if a single crotch does not adequately protect you from falling into energized lines or falling back into the trunk of the tree.
- Do not use the climbing rope as a pull rope or as a handline to lower limbs or branches.
- Do not dangle the ground end of a climbing rope over roadways and keep it away from obstructions, passing vehicles, and so on.
- Do not release the taut-line hitch until the climber is on the ground.
- Do not drop branches or other material unless the immediate area has been cleared to prevent injury to persons or damage to property. If an area cannot be cleared, use a rope to lower branches or other materials.
- When lowering heavy tree branches, do not tie fall lines around hands or bodies.
- Do not attempt to clear limbs or brush from under the side of a tree where a climber is working.
- Obtain assistance or use power equipment, if available, when lifting logs or other heavy loads.
- When loading brush on a truck, do not stand on or straddle the loaded brush.
- Haul brush away or dispose of it promptly to avoid presenting “an attractive nuisance” to children and to prevent injury to persons or damage to passing vehicles.
- When hauling brush, ensure that the brush does not extend over the sides of the truck.
- When it is necessary to work in the vicinity of poison ivy, poison oak, or poison sumac, keep sleeves rolled down, wear gloves, and use barrier creams.
- Chaps are required when operating a chain saw.

Information Transfer

Host Employer

Before work begins, the host employer shall inform contract employers of:

- The characteristics of the host employer's installation that are related to the safety of the work to be performed.
- Conditions that are related to the safety of the work to be performed that are known to the host employer.
- Information about the design and operation of the host employer's installation the contract employer needs to make the necessary assessments.
- Any other information about the design and operation of the host employer's installation that is known by the host employer that the contract employer requests and that is related to the protection of the contract employer's employees.

Contract Employer

- The contract employer shall ensure that each of its employees is instructed in the hazardous conditions relevant to the employee's work that the contract employer is aware of as a result of information communicated to the contractor by the host employer.
- Before work begins, the contract employer shall advise the host employer of any unique hazardous conditions presented by their work.
- The contract employer shall advise the host employer of any unanticipated hazardous conditions found during the contract employer's work. The contract employer shall provide this information to the host employer within two working days after discovering the hazardous condition.

The contract employer and the host employer shall coordinate their work rules and procedures so that each employee is protected.

The transfer of information should be documented. A form has been provided for a means of communicating the requirements of Information Transfer between the host employer, the contract employer and the employees performing the work. See Sample 39-2.

Medical Services

When employees are performing work on, or associated with, exposed lines or equipment energized at 50 volts or more, persons with first-aid and CPR training shall be available as follows:

- For field work involving two or more employees at a work location, at least two trained persons shall be available.
- For fixed work locations such as substations, the number of trained persons shall be sufficient to ensure that each employee exposed to electrical shock can be reached within 4 minutes by a trained person. However, where the existing number of employees is insufficient to meet this requirement, each employee at the work location shall be a trained employee.

Working Near Energized Conductors

The following instructions apply to all workers performing tree trimming activities, except qualified electric power generation, transmission, and distribution employees.

- Before any employee climbs, enters, or works around any tree, make a close inspection to determine whether an electric conductor passes within 10 ft (3.05 m) of the tree.
- Wires in proximity to tree trimming are considered to be energized, unless proven to be dead and grounded by a qualified employee.
- In addition to observing the clearances given in **Error! Reference source not found.** or Table 39-2, all employees, involved with tree trimming, other than line-clearance tree trimmers, must maintain the following minimum clearances from energized conductors and equipment (numbers expressed are phase to ground):
  - For lines and equipment energized at 50 kV, all employees, except line-clearance tree trimmers, must keep a minimum clearance distance for themselves and all materials, tools or equipment from energized lines or exposed energized parts of equipment of 10 ft (3.05 m) plus 4 inches (10.16 cm) for every 10 V over 50 kV.
  - Only line-clearance tree trimmers may perform tree trimming if an electrical hazard exists or if parts of the trees are within 10 ft (3.05 m) of exposed energized overhead conductors or equipment.
  - A second line-clearance tree trimmer must be within normal voice communication and have climbing gear within 50 ft (15.24 m) of the work area if any of the following conditions exist:
    - A line-clearance tree trimmer is closer than 10 ft (3.05 cm) of any conductor or electrical apparatus energized at more than 750 V.
    - Branches or limbs being removed are closer than 3 ft (0.91 m) to lines energized at more than 750 V.
    - Roping is required to remove branches or limbs from energized conductors or apparatus more than 750 V.
  - Line-clearance tree trimmers must maintain a clearance of 3 ft (0.91 m) from energized conductors.
  - Line-clearance tree trimmers must use insulating equipment and rubber gloves when removing branches that are contacting exposed energized conductors or equipment that is within 3 ft (0.91 m) of energized lines. Limbs being removed from contact with wires are to be handled with the same precaution as the wires themselves. Care must be taken to prevent removed limbs from coming in contact with the tree trimmer’s body.
  - Ladders, platforms, aerial lifts, tools, and equipment may not be brought closer than 3 ft (0.91 m) of an energized conductor or apparatus.
- Tree trimming and felling work must terminate and employees must move to a place of safety during electrical storms, periods of high winds, or other potentially dangerous weather conditions.
- Employees must not remove tree limbs or branches from above energized conductors while other employees are working in trees below the conductors.
- Only persons qualified in such work can handle broken or fallen wires.

- When working near wires, employees must secure their climbing ropes so that if they slip or a limb breaks, they will swing free and clear of the wires.
- Tree limbs must not be dropped on conductors.
- Conductors and crossarms must not be used as a support or hitch. Do not throw ropes over conductors or crossarms.
- Dry ropes must be used in trees through which energized conductors pass.

Minimum Approach Distances

The minimum approach distances for voltages less than 72.5 kilovolts can be found in Table 39-1.

No employee may approach or take any conductive object closer to exposed energized parts than the established minimum approach distance unless:

- The employee is insulated from the energized part (insulating gloves and sleeves);
- The energized part is insulated from the employee and any other conductive object at a different potential;
- The employee is insulated from any other conductive object, as during live-line bare-hand work.

Refer to Table 39-1 for minimum approach distances.

Table 39-1. AC Minimum Approach Distances

Voltage Phase-to-Phase	Distance Phase-to-Ground Exposure		Distance Phase-to-Phase Exposure	
0.751 to 5.0 kV	0.63m	2.07ft	0.63m	2.07ft
5.1 to 15.0 kV	0.65m	2.14ft	0.68m	2.24ft
15.1 to 36.0 kV	0.77m	2.53ft	0.89m	2.92ft
36.1 to 46.0 kV	0.84m	2.76ft	0.98m	3.22ft
46.1 to 72.5 kV	1.00m	3.29ft	1.20m	3.94ft
These minimum approach distances can be used provided the jobsite is at an elevation of 900 meters (3,000 feet) or less. If working above 900 meters (3,000 feet) above mean sea level, the distances must be calculated using the altitude correction factor.				

For voltages over 72.5 kilovolts, the minimum approach distance can be calculated by determining the maximum anticipated per-unit transient overvoltage, phase to ground, through an engineering analysis or assume a maximum anticipated per-unit transient overvoltage, phase to ground or use the minimum approach distance found in Table 39-2.

Table 39-2. AC Minimum Approach Distances

<table>
<tr><th>Voltage
Phase-to-Phase</th><th colspan="2">Distance
Phase-to-Ground
Exposure</th><th colspan="2">Distance
Phase-to-Phase
Exposure</th></tr>
<tr><td>72.6 to 121.0 kV</td><td>1.13m</td><td>3.71ft</td><td>1.42m</td><td>4.66ft</td></tr>
<tr><td>121.1 to 145.0 kV</td><td>1.30m</td><td>4.27ft</td><td>1.64m</td><td>5.38ft</td></tr>
<tr><td>145.1 to 169.0 kV</td><td>1.46m</td><td>4.79ft</td><td>1.94m</td><td>6.36ft</td></tr>
<tr><td>169.1 to 242.0 kV</td><td>2.01m</td><td>6.59ft</td><td>3.08m</td><td>10.10ft</td></tr>
<tr><td>242.1 to 362.0 kV</td><td>3.41m</td><td>11.19ft</td><td>5.52m</td><td>18.11ft</td></tr>
<tr><td>362.1 to 420.0 kV</td><td>4.25m</td><td>13.94ft</td><td>6.81m</td><td>22.34ft</td></tr>
<tr><td>420.1 to 550.0 kV</td><td>5.07m</td><td>16.63ft</td><td>8.24m</td><td>27.03ft</td></tr>
<tr><td>550.1 to 800.0 kV</td><td>6.68m</td><td>22.57ft</td><td>11.38m</td><td>37.34ft</td></tr>
<tr><td colspan="5">1. These minimum approach distances can be used provided the jobsite is at an elevation of 900 meters (3,000 feet) or less. If working above 900 meters (3,000 feet) above mean sea level, the distances must be calculated using the altitude correction factor.
2. The phase to phase minimum approach distances may be used provided that no insulated tool spans the gap and no large conductive object is in the gap.
3. The clear live-line tool distance shall equal or exceed the values for the indicated voltage ranges.</td></tr>
</table>

When performing line clearance tree trimming operations on electric transmission and distribution lines and equipment at elevations above 900 meters, the minimum approach distances should be adjusted by the appropriate factor in Table 39-3 for the elevation of the work.

Table 39-3. Altitude Correction Factor

Altitude Above Sea Level (meters)	Factor
0 to 900 m	1.00
901 to 1200 m	1.02
1201 to 1500 m	1.05
1501 to 1800 m	1.08
1801 to 2100 m	1.11
2101 to 2400 m	1.14
2401 to 2700 m	1.17
2701 to 3000 m	1.20
3001 to 3600 m	1.25
3601 to 4200 m	1.30
4201 to 4800 m	1.35
4801 to 5400 m	1.39
5401 to 6000 m	1.44

Instead of using the minimum approach distances contained in Table 39-1 or Table 39-2, a person knowledgable and competent in the field of electric transmission and distribution system design, can perform an engineering analysis and determine the maximum transient overvoltage. When the engineering analysis of the system shows the maximum transient overvoltage is lower and the minimum approach distance can be lowered from the distance shown in Table 39-1or Table 39-2, the minimum approach distances can be adjusted accordingly. To reduce the distances, we must ensure that any conditions assumed in the analysis, for example, blocking the recloser on a circuit or installing portable protective gaps, are present during energized work. To calculate the minimum approach distances for voltages over 72.5 kV, use Table 39-4.

Table 39-4 AC Live-Line Minimum Approach Distance

For phase to phase system voltages of more than 72.5 kV nominal

MAD= $0.3048(C+a)V_{L-G}TA+M$, where

C= 0.01 for phase to ground exposures that the employer can demonstrate consist only of air across the approach distance (gap),

0.01 for phase to phase exposures if it can be demonstrated that no insulated tool spans the gap and That no large conductive object is in the gap, or

0.11 otherwise

V_{L-G}= phase to phase rms voltage, in kV

T= maximum anticipated per-unit transient overvoltage; for phase to ground exposures, T equals T_{L-G}, the maximum per-unit transient overvoltage, phase to ground, determined by the employer; for phase to phase exposures, T equals $1.35T_{L-G}+0.45$

A= altitude correction factor. See Table 39-3.

M= 0.31 m, the inadvertent movement factor

a= saturation factor, as follows

Phase to Ground Exposures				
$V_{Peak}=T_{L-G}V_{L-G}\sqrt{2}$	635 kV or less	635.1 to 915 kV	915.1 to 1050 kV	More than 1050 kV
a	0	$(V_{Peak}-635)/140{,}000$	$(V_{Peak}-645)/135{,}000$	(VPeak-675)/125,000

Phase to Phase Exposure					
$V_{Peak}=(1.35T_{L-G}+0.45)V_{L-G}\sqrt{2}$	630 kV or less	630.1 to 848 kV	848.1 to 1131 kV	1131.1 to 1485 kV	More than 1485 kV
a	0	$(V_{Peak}-630)/155{,}000$	$(V_{Peak}-633.6)/152{,}207$	$(V_{Peak}-628)/153{,}846$	$(V_{Peak}-350.5)/203{,}666$

Methods of Controlling Possible Transient Overvoltage

There are several means of controlling overvoltages that occur on transmission systems. The operation of circuit breakers or other switching voltages can be modified to reduce switching transient overvoltages. Overvoltages can also be held to an acceptable level by installing surge arrestors or portable protective gaps on the system. The use of switching restrictions can also minimize overvoltages.

Operation of Circuit Breakers

The maximum transient overvoltage that can reach the worksite is often the result of switching on the line on which employees are working. Disabling automatic reclosing during energized line work, so that the line will not be reenergized after being opened for any reason, limits the maximum switching surge overvoltage to the larger of the opening surge or the greatest fault-generated surge, provided that the devices (for example, insertion resistors) are operable and will function to limit the transient overvoltage and that circuit breaker restrikes do not occur. The insertion resistors must properly function to limit the overvoltage level. If the automatic recloser cannot be disabled, other methods of controlling the switching surge may be necessary.

When working on double circuit construction, surges on an adjacent line can cause significant overvoltages. The engineering analysis must account for coupling to adjacent lines.

Surge Arrestors

The use of modern surge arrestors allows a reduction in the basic impulse-insulation levels of much transmission system equipment.

Switching Restrictions

Another form of overvoltage control involves establishing switching restrictions, whereby the employer prohibits the operation of circuit breakers until certain system conditions are present. Switching is restricted by using a tagging system, similar to that used for a permit, except that the common term used for this activity is a "hold-off" or "restriction." These terms indicate that the restriction does not prevent operation, but only modifies the operation during the live-line work activity.

Tree Felling

An employee felling a tree (the feller) must observe the following guidelines during all felling activities:

- Plan a clear retreat path before starting a cut.
- Appraise the situation for dead limbs, the lean of the tree to be cut, wind conditions, and other hazards and exercise proper precautions before the starting the cut.
- When felling a tree, make an undercut that is about one-third the diameter of the tree to guide the tree in the direction to fall and reduce the possibility of splitting. Make a back or felling cut parallel to and 2 inches (5.08 cm) higher than the inner edge of the undercut.
- Shut off the saw before starting your retreat.
- On terrain where trees are likely to slide or roll, haul felled trees from the uphill side.
- Do not allow anyone to work in a tree located near a tree that is being felled if there is any danger that the standing tree will be struck by any part of the falling tree. The recommended distance between workers is twice the height of the trees being felled.
- Ensure that all persons not engaged in the felling operation clear of guide ropes and other rigging.
- Give clear warning to all employees in the area when trees are to be felled or heavy tree members are to be dropped.
- Once the felling of a tree has been started, complete the process before leaving the job.

Care and Use of Rope

Observe the following guidelines in the care and use of rope in tree trimming operations:

- Inspect ropes before each use. Unsafe ropes may not be used. Cut out and destroy damaged sections or replace the rope.
- Ropes shall be stored away from cutting edges and sharp tools.
- Keep ropes away from fire, acids, oil, chemicals, and all sources of excessive heat.

- Ensure that climbing ropes have a minimum diameter of 1/2 inch (1.2 cm) with a minimum breaking strength of 2,300 pounds (10.2 kN). Synthetic rope must have an elasticity of not more than 7%.
- Coil, pile, or suspend ropes so that air can circulate through the coils.
- Ensure that rope ends are secured to prevent unraveling.
- Do not splice climbing rope.
- A rope that is wet, that is contaminated to the extent that its insulating capacity is impaired, or that is otherwise not considered to be insulated for the voltage involved may not be used near exposed energized lines.

Care and Use of Tools

Observe the following guidelines in the care and use of tools in tree trimming operations:

- Suitably sheath or guard the cutting edge of tools when they are not in use. Keep cutting tools sharp and properly shaped.
- When not in use, keep the trimmer's saw in its scabbard.
- Do not use axes while trimmers are climbing in trees or carry axes on your shoulder while walking on the ground.
- Do not throw or drop tools from a tree; raise and lower them with a suitable rope line.
- Do not lay a pruner on a limb or in a crotch or hook it on a wire or rope. Hook the pruner over a limb strong enough to hold its weight.
- Remove ladders from the base of the tree when not in use.

Powered Trimming Equipment

Before Use

Observe the following guidelines when preparing to use powered trimming equipment:

- Complete required training in the proper and safe use and care of the equipment.
- Wear suitable eye and face protection.
- Inspect the chainsaws before each use to ensure that all handles and guards are in place and tight, all controls function properly, and the muffler is operational.
- Follow the chainsaw manufacturer's instructions on operation and maintenance.
- Ensure that power saws weighing more than 15 lb (6.80 kg) that are used in trees must be supported by a separate line, unless the work is performed from an aerial lift or no supporting limbs are available.
- Clear the work area to ensure that brush does not interfere with the chainsaw operation.

During Use

Observe the following guidelines during the use of powered trimming equipment:

- When starting a chain saw, place it on or against a solid support, and clear the area of all coworkers.
- Grip the chain saw with both hands during the entire cutting operation.
- Place a saw bumper against a tree or limb before starting a cut.
- Stop the chain saw engine or motor before:
  - Working on any part of the chain or cutting bar.
  - Moving the saw from one location to another, including carrying it into the tree.
  - Leaving the unit unattended.
- Do not use a gasoline-driven chain saw above shoulder level or at a distance that would require you to relinquish a safe grip on the saw.
- Do not allow employees to approach within reach of a saw while the saw is in operation.
- Do not hand a pneumatic or hydraulic pruner or saw to another employee unless it is disconnected from the power source.
- Do not leave powered tools unattended if connected to a power source.
- Do not adjust or repair powered tools while they are connected to a power source.

Miscellaneous

Observe the following additional guidelines when using powered equipment:

- All chain saws must be equipped with deadman controls.
- Gasoline-driven chain saw engines must be stopped when being refueled. If gas is spilled on a chain saw during refueling, it must be wiped off before the engine is started. Chain saws must not be started within 10 ft (3.05 m) of a fueling area.
- Stump cutters must be equipped with enclosures or guards to protect employees. Each employee in the immediate area of stump grinding operations must wear PPE.
- When backpack power units are used, the following precautions apply:
  - No one except the operator is allowed within 10 ft (3.05 m) of the cutting head of a brush saw.
  - The backpack power unit must be equipped with a quick shut-off switch readily accessible to the operator.
  - Backpack power unit engines must be stopped for all cleaning, refueling, adjustments, and repairs to the saw or motor except when the manufacturer's service procedure requires otherwise.

For additional information concerning power trimming equipment, contact the Company Safety Department.

Chippers

Observe the following safety guidelines when using chippers:

- Ensure that access panels for maintenance and adjustment of the chipper blades and associated drive train are in place and secure during operation.
- Never park chippers directly under the tree being trimmed.
- Do not permit spectators to stand near the machine while feeding brush into the chipper.
- Wear full-cover goggles or a face shield when feeding brush into the chipper.
- Never place hands or any other body part into the brush hopper while the chipper is in operation.
- Do not use tools or other metallic objects to push brush into the chipper. Do not load sweepings, which may contain foreign objects such as stones and nails, on the truck and or feed them into the chipper.
- Remove the ignition key when leaving the chipper unattended.
- Wear only wrist-length (non-gauntlet) gloves when feeding a chipper.
- Chock the wheels of trailer chippers that are detached from trucks.
- Ensure that brush chippers are equipped with a locking device in the ignition system.

Right-of-Way Clearing and Maintenance

The following guidelines must be observed when employees are clearing or performing site maintenance in a right-of-way:

- When two or more employees are cutting brush, they must be separated by at least 10 ft (3.05 m).
- Under no circumstances should anyone except the operator ride on a bulldozer or any other heavy equipment used in land clearing.
- Bulldozer operators must wear seat belts.
- Employees must not anchor equipment to railroad tracks, fences, or structures belonging to others.
- When emerging from a right-of-way onto a main road, employees must test the brakes before proceeding.

Fall Protection

When performing tree-trimming operations in a bucket truck, employees must wear a full body harness and be tied to the proper attachment on the bucket at all times.

Employees are never allowed to climb into or out of the bucket to extend their reach or access a tree or other structure to perform tree-trimming operations.

Safe Use of Pesticides

When using pesticides, observe the following safety guidelines:

- Never apply chemical unless you are properly trained and authorized by the Company to do so.
- Read the SDS and follow all warnings and instructions for the proper use of the product.
- Never apply chemicals in any mixture or rate other than the approved mixture and rate on the label.
- Wear chemical splash goggles and a face shield when mixing and applying chemicals.
- Wear rubber gloves when applying chemicals.
- Keep pesticides that are used in the field in sight at all times and under direct personal control. When not in use, pesticides must be locked up and stored properly.
- Do not take any food or drink into areas where pesticides are stored.
- Ensure that all pesticide containers are the original containers with product labeling or that any service containers are labeled with the common name of the pesticide and the hazard warnings noted on the original container.
- If you get chemicals on your skin or in your eyes, stop work immediately and rinse with water or eye wash. Seek medical attention when necessary.
- If you feel ill while using chemicals, seek medical care immediately. Be familiar with the product you are using so proper medical care can be initiated.

Sprayers

- Walking and working surfaces of sprayers and related equipment shall be covered with slip-resistant material. If slipping hazards cannot be eliminated, slip-resistant footwear or handrails and stair rails may be used instead of slip-resistant material.
- Equipment on which employees stand to spray while the vehicle is in motion shall be equipped with guardrails around the working area.

Safety Meetings

Safety meetings are an integral part of a proactive safety management process. There are many types of safety meetings held.

Daily, before the start of work, the crew generally should hold a documented tailgate safety meeting. The meeting should focus on safety issues relevant to the work processes to be performed that day, along with reminders regarding the safe use and inspection of the tools and equipment required for the tasks to be performed that day. The crew should also discuss any near-misses, noncompliance, or other safety issues that were encountered the previous day.

A weekly safety meeting will be held on each jobsite. The purpose is to cover subjects of great importance and relevance to the success of the job. The subjects discussed and attendance will be documented by signing a meeting roster. These meetings supplement and support the safety training provided for all employees. Weekly safety meetings will generally last between 15 and 30 minutes.

The topics may be:

- Pre-chosen and information sent to the field by the Corporate Office and/or Operating Unit.
- Pertinent to the work being performed.
- Tools and equipment being used in the field.
- Work procedures and policies of the client/customer.
- Issues related to the crew's activities.
- "Special" safety meetings, which may be called when:
  - An incident occurs on a jobsite.
  - Non-compliance was observed.
  - New work practices and/or policies are implemented.
  - New tools and/or equipment are introduced into the work area.
  - Other reasons.

Job Task Safety Analysis

Each day, before the start of each workday, the supervisor/foreman (person in charge) or their designee, should conduct a job briefing or Job Task Safety Analysis (JTSA) with the employees involved (see Chapter 29). The purpose of the JTSA is to identify the hazards associated with the scope of work, determine the safety precautions that will be implemented, and the required PPE by the crew performing the work assignment. The JTSA helps ensure that all members of the crew understand the work assignment and acknowledge that they understand and will follow the safety plan established to complete the work assignment. The JTSA should be documented and signed by all crewmembers. Refer to Sample 39-1. The following are requirements for the JTSA:

- The foreman (person in charge) should assemble the crew at the job site and explain the work to be done, and outline the steps to be followed.
- The foreman (person in charge) and the members of the crew will identify the hazards of the job. The crew should identify appropriate controls to eliminate, mitigate, control, or reduce the accident-producing potential of the hazards.
- If the hazards cannot be eliminated from the jobsite, the JTSA should list how the hazards can be mitigated, controlled, or reduced. This may be done by:
  - Dedicated assignment of work responsibilities.
  - Methods to isolate or control the hazard.
  - Other forms of protection (PPE, training, others) to reduce the hazard to the employees.
- The foreman (person in charge) must ensure that each member of the crew understands all instructions given.

- If the work or operations to be performed during the workday or shift are repetitive and similar, at least one JTSA should be conducted before the start of the first job of each day or shift. An additional JTSA should be completed and a meeting held with the members of the crew if significant changes that might affect the safety of the employees occur during the course of the work. Significant changes include changes in the scope of the work, work assignments, crew structure, crew leadership, environmental conditions, or when other hazards (not originally noted) are determined to be present in the workplace.
- The discussion should be in such detail that all employees, by virtue of training and experience, can reasonably be expected to recognize and avoid the hazards involved in the job. A more extensive discussion should be conducted if the work is complicated or particularly hazardous or if the employee cannot be expected to recognize and avoid the hazards involved in the job.
- The foreman (person in charge) is responsible for accounting for all employees after the completion of each job.

Sample 39-1. Job Task Safety Analysis – Tree Trimming

Job Task Safety Analysis - Tree Trimming

Company Name:	**Date:**	**Time:**	**Job #:**
Location:		**City:**	**State:**
Describe job task:			
Person responsible for First Aid / CPR:			
Name and Location of Emergency Medical Facility:			
Location of the AED:		**Emergency Contact Number: 911**	

PPE Required (Yes / N/A)
- Hardhat
- Safety Glasses/Goggles
- Hearing Protection
- Leather Gloves
- Boots/Foot Protection
- Face Shield
- Chainsaw Chaps
- Chemical Gloves
- Dielectric Gloves
- Protective Sleeves
- Air Test (Electrical PPE)
- Class 2 Reflective Vest
- Class 3 Reflective Vest
- Respirators
- Fire Extinguisher

Fall Protection (Yes / N/A)
- Full Body Harness/Lanyard
- All equipment inspected?
- Competent Person
- Boatswain Chair Inspected
- Ropes Inspected
- Climbers body belt
- Warning Line
- Safety Monitor
- Barricaded/Control Zone
- Falling Object Protection

Aerial Lifts (Yes / N/A)
- Lower Controls Operational
- Qualified Operator
- Daily Inspection
- Outrigger Pads
- Barricaded
- Warning Labels
- Controls Labeled
- Whhel Chocks

Equipment Used (Yes / N/A)
- Chainsaw
- Chipper
- Chipper Guard in Place?
- Hand Saw
- Pruning Saw
- Pole Gaffs (inspected)
- Tree Gaffs (inspected)
- Climbing Rope
- Ladders

Ladders (Yes / N/A)
- Daily Inspection
- Warn./Usage Labels Affixed
- 3 Feet above Landing
- Ladder Secured

Sanitation (Yes / N/A)
- Water (Marked as Potable)
- Single Use Cups
- Clean Restrooms
- Hand Wash Station

Medical (Yes / N/A)
- Occupation Med Center List
- Hospital Location
- Trained CPR/FA Employees
- First Aid Kit
- Bloodborne Pathogen Kit

Traffic Control (Yes / N/A)
- Traffic Control Plan
- Right/Left Lane Closed
- Sign - Flagman Ahead
- Sign - Construction Ahead
- Arrow Board
- Message Board
- Traffic Control Zone
- Advance Warning Area
- Transition Area
- Buffer Space
- Work Area
- Termination Area
- Barricades/Cones
- Stop/Slow Paddles

Cranes/Digger Derricks (Yes / N/A)
- Qualified Operator
- Annual Inspection
- Daily Inspections
- Fire Extinguisher
- Signal Person
- Outrigger Pads
- Rigging Equipment Inspected
- Wheel Chocks
- Warning Signal/Light
- Load Charts
- Protection from Susp. Loads
- Qualified Signal Person
- Qualified Riggers
- Crane Signals Posted

Electrical (Yes / N/A)
- Daily Inspection of Tools/Cords
- GFCI/Assured Grounding
- Hot Work-Authorized Person
- Survey of Daily Conditions
- Energized/Deenergized
- Voltage ________________
- Minimum Safe Distances
- Power lines located and identified

Lockout/Tagout (Yes / N/A)
- Competent Person
- Lockout Procedure
- Voltage Meter
- Grounding Equipment
- Electrical Flow Tester

Pesticides (Yes / N/A)
- Are pesticides being used?
- Is there an MSDS available?
- Employees understand hazard?
- Are respirators necessary?

Administrative Issues (Yes / N/A)
- OSHA Poster
- MSDS Manual
- Written Safety Program
- Permits
- Logs
- Daily AED Check

Clearance Issued (Yes / N/A)

#: ____________

Time: ____________

By: ____________

Work assignments not addressed above shall be outlined below

___

___

___

All employees must print and sign their names below

Printed Name	Signature	Printed Name	Signature
1.		6.	
2.		7.	
3.		8.	
4.		9.	
5.		10.	

Foreman Signature ____________________ **Safety Rep. Signature** ____________________

NOTE: Additional Job Briefing will be required when scope of work changes and/or conditions change

1. Have overhead lines been located and have proper precautions been identified?
2. Have all employees received training and are qualified to perform the tasks which they have been assigned?
3. List injuries, incidents, first aid and near miss cases that occur at the job site during the course of the day?

Sample 39-2. Pre/Post Job Briefing & Hazard Analysis

PRE/POST JOB BRIEFING & HAZARD ANALYSIS

EMERGENCY INFORMATION

HOSPITAL/ADDRESS

FOREMAN — PHONE

SUPERVISOR — PHONE

SAFETY COORD. — PHONE

ALT PERSON IN CHARGE

AED LOCATION

AED INSPECTED — YES — NO — NA

FA/CPR/AED TRAINED — YES — NO

JOB INFORMATION

Date — CUSTOMER

JOB/WO NUMBER

JOBSITE ADDRESS

NEAR INTERSECTION

CIRCUIT/VOLTAGE — MAX T (TOV 1.5-3.5)

MAD (PHASE TO PHASE)

INDUCED VOLTAGE — YES — NO

TEMPORARY GROUNDS — YES — NO — CONDITION — OK — POOR

POLE/STRUCTURE CONDITION — OK — POOR

ENVIRONMENTAL CONDITIONS

DAILY EQUIPMENT INSPECTIONS

DVIR PRE/POST INSPECTION	YES	NO	NA
AERIAL LIFT INSPECTION	YES	NO	NA
CRANE INSPECTION	YES	NO	NA
CRANE BASKET TRIAL LIFT	YES	NO	NA

TRAFFIC CONTROL REQUIRED — YES — NO

MUTCD TRAFFIC PLAN REQ.	YES	NO	NA
SIGNS/CONES	YES	NO	
FLAGGER(S) NEEDED	YES	NO	

PPE REQUIRED

- HARD HAT
- SAFETY GLASSES
- FALL PROT.
- WORK GLOVES
- CHAINSAW CHAP
- OTHER

NOTES, JOB SKETCH, ADDITIONAL INFORMATION

TASK HAZARD ANALYSIS

TASK	RAC	HAZARDS	CONTROLS

SAMPLE

(Pre/Post Job Briefing & Hazard Analysis Continued)

CREWMEMBERS

PRINT NAME	SIGNATURE	ROLE/RESPONSIBILITY	POST BRIEF INITIALS

QUAL. CRANE OPR. ____ QUAL. RIGGER/SIGNL ____ QUAL. OBSERVER ____

VISITORS

PRINT NAME	SIGNATURE

POST JOB BRIEF INFORMATION

WERE THERE ANY ACCIDENTS OR INJURIES TO REPORT TODAY? YES NO SUPERVISION NOTIFIED? YES NO

IF YES, LIST

WERE THERE ANY NEAR MISSES OR GOOD CATCHES TO REPORT? YES NO SUPERVISION NOTIFIED? YES NO

IF YES, LIST

HOST (CLIENT) NOTIFICATION

Must notify the Host (Client) within (2) working days of any unanticipated hazardous conditions not mentioned by the Host.

WERE THERE ANY UNIQUE HAZARDOUS CONDITIONS PRESENTED BY THE WORK PERFORMED? YES NO

IF YES, LIST

WERE THERE ANY HAZARDOUS CONDITIONS NOT MENTIONED BY THE HOST (CLIENT) ENCOUNTERED? YES NO

IF YES, LIST

WHO FROM THE HOST (CLIENT) DID YOU NOTIFY REGARDING THE HAZARDS? NAME ____ DATE ____ TIME ____

NOTIFICATION BY

HOW WAS NOTIFICATION GIVEN? EMAIL WRITTEN DOC PHONE FACE-TO-FACE

NOTES, JOB SKETCH, ADDITIONAL INFORMATION

SAMPLE

40

Subcontractor Safety Requirements

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

General Requirements

These guidelines and safe work practices have been compiled to assist subcontractor personnel in becoming familiar with the Company work safety philosophy. All contractor personnel are responsible for conducting their work in accordance with the following safety practices. These procedures are identified to ensure that all subcontractors are in compliance with the Company safety requirements. Remember, each subcontractor is required to comply with all client, Company, and governmental safety guidelines. The goal of the Company is for all personnel to work safely and efficiently and to eliminate accidents.

Prequalification of Subcontractors

Subcontractors should be prequalified before being allowed to bid work for the Company. Subcontractors should complete the Subcontractor Safety Questionnaire and submit copies of their OSHA 300 logs for the past three years with a copy of their safety program manual. Refer to the questionnaire located at the end of this chapter.

Subcontractor Safety Process

Purpose

To ensure that subcontractors working for the Company have safety processes within their organizations that allow them to perform their jobs in the safest manner possible and avoid passing risk of the subcontractor on to the Company.

Scope

This standard applies to all subcontractors hired to perform work by the Company. Nothing in this section supersedes any work practice or subcontractor rule that is more stringent than outlined in this manual.

Responsibility

It is the responsibility of the person in charge of the project to inform the subcontractor of the potential hazards that might be present at the work site. These hazards can include flammability, toxicity, high pressures, or other operations that can affect the subcontracted employees. The subcontractor must be informed of emergency response plans, required PPE, and safety rules that apply to the assigned tasks. It is the duty of the subcontractor representative to inform all subcontractor employees of this information. It is the responsibility of the subcontractor to provide documentation that this information has been communicated.

The subcontractor is also required to inform Company management of any hazardous materials that the subcontracting company might bring to the work site. These hazards must be communicated to the person in charge of the project, and these communications must be documented.

It is the responsibility of the subcontractor to supply the jobsite with trained personnel and provide proof of training on request.

It is the responsibility of the subcontractor to ensure that all equipment supplied, such as tools, cranes, backhoes, and safety equipment, is in good working condition. Equipment must meet or exceed all Company, local, state, and federal standards. All heavy equipment must be supplied with inspection papers (on request) and, where operators are supplied, show or display proof of qualification. The contractor must provide a competent person where required by applicable regulations.

Procedure

All subcontractors are required to read and comply with the applicable Company safety rules. Some of the key provisions are:

- Work must not begin until the subcontractor is satisfied that the work site and vicinity are safe. Also, work must not begin if the Company objects to the safety of the site and vicinity.
- Tailgate safety training, JTSA, work permits, or other written records must be used to document the communication of the hazards to the subcontractor employees.
- There must be no unauthorized hot work, smoking, lighting of matches, or open fires at the work site at any time. Smoking is permitted only at designated locations, which must be away from the work site and at least 100 ft (30.48 m) away from any vessel or pipeline containing or that have contained hydrocarbons.
- Work must not be done by anyone who is under the influence of illegal drugs, alcoholic beverages, or prescription medication that can interfere with judgment or coordination.
- All persons performing any work must wear appropriate PPE, such as hardhats, gloves, proper footwear, splash goggles, face and eye protection, and respirators. Such items shall be the responsibility of the contractor unless otherwise stated.
- If the work requires a Hot Work Permit, the subcontractor is required to comply with that section of this manual (see Chapter 20, “Welding and Cutting Procedures”).
- If the work requires a Confined Space Entry Permit, the subcontractor is required to comply with that section of this manual. (See Chapter 22 “Confined Space and Vessel Entry Procedures”).

- If the work is performed at locations where hydrogen sulfide (H_2S) is suspected or known to be present:
  - The atmosphere must be tested with an H_2S monitor before subcontract work is done and continuously during the performance of work. If the monitor indicates more than 10 ppm of H_2S at any time, all persons must either leave the area until the source of the emission has been eliminated or wear supplied air respirators or SCBA.
  - The subcontractor must be aware of and must explain to employees performing said work the significance of the physical and toxic properties of H_2S, as well as how to detect the presence of the gas. Everyone on the work site must be aware of the evacuation plan for the area.
  - The subcontractor is responsible for providing employees with properly maintained monitoring and breathing equipment. All subcontractor employees must be aware of the correct use of the gas detection equipment and respirators.
  - When respirators and/or SCBAs are used, the subcontractor is required to comply with the Respiratory Protective Program.
- Each work area that involves excavation must comply with the guidelines in Chapter 23, “Trenching and Excavations,” in this manual.
- Equipment brought into company-controlled areas must be in good working condition and must be clean and maintained in full compliance with OSHA and other governmental regulations, as well as the requirements of this manual.
- Subcontractors must supply Safety Data Sheets (SDSs) for all chemicals, treating agents, and other substances that they bring to Company-controlled property that could pose a safety or health threat to employees.
- Subcontractors must maintain proof of insurance, according to current standards. The proof of insurance must be on file with Company.
- The subcontractor must understand that these rules are minimum requirements only and do not preclude the establishment or enforcement of any additional safety rules on the same or other subjects. This standard shall not lessen any rules that the subcontractor may have established.

Safety Orientation

The subcontractor is required to attend a pre-job orientation/pre-job safety meeting prior to beginning work on our project site. The subcontractor is then required to provide a safety orientation for their employees before beginning work on the site. This orientation must cover emergency procedures, process safety management, control of hazardous energy (lockout/tagout), hazard communication guidelines, and other basic safety requirements that are required by the Company, the customer or client, and governmental regulations. The site-specific policies for smoking, parking, project entry, eating, restroom facilities, drug policies, and so on will be provided to all subcontractors during the required safety orientations.

Safety Program

Each subcontractor should have a written site-specific safety and health program.

Safety Committee

Where required, each subcontractor must appoint a Safety Coordinator who represents the subcontractor at meetings.

Safety Meetings

Every subcontractor is required to conduct safety meetings on the job as directed. At the discretion of the Company, the subcontractor might want to attend regularly-scheduled Company safety meetings. All subcontractor employees must be identified on the safety meeting report, and each employee is required to sign the report to verify attendance.

Safety Inspections

Each subcontractor is required to conduct jobsite inspections on a regular basis. While these inspections may conform to the requirements of the subcontractor's own safety audit program, the inspections will be subject to minimum standards established for the jobsite. In addition, the Company Safety Department will audit each subcontractor for compliance with these standards during regularly scheduled jobsite surveys. Corrective measures are of extreme importance in abating jobsite hazards that are discovered during the audits.

The company retains the right to immediately stop any unsafe work practices, which are a violation of the subcontract between the company and the subcontractor, and to require abatement of hazardous conditions as a condition of continuing work under the subcontract.

Accident Investigations

Each subcontractor is expected to investigate and report to the Company in writing any accident, near-miss, or incident that occurs on the jobsite. The Company Safety Department may assist with the investigation.

Hazardous Energy

Subcontractors must comply with the applicable control of hazardous energy (lockout/tagout) procedures. Company Management requires the use of GFCI protection or the use of an assured grounding program at all times.

Hazard Communication and Employee Right-to-Know

Subcontractors are required to comply with the applicable hazard communication program and process safety guidelines. Additionally, the subcontractor is required to exchange information concerning any hazardous chemicals brought to the jobsite. The Company provides a copy of the SDS pertaining to jobsite chemicals and requires all subcontractors to do the same. During the jobsite orientation, the location of Company SDS books is provided to subcontractors.

Personal Protective Equipment

The Company Safety Department notifies all subcontractors during orientation about the PPE required on jobsites.

Fire Protection

Subcontractors must comply with the applicable fire protection procedures. Fire watches are required for all hot work procedures.

Safe Work Areas and Housekeeping

All subcontractors must clean their immediate work areas on a regular basis and barricade their work areas when required.

Subcontractor Equipment

All subcontractor equipment is subject to safety inspections. All unsafe equipment observed will be removed from the jobsite, tagged out of service, or repaired before use.

Work Permits

Work permits may be issued for hot work. Subcontractors do not begin work until the required permits are issued.

Miscellaneous Procedures

The Company will notify subcontractors of any special safety requirements that are mandated by the customer or client.

Sample 40-1. Subcontractor Safety Questionnaire

SUBCONTRACTOR SAFETY QUESTIONNAIRE

Safety information must be completed and submitted by any subcontractor interested in performing work. Subcontractor safety programs are subject to review by management prior to final approval of contract agreements.

Company Name: ______________________

Address: ______________________ City: __________ State: ______ Zip Code: ______

Safety Contact: ______________________ Prepared by: ______________________

Phone Number: ______________________ Fax Number: ______________________

Check The Types Of Work That Your Company Performs

______ Painting/Abrasive Blasting	______ General Maintenance	______ Construction
______ Mechanical	______ Pipeline	______ Cable/Fiber
______ Welding	______ NDT (X-Ray)	______ Laborer
______ Hauling/Transportation	______ Petrochemical	______ Foundations
______ Electrical	______ Crane	______ HDD

______ Other (Describe) ______________________

Please answer the following questions. (Answers may be verified by audit.)

1. Workers Compensation Insurance Information

   a. Does your company carry Workers Compensation Insurance? ______ Yes ______ No

   b. List your insurance carriers for the last three years.

   2013 ______________ 2012 ______________ 2011 ______________

   c. List the Experience Modification Rate (EMR) for your firm for the last three years. (Do not include the current year in these numbers)

   2013 ______________ 2012 ______________ 2011 ______________

   d. What is the expiration date of your current policy? ______________

2. Safety performance information (injury/illness experience) for previous three years.

ITEM	2013	2012	2011
Number of Fatalities			
Number of Lost Workday Cases (LTAs)			
Number of Total Days Lost from the Previous Cases			
Number of Non-Lost Workday Cases Restricted Duty			
Number of Non-Lost Workday Cases Medical Treatment			
Number of Total OSHA Recordable Cases			
Number of Total Work Hours (annual total)			
TOTAL RECORDABLE INCIDENT RATE			

$$\text{Total Recordable Injury Rate} = \frac{\text{Total \# of OSHA Recordables} \times 200{,}000}{\text{Total \# of Employee Hours Worked}}$$

$$\text{Lost Time Recordable Injury Rate} = \frac{\text{Total \# of Lost Time Accidents} \times 200{,}000}{\text{Total \# of Employee Hours Worked}}$$

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(Subcontractor Safety Questionnaire, Continued)

3. Do you have a written safety program? _______ Yes _______ No

4. Have you previously submitted a copy of your written safety program? _______ Yes _______ No

   If "No," please forward a copy of the program.

5. Does your company have a written Management Safety Policy Statement that establishes responsibility and accountability for safety within your company? _______ Yes _______ No

6. Do you have one or more full time:
   - Physicians? _______ Yes _______ No
   - Safety Professionals? _______ Yes _______ No
   - Industrial Hygienists? _______ Yes _______ No
   - Other Care Providers? _______ Yes _______ No

7. Can you provide a list of employees hired within the last year? _______ Yes _______ No

8. Does your company provide New Employee Safety Orientation training? _______ Yes _______ No

9. Does your company hold safety meetings? _______ Yes _______ No

10. Are these meetings documented? _______ Yes _______ No

Please check all that apply: _____ daily tailgate/toolbox _____ weekly _____ bi-weekly _____ monthly _____ less often

11. Does your company have a written emergency response plan? _______ Yes _______ No

12. Does your company have an accident reporting and investigation procedure? _______ Yes _______ No

13. Employee Notification

    a. How are employees notified of employee accidents and near misses? ______________________________

    b. What methods are used to notify or follow up with employees? ______________________________

    c. How soon after an event do employees receive this notification? ______________________________

14. Inspections and Audits

    a. Do you conduct regular jobsite safety and health inspections? _______ Yes _______ No
    b. Do you conduct audits for written safety and health training programs? _______ Yes _______ No
    c. Are audit results and upgrades to programs documented? _______ Yes _______ No

15. Equipment Inspections

    Check one: This section is _______________ applicable _______________ not applicable

    a. Do you conduct inspections on operating equipment (for example, cranes and forklifts) _______ Yes _______ No
    b. Do you maintain operating equipment as required by safety regulations? _______ Yes _______ No
    c. Do you maintain appropriate inspection and maintenance records for equipment? _______ Yes _______ No

16. Drug and Alcohol Program

    a. Does your company have a written drug & alcohol testing program?
       If "Yes," please forward a copy of the program. _______ Yes _______ No
    b. If yes, does your drug and alcohol program include the following tests:
       - Pre-employment _______ Yes _______ No
       - Cause _______ Yes _______ No
       - Post-Accident _______ Yes _______ No
       - Random _______ Yes _______ No
    c. Please fax a list of employees covered by your drug and alcohol program to:
       Corporate Safety Director ______________________________
       Phone Number ______________________________

17. Is safety used as a performance criteria for evaluating:

    a. Foremen _______ Yes _______ No
    b. Supervisors _______ Yes _______ No
    c. Management _______ Yes _______ No

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(Subcontractor Safety Questionnaire, Continued)

18. Employee Safety and Health Training

a. Does your company provide safety and health training? _______ Yes _______ No

b. Do your training records include the following information:

- Employee identification _______ Yes _______ No
- Date of training _______ Yes _______ No
- Name of trainer/instructor _______ Yes _______ No
- Method used to verify understanding _______ Yes _______ No

c. How do you verify understanding? (Check all that apply.)

- Written test _______ Yes _______ No
- Oral test _______ Yes _______ No
- Performance test _______ Yes _______ No
- Other (explain) ____

d. Are your training records available for audit? _______ Yes _______ No

19. Complete the following summary of Safety and Health training provided to your employees

TRAINING SUBJECTS	PROVIDED Yes/No/NA	FREQUENCY	RECORDS AVAILABLE Yes/No
Benzene			
Bloodborne Pathogens			
Burning, Grinding, Welding Safety			
Confined Space Entry			
Crane Operator Certification			
Crane – Qualified Riggers			
Crane – Qualified Signal Persons			
DOT Drug and Alcohol Policy			
DOT HazMat			
Driving Safety			
Electrical Safety Related Work Practices			
Emergency Response Procedures			
Fall Protection: Walking/Working Surfaces			
Fire Safety (Prevention/Protection/Equipment)			
First Aid/CPR			
Flagger Certification			
Forklift Certification			
General Housekeeping			
Hand Tools			
Hazard Communications (HAZCOM)			
Hazardous Waste Operations and Emergency Response (HAZWOPER)			
Hazard Recognition/Analysis and Near Miss Reporting			
Hearing Conservation Program			
Heavy Equipment			
Helicopter Safety			
Hydrogen Sulfide Training (H_2S)			
Incident Reporting (Illness/Injury)			
Lead Safety			
Lockout/Tagout			
Materials Handling			
New Hire Orientation			
Personal Protective Equipment (Eye, Foot, Head, Hand)			
Power Operated Tools			
Powder Actuated Tools			
Respiratory Protection			
Silica			
Trenching/Excavation Awareness			
Trenching/Excavation Competent Person			

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Respiratory Protection

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

Definitions

Abrasive-blasting respirator—A respirator constructed to cover the wearer's head, neck, and shoulders to protect the wearer from rebounding abrasive material.

Air-purifying respirator—A respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.

Atmosphere-supplying respirator—A respirator that supplies the user with breathing air from a source independent of the ambient atmosphere and includes supplied-air respirators (SARs) and self-contained breathing apparatuses.

Canister or cartridge—A container with a filter, sorbent, catalyst, or combination of these items that removes specific contaminants from the air when passed through the container.

Demand respirator—An atmosphere-supplying respirator that admits breathing air to the facepiece only when a negative pressure is created inside the facepiece by inhalation.

Emergency situation—Any occurrence, such as equipment failure, rupture of containers, or failure of control equipment that results in an uncontrolled significant release of an airborne contaminant.

Employee exposure—Exposure to a concentration of an airborne contaminant that would occur if the employee were not using respiratory protection.

End-of-service-life indicator (ESLI)—A system that warns the respirator user of the approach of the end of adequate respiratory protection (for example, that the sorbent is approaching saturation or is no longer effective).

Filtering facepiece (dust mask)—A negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.

Fit factor—A quantitative estimate of the fit of a particular respirator to a specific individual, typically including an estimate of the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn.

Fit test—The use of a protocol to qualitatively or quantitatively evaluate the fit of a respirator on an individual (see also qualitative fit test and quantitative fit test).

High efficiency particulate air (HEPA) filter—A filter that is at least 99.97% effective in removing monodisperse particles of 0.3 micrometers in diameter. The equivalent NIOSH 42 CFR 84 particulate filters are the N100, R100, and P100 filters.

Immediately dangerous to life or health (IDLH)—An atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.

Negative-pressure respirator (tight fitting)—A respirator in which the air pressure inside the facepiece is negative during inhalation with respect to the ambient air pressure outside the respirator.

Oxygen-deficient atmosphere—An atmosphere with oxygen content below 19.5% by volume.

Oxygen-enriched atmosphere—An atmosphere with oxygen content above 23.5% by volume.

Physician or other licensed health care professional (PLHCP)—An individual whose legally-permitted scope of practice (license, registration, or certification) allows him or her to independently provide, or be delegated the responsibility to provide, some or all of the healthcare services required.

Positive pressure respirator—A respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.

Powered air-purifying respirator (PAPR)—An air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.

Pressure demand respirator—A positive-pressure, atmosphere-supplying respirator that admits breathing air to the facepiece when the positive pressure is reduced inside the facepiece by inhalation.

Qualitative fit test (QLFT)—A pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.

Quantitative fit test (QNFT)—An assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

Self-contained breathing apparatus (SCBA)—An atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.

Service life—The period of time in which a respirator, filter, sorbent, or other respiratory equipment provides adequate protection to the wearer.

Supplied-air respirator (SAR) or airline respirator—An atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user.

Tight-fitting facepiece—A respiratory inlet covering that forms a complete seal with the face.

User seal check—An action conducted by the respirator user to determine if the respirator is properly sealed to the face.

General Requirements

These guidelines establish the minimum requirements for the use of respiratory protective equipment. The components of a respiratory protection program are:

- Selecting respirators
- Evaluating the medical condition of respirator users
- Fit testing
- Using respirators
- Maintaining respirators
- Ensuring adequate air quality, quantity, and flow for supplied-air respirators
- Employee training
- Evaluating the effectiveness of the respiratory protection program.

When it is clearly impractical to remove respiratory hazards through engineering controls or where emergency protection against occasional or brief exposures is necessary, approved respiratory protective equipment is issued and used in accordance with this program.

These requirements apply to all exposures in which employees are required or allowed to wear respiratory protective equipment.

The Company must designate a program administrator to oversee the respiratory protection program and conduct the required evaluations of program effectiveness. The program administrator must be qualified by appropriate training or experience that is commensurate with the complexity of the program.

Respiratory hazards for the purpose of this program include the following classifications:

- Oxygen deficiency
- Gas and vapor contaminants
- Particulate contaminants
- Combinations of any of the hazards listed above

Procedures for Selecting Respirators

An evaluation is conducted to identify potential respiratory hazards in the workplace and relevant workplace and user factors. Respirator selection is based on these findings. This evaluation occurs during the estimation phase of all work.

The evaluation of workplace hazards must include a reasonable estimate of employee exposures to respiratory hazards and an identification of the chemical state and physical form of the contaminant. Where employee exposure cannot be identified or reasonably estimated, the atmosphere must be considered to be IDLH.

Only respirators certified by the National Institute for Occupational Safety and Health (NIOSH) for protection against a particular respiratory hazard are selected. All filters, cartridges, and canisters used in the workplace are labeled and color coded with the NIOSH-approval label. The label may not be removed and must remain legible.

When selecting respirators, the Company considers the following factors:

- The classification of the hazard
- The extent and concentration of the hazard
- The duration of potential exposure
- The work requirements and conditions
- The characteristics and limitations of available respirators

A respirator appropriate for the chemical state and physical form of the contaminant is selected from a sufficient number of respirator models and sizes to ensure acceptability and proper fit for the employee. The respirator selected must be adequate to protect the health of the employee during routine and reasonably foreseeable emergency situations.

Respiratory Hazards

The classification and extent of respiratory hazards should be verified by monitoring and evaluating potential employee exposure. If the potential respiratory hazards in the workplace include IDLH atmospheres, one of the following types of respirators must be used:

- A full facepiece pressure demand SCBA certified by NIOSH for a minimum service life of 30 minutes
- A combination full facepiece pressure demand SAR with auxiliary self-contained air supply

If the potential respiratory hazards in the workplace are gases and vapors that are not IDLH, the Company provides either an atmosphere-supplying respirator or an air-purifying respirator meeting the following criteria:

- The respirator is equipped with an ESLI certified by NIOSH for the contaminant.
- If there is no ESLI appropriate for conditions in the workplace, the program administrator implements a change schedule for canisters and cartridges that is based on objective information or data that ensures that canisters and cartridges are changed before the end of their service lives. The program administrator must document and attach to the respirator program the information and data relied on, the basis for the canister and cartridge change schedule, and the basis for reliance on the data.

If the potential respiratory hazards in the workplace are particulates that are not IDLH, one of the following types of respirators must be provided and used:

- An atmosphere-supplying respirator
- An air-purifying respirator equipped with a filter certified by NIOSH under CFR 30, part 11 as a HEPA filter
- An air-purifying respirator equipped with a filter certified for particulates by NIOSH under 42 CFR part 84
- For contaminants consisting primarily of particles with mass median aerodynamic diameters (MMAD) of at least 2 micrometers, an air-purifying respirator equipped with any filter certified by NIOSH for particulates

Medical Evaluations of Employees Required to Use Respirators

Using a respirator can place a physiological burden on employees that varies with the type of respirator worn, the job and workplace conditions in which the respirator is used, and the medical status of the employee. Accordingly, these are the minimum requirements for medical evaluation that must be implemented to determine an employee's ability to use a respirator before the employee is fit tested or required or allowed to use the respirator in the workplace.

- A PLHCP must be selected to perform medical evaluations for each worker. The PLHCP must be provided with a copy of this respiratory protection program and a copy of the OSHA regulation 29 CFR 1910.134 Respiratory Protection.

  If the Company replaces a PLHCP, the Company must ensure that the new PLHCP receives the program and OSHA information, either by providing the documents directly to the new PLHCP or having the documents transferred from the former PLHCP to the new PLHCP. Employees do not need to be medically reevaluated solely because a new PLHCP has been selected.

- The PLHCP must perform medical evaluations using an OSHA Respirator Medical Evaluation Questionnaire or a medical examination that obtains the same information as Sections 1 and 2, Part A of the OSHA Respirator Medical Evaluation Questionnaire. Refer to the questionnaire located at the end of this chapter.

- The questionnaire and examinations must be administered confidentially during the employee's normal working hours or at a time and place convenient to the employee. The questionnaire must be administered so that the employee understands its contents. Company management must provide employees with an opportunity to discuss the questionnaire and examination results with the PLHCP.

- A follow-up medical examination must be provided for an employee who gives a positive response to any of questions 1 through 8 in Section 2, Part A of the questionnaire or whose initial medical examination demonstrates the need for a follow-up medical examination.

  The follow-up medical examination includes any medical tests, consultations, or diagnostic procedures that the PLHCP deems necessary to make a final determination.

- The following information must be provided to the PLHCP before the PLHCP can make a recommendation concerning an employee's ability to use a respirator:

  - The type and weight of the respirator to be used by the employee
  - The duration and frequency of respirator use (including use for rescue and escape)
  - The expected physical work effort
  - Additional protective clothing and equipment to be worn
  - Temperature and humidity extremes that might be encountered

- The Company must obtain a written recommendation from the PLHCP regarding the employee's ability to use the respirator. The recommendation must provide only the following information:
    - Any limitations on respirator use related to the medical condition of the employee or to the workplace conditions in which the respirator will be used, including whether the employee is medically able to use the respirator

      For example, if the respirator is a negative-pressure respirator and the PLHCP finds a medical condition that might place the employee's health at increased risk if the respirator is used, the Company must provide a PAPR if the PLHCP's medical evaluation finds that the employee can use such a respirator.
    - The need, if any, for follow-up medical evaluations
    - A statement that the PLHCP has provided the employee with a copy of the written recommendation of the PLHCP
- Additional medical evaluations that comply with these requirements must be provided in the event of any of the following:
    - An employee reports medical signs or symptoms that are related to the ability to use a respirator.
    - A PLHCP, supervisor, or the program administrator determines that an employee needs to be reevaluated.
    - Information from this respiratory protection program, including observations made during fit testing and program evaluation, indicates a need for employee reevaluation.
    - A change occurs in workplace conditions (for example, physical work effort, protective clothing, or temperature) that might substantially increase the physiological burden placed on an employee.

Fit Testing Procedures for Tight-Fitting Respirators

Before an employee is required or allowed to use any respirator with a negative- or positive-pressure, tight-fitting facepiece, the employee must pass an appropriate QLFT or QNFT using the same make, model, style, and size of respirator that will be used at the jobsite. The QLFT and QNFT must be in accordance with the following guidelines:

- An employee using a tight-fitting facepiece respirator must be fit tested before initial use of the respirator, whenever a different respirator facepiece (make, model, style, or size) is used, and at least annually thereafter.
- Additional fit tests must be conducted whenever the employee reports or the PLHCP, supervisor, or program administrator makes visual observations of changes in the employee's physical condition that could affect respirator fit. Such conditions can include facial scarring, dental changes, cosmetic surgery, or an obvious change in body weight.
- If after passing a QLFT or QNFT, the employee subsequently notifies the PLHCP, supervisor, or program administrator that the fit of the respirator is unacceptable, the employee is given a reasonable opportunity to select a different respirator facepiece and be retested.
- The fit test must be administered using an OSHA-accepted QLFT or QNFT protocol.

- QLFT may only be used to fit test negative-pressure air-purifying respirators that must achieve a fit factor of 100 or less.
- If the fit factor, as determined through an OSHA-accepted QNFT protocol, is equal to or greater than 100 for tight-fitting half facepieces or equal to or greater than 500 for tight-fitting full facepieces, the QNFT has been passed with that respirator.
- Fit testing of tight-fitting atmosphere-supplying respirators and tight-fitting PAPRs requires quantitative or qualitative fit testing in the negative-pressure mode, regardless of the mode of operation that is used for respiratory protection.
  - Perform qualitative fit testing of these respirators by temporarily converting the facepiece of the respirator into a negative-pressure respirator with appropriate filters or by using an identical negative-pressure air-purifying respirator facepiece with the same sealing surfaces as a surrogate for the atmosphere-supplying or PAPR facepiece.
  - Perform quantitative fit testing of these respirators by modifying the facepiece to allow sampling inside the facepiece in the breathing zone of the user, midway between the nose and mouth. To modify the facepiece, install a permanent sampling probe onto a surrogate facepiece or use a sampling adapter designed to temporarily provide a means of sampling air from inside the facepiece.
  - Any modifications to the respirator facepiece for fit testing must be completely removed and the facepiece restored to the NIOSH-approved configuration before that facepiece can be used in the workplace.

Routine and Reasonably Foreseeable Emergency Situations

Routine and emergency respirator requirements include:

- Prohibiting conditions that can result in facepiece seal leakage.
- Preventing employees from removing respirators in hazardous environments.
- Taking actions to ensure continued effective respirator operation throughout the work shift.
- Establishing procedures for the use of respirators in IDLH atmospheres.

Employees may not wear respirators with tight-fitting facepieces if they have:

- Facial hair that comes between the sealing surface of the facepiece and the face (the face-to-facepiece seal) or that interferes with valve function.
- Any condition that interferes with the face-to-facepiece seal or valve function.

If an employee wears corrective glasses, goggles, or other PPE, that equipment must be worn in a manner that does not interfere with the face-to-facepiece seal.

Employees who use a tight-fitting respirator must check to ensure that an adequate the face-to-facepiece seal is achieved each time the respirator is put on. Either the following positive- and negative-pressure checks or the respirator manufacturer’s recommended user seal check method must be used. User seal checks are not substitutes for qualitative or quantitative fit tests.

- To perform a positive-pressure check, close off the exhalation valve by covering the valve with the palm of the hand and exhaling gently into the facepiece. The fit is considered satisfactory if a slight positive pressure can be built up inside the facepiece for 10 seconds without any evidence of outward leakage of air at the seal.

For most respirators, this method of leak testing requires the user to remove the exhalation valve cover before closing off the exhalation valve and then carefully replace the cover after the test.

- To perform a negative-pressure check, close off the inlet opening of the canister or cartridges by covering the inlet with the palms of the hands or by replacing the filter seals and inhale gently into the facepiece. The fit is considered satisfactory if a slight negative pressure can be built up inside the facepiece for 10 seconds without any evidence of inward leakage of air at the seal.

When there is a change in work area conditions or degree of employee exposure or stress that might affect respirator effectiveness, the program administrator must reevaluate the continued effectiveness of the respirator.

The supervisor or program administrator must ensure that employees leave the respirator use area:

- To wash their faces and respirator facepieces as necessary to prevent eye or skin irritation associated with respirator use.
- If they detect vapor or gas breakthrough, changes in breathing resistance, or leakage of the facepiece.
- To replace the respirator or the filter, cartridge, or canister elements.

If the employee detects vapor or gas leakage, changes in breathing resistance, or leakage of the facepiece, the respirator must be replaced or repaired before the employee can return to the work area.

For all IDLH atmospheres, the supervisor must ensure that:

- At least one standby attendant is located outside the IDLH atmosphere.
- Visual, voice, or signal line communication is maintained between the employees in the IDLH atmosphere and the attendants.
- The attendants are trained to provide effective emergency rescue.
- The program administrator, after being notified, provides necessary assistance appropriate to the situation.
- Attendants are equipped with a pressure demand or other positive-pressure SCBA or with a pressure demand or other positive-pressure supplied-air respirator with auxiliary SCBA and either of the following:
    - ❑ Appropriate retrieval equipment where the equipment would contribute to the rescue of the employees and would not increase the overall risk resulting from entry
    - ❑ An equivalent means for rescue where retrieval equipment cannot be used because the equipment increases the overall risk of entry

Respirator Maintenance

Each respirator user is provided with a respirator that is clean, sanitary, and in good working order. To clean and disinfect respirators, use the procedures recommended by the respirator manufacturer. When recommendations are not available from the manufacturer, use the following procedures:

1. Remove filters, cartridges, or canisters. Disassemble facepieces by removing speaking diaphragms, demand and pressure demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.

2. Wash components in warm (110° F maximum) water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used.
3. Rinse components thoroughly in clean, warm, running water. Then drain the water.
4. If the cleaner used in step 2 does not contain a disinfecting agent, immerse the respirator components for two minutes in one of the following substances:

   - ❑ Hypochlorite solution (50 ppm of chlorine) made by adding approximately 1 ml of laundry bleach to 1 l of warm water
   - ❑ Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 ml of tincture of iodine to 1 l of warm water
   - ❑ Other commercially available cleansers of equivalent disinfectant quality when used as directed if their use is recommended or approved by the respirator manufacturer

   Rinse components thoroughly in clean, warm, running water. Then drain the water. Thorough rinsing is important because detergents or disinfectants that dry on facepieces can cause dermatitis and some disinfectants can cause rubber to deteriorate or metal parts to corrode if not completely removed.
5. Air dry components or hand-dry them with a clean, lint-free cloth.
6. Reassemble the facepiece, replacing filters, cartridges, and canisters where necessary.
7. Test the respirator to ensure that all components work properly.

Clean and disinfect respirators at the following intervals:

- Respirators issued for the exclusive use of an employee—Clean and disinfect as often as necessary to maintain a sanitary condition.
- Respirators issued to more than one employee—Clean and disinfect after each use.
- Respirators maintained for emergency use—Clean and disinfect after each use.
- Respirators used in fit testing and training—Clean and disinfect after each use.

Store all respirators where they will be protected from damage, contamination, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals. Pack respirators in a way that prevents the facepiece and exhalation valve from being damaged or deformed.

Emergency respirators must be:

- Kept accessible to the work area.
- Stored in containers or covers that are clearly marked as containing emergency respirators.
- Stored in accordance with any applicable manufacturer instructions.

Respirator Inspections

Inspect respirators periodically according to the following instructions:

- Inspect all respirators used in routine situations before each use and during cleaning.
- Inspect all respirators maintained for use in emergency situations at least monthly and in accordance with the recommendations of the manufacturer and check them for proper function before and after each use.
- Inspect emergency escape-only respirators before being carried into the workplace for use.

Respirator inspections must include:

- A check of respirator function, tightness of connections, and the condition of the various parts, including, but not limited to, the facepiece, head straps, valves, connecting tube, cartridges, canisters, or filters.
- A check of elastomeric parts for pliability and signs of deterioration.
- Monthly inspections of SCBAs. Air and oxygen cylinders must be maintained in a fully charged state and must be recharged when the pressure falls to 90% of the pressure level recommended by the manufacturer. The regulator and warning devices must function properly.

If respirators are maintained for emergency use, the program administrator must:

- Certify the respirator by documenting the date the inspection was performed, the name and signature of the person who made the inspection, the findings, the required remedial action, and a serial number or other means of identifying the inspected respirator.
- Provide this information on a tag or label that is attached to the storage compartment for the respirator, kept with the respirator, or included in inspection reports stored as paper or electronic files.

Respirators that fail an inspection or are otherwise found to be defective must be removed from service and discarded, repaired, or adjusted in accordance with the following requirements:

- Only persons appropriately trained to perform repairs and adjustments, using NIOSH-approved parts designed for respirators by the respective manufacturer, are allowed to perform such operations.
- Repairs must be made according to the recommendations and specifications of the manufacturer for the type and extent of repairs to be performed.
- Only the manufacturer or technician trained by the manufacturer may adjust or repair reducing and admission valves, regulators, and alarms.

Air Quality, Quantity, and Flow

Compressed air, compressed oxygen, liquid air, and liquid oxygen used for respiration in atmosphere-supplying respirators must meet the following specifications:

- Compressed and liquid oxygen must meet the United States Pharmacopoeia requirements for medical or breathing oxygen.
- At a minimum, compressed breathing air must meet the requirements for Type 1-Grade D breathing air described in ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1 and must include:
  - Oxygen content of 19.5 to 23.5%
  - Hydrocarbon content of 5 mg/m^3 of air or less
  - Carbon monoxide (CO) content of 10 ppm or less
  - Carbon dioxide (CO_2) content of 1,000 ppm or less
  - Lack of noticeable odor

- Compressed oxygen may not be used in atmosphere-supplying respirators that have previously used compressed air.
- Oxygen concentrations greater than 23.5% may only be used in equipment designed for oxygen service or distribution.
- Cylinders used to supply breathing air to respirators must meet the following requirements:
  - Cylinders must be tested and maintained as prescribed in the Shipping Container Specification Regulations of the Department of Transportation (49 CFR part 173 and part 178).
  - Cylinders must have a certificate of analysis from the supplier verifying that the breathing air meets the requirements for Type 1-Grade D breathing air.
  - The moisture content in the cylinder must not exceed a dew point of -50° F at one atmosphere pressure.
- Compressors used to supply breathing air to respirators must be constructed and situated to:
  - Prevent entry of contaminated air into the air-supply system.
  - Minimize moisture content so that the dew point at one atmosphere pressure is 10° F below the ambient temperature.
  - Have suitable in-line air-purifying sorbent beds and filters to ensure breathing air quality. Sorbent beds and filters must be maintained and replaced or refurbished periodically, according to the instructions of the manufacturer.
  - Have a tag containing the most recent change date and the signature of the person authorized to perform the change. The tag must be maintained at the compressor.
- For compressors that are not oil-lubricated, the air supply must be monitored at intervals sufficient to prevent CO levels in the breathing air from exceeding 10 ppm.
- For oil-lubricated compressors, a high-temperature and CO alarm must be installed in-line to monitor CO levels. If only high-temperature alarms are used, the air supply must be monitored at intervals sufficient to prevent CO in the breathing air from exceeding 10 ppm.
- Breathing air couplings must be equipped with fittings that are incompatible with outlets for nonrespirable work site air or other gas systems. No asphyxiating substance may be introduced into breathing air lines.
- Breathing gas containers must be marked in accordance with the NIOSH respirator certification standard, 42 CFR part 84.

Breathing Air

Breathing air must meet or exceed the requirements for grade D breathing air. The oxygen content of the air must be between 19.5 and 23.5%. Additionally, the air must have a dew point of -20° F or lower to avoid freezing in the regulators during use. Any cylinder that does not meet this specification must be refused and returned to the vendor.

Breathing air cylinders with 110-ft^3 capacities must be replaced when the pressure drops to 500 psi, and 220-ft^3 capacity cylinders must be replaced when the pressure is 300 psi. These pressures allow a safety factor of approximately 15 minutes of heavy use time in the cylinder.

Whenever corrosion is a problem, all breathing air quick coupling fittings must be 316 stainless steel. All breathing air regulators must be equipped with CGA 346 thread connectors to prevent accidental use of the wrong gas. Breathing air quick coupling fittings must be unique to prevent usage of the air hoses or regulators on other systems.

Training

Effective training must be provided to employees who are required or allowed to use respirators. The training must be comprehensive and must be repeated annually or more often if necessary.

The training must be conducted in a way that is understandable to the employees and must be completed before requiring or allowing employees to use respirators in the workplace. The training must ensure that each employee can demonstrate the following knowledge:

- Why the respirator is necessary and how improper fit, use, or maintenance can compromise the protective effect of the respirator
- The limitations and capabilities of the respirator
- How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions
- How to inspect, attach, remove, use, and check the seals of the respirator
- The procedures for maintaining and storing the respirator
- How to recognize medical signs and symptoms that can limit or prevent the effective use of respirators
- The general requirements of this program and all applicable governmental regulations

Retraining is administered annually and when the following situations occur:

- Changes in the workplace or the type of respirator render previous training obsolete.
- Inadequacies in the employee's knowledge or use of the respirator indicate that the employee has not retained the necessary level of understanding or skill.
- Any other situation in which retraining seems necessary.

If employees are allowed to wear respirators that are not required because of a hazardous atmospheric condition, the following additional basic advisory information about respirators must be provided to those employees.

Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for employees. Employees sometimes may wear respirators to avoid exposures to hazards, even if the amount of the hazardous substance does not exceed the limits set by OSHA standards.

However, if a respirator is used improperly or is not kept clean, the respirator itself can become a hazard. If an employee chooses to wear a respirator for his or her own comfort, the employee must to take the following precautions to ensure that the respirator itself does not present a hazard:

- Read and heed all instructions provided by the manufacturer about the use, maintenance, cleaning and care, and warnings regarding the limitations of the respirator.

- Choose a respirator that is certified to protect against the contaminant of concern. NIOSH certifies respirators. A label or statement of certification should appear on the respirator or respirator packaging and explain the purpose of and the protection offered by the respirator.
- Do not wear a respirator into atmospheres containing contaminants against which that respirator is not designed to protect. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke.
- Do not mistakenly use a respirator that belongs to someone else.

Evaluating the Program

The program administrator conducts evaluations of the workplace when necessary to ensure that the provisions of the current written program are being effectively implemented and continue to be effective.

The program administrator regularly consults employees required to use respirators to assess the effectiveness of the program and identify any problems. Any problems that are identified during this assessment must be corrected. Factors to be assessed include:

- Respirator fit (including the ability to use the respirator without interfering with effective workplace performance).
- Appropriate respirator selection for the hazards to which the employee is exposed.
- Proper respirator use in the workplace conditions that the employee encounters.
- Proper respirator maintenance.

Retention of Records

The Company shall maintain all employee medical records for the length of employment plus 20 years or 30 years whichever is greater.

Access to Medical Records

The employee shall have access to their medical records by making a written request to the Human Resources Department.

Sample 41-1. OSHA Respirator Medical Evaluation Questionnaire

OSHA RESPIRATOR MEDICAL EVALUATION QUESTIONNAIRE

To the employer: Answers to questions in Section 1 and to question 9 in Section 2 of Part A do not require a medical examination.

To the employee: Can you read? (circle one): Yes / No

Your employer must allow you to answer this questionnaire during normal working hours or at a time and place that is convenient to you. To maintain your confidentiality, your employer or supervisor must not look at or review your answers, and your employer must tell you how to deliver or send this questionnaire to the health care professional who will review it.

Part A. Section 1. (Mandatory) The following information must be provided by every employee who has been selected to use any type of respirator (please print and circle "yes" or "no").

1. Today's date: ___________________________

2. Your name: ___________________________

3. Your age (to nearest year): ___________________

4. Sex (circle one): M / F

5. Your height: ______________________ft. ______ in.

6. Your weight: ___________________________ lb

7. Your job title: ___________________________

8. A phone number where you can be reached by the health care professional who reviews this questionnaire (include the area code): ___________________________

9. The best time to phone you at this number: __________

10. Has your employer told you how to contact the health care professional who will review this questionnaire: Yes / No

11. Check the type of respirator you will use (you can check more than one category):

a. ____ Disposable respirator (filter-mask, non-cartridge type only)

b. ____ Other type (half- or full-facepiece type, powered-air purifying, supplied-air, SCBA)

12. Have you worn a respirator: Yes / No

If "yes," what types?: ___________________________

Part A. Section 2. (Mandatory) Questions 1 through 9 must be answered by every employee who has been selected to use any type of respirator (please circle "yes" or "no").

1. Do you currently smoke tobacco or have you smoked tobacco in the last month: Yes / No

2. Have you ever had any of the following conditions?

a. Seizures (fits): Yes / No
b. Diabetes (sugar disease): Yes / No
c. Allergic reactions that interfere with your breathing: Yes / No
d. Claustrophobia (fear of closed-in places): Yes / No
e. Trouble smelling odors: Yes / No

3. Have you ever had any of the following pulmonary or lung problems?

a. Asbestosis: Yes / No
b. Asthma: Yes / No
c. Chronic bronchitis: Yes / No
d. Emphysema: Yes / No
e. Pneumonia: Yes / No
f. Tuberculosis: Yes / No
g. Silicosis: Yes / No
h. Pneumothorax (collapsed lung): Yes / No
i. Lung cancer: Yes / No
j. Broken rib: Yes / No
k. Chest injuries or surgeries: Yes / No
l. Any other lung problem that you have been told about: Yes / No

4. Do you currently have any of the following symptoms of pulmonary or lung illness? Yes / No

a. Shortness of breath: Yes / No
b. Shortness of breath when walking fast on level ground or walking up a slight hill or incline: Yes / No
c. Shortness of breath when walking with other people at an ordinary pace on level ground: Yes / No
d. Have to stop for breath when walking at your own pace on level ground: Yes / No
e. Shortness of breath when washing or dressing yourself: Yes / No
f. Shortness of breath that interferes with your job: Yes / No
g. Coughing that produces phlegm (thick sputum): Yes / No
h. Coughing that wakes you early in the morning: Yes / No
i. Coughing that occurs mostly when you are lying down: Yes / No
j. Coughing blood in the last month: Yes / No
k. Wheezing: Yes / No
l. Wheezing that interferes with your job: Yes / No
m. Chest pain when you breathe deeply: Yes / No
n. Any other symptoms that you think may be related to lung problems: Yes / No

5. Have you ever had any of the following cardiovascular or heart problems?

a. Heart attack: Yes / No
b. Stroke: Yes / No
c. Angina: Yes / No
d. Heart failure: Yes / No
e. Swelling in your legs or feet (not caused by walking): Yes / No
f. Heart arrhythmia (heart beating irregularly): Yes / No
g. High blood pressure: Yes / No
h. Any other heart problem that you have been told about: Yes / No

6. Have you ever had any of the following cardiovascular or heart symptoms?

a. Frequent pain or tightness in your chest: Yes / No
b. Pain or tightness in your chest during physical activity : Yes / No
c. Pain or tightness in your chest that interferes with your job: Yes / No
d. In the past two years, have you noticed your heart skipping or missing a beat: Yes / No
e. Heartburn or indigestion that is not related to eating: Yes / No
f. Any other symptoms that you think may be related to heart or circulation problems: Yes / No

7. Do you currently take medication for any of the following problems?

a. Breathing or lung problems: Yes / No
b. Heart trouble: Yes / No
c. Seizures (fits): Yes / No

8. If you have used a respirator, have you ever had any of the following problems?

(If you have never used a respirator, check the following space and go to question 9): ________

a. Eye irritation: Yes / No
b. Skin allergies or rashes: Yes / No
c. Anxiety: Yes / No
d. General weakness or fatigue: Yes / No
e. Any other problem that interferes with your use of a respirator: Yes / No

9. Would you like to talk to the health care professional who will review this questionnaire about your answers to this questionnaire: Yes / No

(OSHA Respirator Medical Evaluation Questionnaire, Continued)

Questions 10 to 15 must be answered by every employee who has been selected to use either a full-facepiece respirator or a self-contained breathing apparatus (SCBA). For employees who have been selected to use other types of respirators, answering these questions is voluntary.

10. Have you ever lost vision in either eye (temporarily or permanently): Yes / No

11. Do you currently have any of the following vision problems?
a. Wear contact lenses: Yes / No
b. Wear glasses: Yes / No
c. Color blind: Yes / No
d. Any other eye or vision problem: Yes / No

12. Have you ever had an injury to your ears, including a broken ear drum: Yes / No

13. Do you currently have any of the following hearing problems?
a. Difficulty hearing: Yes / No
b. Wear a hearing aid: Yes / No
c. Any other hearing or ear problem: Yes / No

14. Have you ever had a back injury: Yes / No

15. Do you currently have any of the following musculoskeletal problems?
a. Weakness in any of your arms, hands, legs, or feet: Yes / No
b. Back pain: Yes / No
c. Difficulty fully moving your arms and legs: Yes / No
d. Pain or stiffness when you lean forward or backward: Yes / No
e. Difficulty fully moving your head up or down: Yes / No
f. Difficulty fully moving your head side to side: Yes / No
g. Difficulty bending at your knees: Yes / No
h. Difficulty squatting to the ground: Yes / No
i. Difficulty climbing a flight of stairs or a ladder while carrying more than 25 lb: Yes / No
j. Any other muscle or skeletal problem that interferes with using a respirator: Yes / No

Part B Any of the following questions, and other questions not listed, may be added to the questionnaire at the discretion of the health care professional who will review the questionnaire.

1. In your present job, are you working at high altitudes (over 5,000 ft) or in a place that has lower than normal amounts of oxygen: Yes / No
If "yes," do you have feelings of dizziness, shortness of breath, pounding in your chest, or other symptoms when you are working under these conditions: Yes / No

2. At work or at home, have you ever been exposed to hazardous solvents, hazardous airborne chemicals (for example, gases, fumes, or dust), or has your skin come into contact with hazardous chemicals: Yes / No
If "yes," name the chemicals if you know them: ___________

3. Have you ever worked with any of the materials, or under any of the conditions listed below:
a. Asbestos: Yes / No
b. Silica (for example, in sandblasting): Yes / No
c. Tungsten/cobalt (for example, grinding or welding this material): Yes / No
d. Beryllium: Yes / No
e. Aluminum: Yes / No
f. Coal (for example, mining): Yes / No
g. Iron: Yes / No
h. Tin: Yes / No
i. Dusty environments: Yes / No
j. Any other hazardous exposures: Yes / No
If "yes," describe these exposures: ____________________

4. List any second jobs or side businesses you have: _______

5. List your previous occupations: ____________________

6. List your current and previous hobbies: _______________

7. Have you been in the military services? Yes / No
If "yes," were you exposed to biological or chemical agents (either in training or combat): Yes / No

8. Have you ever worked on a HAZMAT team? Yes / No

9. Other than medications for breathing and lung problems, heart trouble, blood pressure, and seizures mentioned earlier in this questionnaire, are you taking any other medications for any reason (including over-the-counter medications): Yes / No
If "yes," name the medications if you know them: __________

10. Will you be using any of the following with your respirators?
a. HEPA filters: Yes / No
b. Canisters (for example, gas masks): Yes / No
c. Cartridges: Yes / No

11. How often are you expected to use the respirators? Circle "yes" or "no" for all answers that apply to you:
a. Escape only (no rescue): Yes / No
b. Emergency rescue only: Yes / No
c. Less than 5 hours per week: Yes / No
d. Less than 2 hours per day: Yes / No
e. 2 to 4 hours per day: Yes / No
f. Over 4 hours per day: Yes / No

12. While wearing a respirator, is your work effort:
a. Light (less than 200 kcal per hour): Yes / No
If "yes," how long does this period last during the average shift: ______________ hr ______________ min
Examples of a light work effort are sitting while writing, typing, drafting, or performing light assembly work or standing while operating a drill press (1-3 lb) or controlling machines.
b. Moderate (200 to 350 kcal per hour): Yes / No
If "yes," how long does this period last during the average shift: ______________ hr ______________ min
Examples of moderate work effort are sitting while nailing or filing; driving a truck or bus in urban traffic; standing while drilling, nailing, performing assembly work, or transferring a moderate load (about 35 lb) at trunk level; walking on a level surface at about 2 mph or down a 5-degree grade at about 3 mph; or pushing a wheelbarrow with a heavy load (about 100 lb) on a level surface.
c. Heavy (above 350 kcal per hour): Yes / No
If "yes," how long does this period last during the average shift: ______________ hr ______________ min
Examples of heavy work are lifting a heavy load (about 50 lb) from the floor to your waist or shoulder, working on a loading dock, shoveling, standing while bricklaying or chipping castings, walking up an 8-degree grade at about 2 mph, and climbing stairs with a heavy load.

13. Will you be wearing protective clothing and/or equipment (other than the respirator) when using your respirator: Yes / No
If "yes," describe this equipment: ________________________

14. Will you be working under hot conditions (over 77°F): Yes / No

15. Will you be working under humid conditions: Yes / No

16. Describe the work you will be doing while using your respirators: ____________________

17. Describe any special or hazardous conditions you might encounter when using your respirators (for example, confined spaces, or life-threatening gases): ________________

18. Provide the following information for each toxic substance that you will be exposed to when using your respirators:
Name of the first toxic substance: ________________________
Estimated maximum exposure level per shift: ________________
Duration of exposure per shift: ________________________
Name of the second toxic substance: ____________________
Estimated maximum exposure level per shift: ________________
Duration of exposure per shift: ________________________
Name of the third toxic substance: _____________________
Estimated maximum exposure level per shift: ________________
Duration of exposure per shift: ________________________
The name of any other toxic substances that you will be exposed to while using your respirator: ________________________

19. Describe any special responsibilities you will have while using your respirators that may affect the safety and well-being of others (for example, rescue or security): ________________

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Housekeeping

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

Good Housekeeping

Good housekeeping is important to accident prevention. All phases shall be kept clean to the extent the nature of the work allows. Proof that good housekeeping is important to a successful safety program is shown in studies that indicate:

- Good housekeeping reduces exposure to incidents/accidents and improves safety performance.
- Good housekeeping improves worker morale and helps attract superior workers.
- Safety-minded management considers good housekeeping important to good industrial relations, good production, and high efficiency.
- When trucks and equipment are clean, the Company's image within the community is enhanced.

Examples of poor housekeeping that contribute to accidents include:

- Loose objects on floors that are tripping hazards.
- Slippery material on floors that can cause slips and falls.
- Loose objects overhead that can fall on persons below.
- Large objects out of place that might be in the path of pedestrian and vehicular traffic.
- Insecurely piled materials that can fall on workers.
- Improperly placed tools that can cause individuals to come in contact with sharp edges.

- Projecting nails that can puncture or scratch.
- Dirty windows and light reflectors that offer inadequate illumination.
- Disorderly methods and processes that contribute to all hazards.
- Floorboards in trucks littered with scrap, soda cans, candy wrappers, and so on.
- The back of trucks piled high with trash and debris that blow off as the truck travels down the highway.
- Dirt, rocks, sand, and other materials on the back of a dump truck that bounce off onto vehicles traveling behind them on the highway.

Poor housekeeping can contribute to fires in several ways:

- Collections of rubbish provide fuel for fire.
- Oil-soaked cloth, shavings, straw, and other items can cause spontaneous ignition.
- The mixture of nitrates, chlorates, and other chemicals with carbonaceous materials can cause explosions.
- Paper, shavings, and rags can be easily ignited by matches, sparks, and so on.
- Disorderly storage or overcrowding can block access to fire extinguishing equipment.
- Organic dust or lint can cause explosions or “flash” fires.

Keys to good housekeeping include:

- Developing an orderly arrangement of processes, operations, and equipment.
- Providing a definite place for each object.
- Keeping each object in the designated place or returning the object if removed.
- Providing adequate disposal of scrap, waste, and surplus materials.
- Maintaining sufficient work areas and adequate aisle space.
- Ensuring that vehicles and equipment are kept clean:
  - Floorboards within trucks must be kept clean.
  - Debris cannot be allowed to pile up in the back of trucks.
  - Excess material and trash should be removed from trucks on a daily basis.

Responsibility

The following sections indicate the housekeeping responsibilities of different Company personnel.

Management

Company managers are responsible for:

- Including housekeeping in the planning of all operations by setting up control and cleanup measures and regulating work practices.
- Providing equipment such as waste containers, dust collectors, cleaning equipment, and so on.

- Including maintenance of good housekeeping as part of the job responsibility of each employee.
- Providing cleanup schedules and personnel.
- Maintaining executive supervision and interest.

Supervisors

Company supervisors are responsible for:

- Maintaining a constant check on the housekeeping condition.
- Having unusual situations corrected or cleaned immediately.
- Seeing that employees maintain good housekeeping.
- Planning for orderliness in all operations.
- Issuing definite instructions to employees.
- Insisting on and providing time for cleanup after every job.

Employees

All Company employees are responsible for:

- Following instructions about maintaining good housekeeping.
- Reporting promptly any poor housekeeping conditions.

Planning

Planning for good housekeeping includes:

- Orderly arrangement of processes and equipment.
- Adequate space for materials, tools, and portable equipment.
- Tool racks and tool holders.
- Anticipation of waste, scrap, spillage, leakage, dust, and splashing and provision of some means of control, such as:
  - Receptacles for waste and scrap.
  - Overflow pans, splashguards, chip screens, and so on.
  - Provision for systematic disposal of all waste.
  - Drains for liquid spillage.
  - Exhaust systems and collectors.
  - Adequate windows, skylights, and lighting design for safe cleaning and repair.
  - Planned use of contrasting color.
  - Aisles and storage spaces outlined with distinctive borders.

- ❑ Corners painted in a light color.
- ❑ Waste cans for paper and trash.
- ❑ Holders for all tools.
- ❑ Tote boxes, belts, and carriers for tools.

Cleaning Aids

Cleaning and maintenance aids for better housekeeping include:

- Vacuum cleaners (portable or built-in).
- Floor cleaning equipment (scrubbers and washers).
- Safe cleaning and sweeping compounds.
- Belts, anchors, and other window-cleaning equipment.
- Platform ladders, pole-type bulb holders, and other lighting maintenance equipment.

Checklist

A checklist for specific housekeeping items includes:

- Floors.
  - ❑ Are floors kept clean of slippery materials and loose objects?
  - ❑ Are excess chips and scrap from machines put into containers?
  - ❑ Are floor mats or platforms in good condition?
  - ❑ Is a definite floor or site-cleaning schedule in operation?
- Processes and equipment.
  - ❑ Are materials and equipment kept out of passageways?
  - ❑ Is sufficient space available for safe movement of trucking equipment?
  - ❑ Are aisles clearly marked?
  - ❑ Is sufficient room provided between machines for safe operation?
  - ❑ Are dirty operations isolated or enclosed?
- Objects in proper places.
  - ❑ Are fire extinguishers readily accessible and properly identified?
  - ❑ Are lunch boxes out of working areas?
  - ❑ Are lunch bags, papers, cups, and other trash placed in trash containers?
  - ❑ Are tools returned to racks, the tool room, or the proper bins on trucks and equipment?
- Piling materials.
  - ❑ Are work materials piled in an orderly manner, not extending into work areas?
  - ❑ Are materials piled in designated areas?

- Are materials properly cross-tied, stepped back, or stored with dunnage between courses?
- Are manually piled or unpiled materials kept to a maximum height of 7 ft (2.13 m)?

- Tool storage.
  - Have general tool storage rooms, boxes, or racks been provided?
  - Are sufficient local racks, carts, or boxes available?
  - Are sharp-edged tools kept in sheaths or holders?
  - Are areas provided for cleaning and repairing tools?
- Waste disposal.
  - Are sufficient number and the proper type and size of trash containers available?
  - Are self-closing containers for flammable materials available, and are these containers used?
  - Are waste, scraps, and rubbish collected at regular periods?

Trips, Slips, and Falls

Most accidents are the result of poor housekeeping. Preventing such accidents requires maintaining safe conditions at the jobsite and Company facilities and controlling unsafe acts of employees and subcontractors.

Causes of Tripping and Stumbling

The following are the most common causes of tripping and stumbling on the jobsite:

- Objects out of place
- Objects or materials in the walkway
- Tools on the floor
- Projecting parts of machines or equipment
- Equipment or material on stairs
- Scrap or waste materials
- Pipe or conduit set near floor level
- Extension cords, power cables, and air hoses
- Uneven floor surface, such as:
  - Holes and depressions in the floor or other walkway
  - Projections, such as warped or loose boards or blocks
  - Broken floor surface
  - Uneven patches
  - Uncovered drains or pits

- ❑ Bent floorboards or plates
- ❑ Loose or poorly fitted grating
- ❑ Sudden changes in pitch or elevation
- ❑ Sagging or expanded floor support

Preventing Tripping and Stumbling

The following sections discuss safety precautions to prevent tripping and stumbling accidents on the jobsite.

Safe Work Conditions

Maintain safe working conditions to prevent tripping and stumbling by observing the following guidelines:

- Plan and arrange machines, processes, and walk areas to eliminate tripping or stumbling hazards.
- Provide placement and storage areas for tools, equipment, and materials.
- Provide regular inspections and immediate removal, replacement, or repair of tripping or stumbling hazards.
- Maintain good housekeeping.

Safe Work Methods

Promote safe working methods among employees to prevent tripping and stumbling by observing the following guidelines:

- Instruct employees about how to keep materials, tools, and objects in designated places.
- Hold employees responsible for correcting or reporting tripping and stumbling hazards.
- Instruct employees to return tools and equipment to the proper place immediately after use.
- Instruct employees to step over or around obstructions, not on them.

Causes of Slipping

The following are the most common causes of slipping on the jobsite:

- Wet floors, stairs, or walkways caused by:
  - ❑ Water
  - ❑ Oil or grease
  - ❑ Chemicals
  - ❑ Wet grass
  - ❑ Mud

- Smooth surfaces on floors, stairs, equipment or walkways, such as:
  - Waxed or polished surfaces
  - Metal plates or covers
  - Tile, terrazzo, or marble surfaces

Preventing Slipping

The following sections discuss safety precautions to prevent slipping accidents on the jobsite.

Safe Work Conditions

Maintain safe working conditions to prevent slipping by observing the following guidelines:

- Clean all spills, drips, or leaks immediately.
- Correct causes of spills or leaks.
- Provide necessary drains, pans, or splash guards.
- Use only slip-resistant waxes and polishes.
- Roughen plates, grills, and concrete.
- Use nonslip paint, mats, treads, or abrasive surfacing.
- Provide signs or barriers where uncontrollable or temporary slipping hazards exist.

Safe Work Methods

Promote safe working methods among employees to prevent tripping and stumbling by observing the following guidelines:

- Instruct employees to clean spills immediately and report leaks, puddles, and other slippery conditions.
- Advise employees to use caution when walking on slippery surfaces.

Causes of Falling

The following are the common causes of falling on the jobsite:

- Not maintaining proper three-point contact when getting in or out of trucks and equipment and jumping off of equipment
- Unsafe ladders, which have any of the following:
  - Deteriorated or cracked rungs or side rails
  - Ineffective braces, spreaders, or other hardware
  - Improperly attached cleats or steps
  - No ladder shoes
  - Insufficient clearance

- Improper use of ladders, including:
  - Ladder not placed at proper angle
  - No solid, level footing
  - Ladder not anchored at top
  - No barricades at doorways or travel ways
  - Workers carry objects while climbing
  - Workers reach too far while on ladder
  - Workers do not face ladder while climbing
  - Insufficient overlap on extension ladder
  - Workers climb or stand on top rung or step
- Unsafe stairs, including:
  - Slippery, worn, or broken treads
  - Risers that are too high or not high enough
  - Varying riser height
  - Insufficient or excessively steep slope
  - No railings or unsafe railings
  - Excessive stairway length, with no a landing
- Climbing on machines, boxes, or chairs
- Running or walking too fast
- Insecure or improperly constructed scaffolds or platforms
- Unsafe clothing, such as loose trouser cuffs or high-heeled shoes
- Shadows, glare, or inadequate lighting
- Poor vision from steam, smoke, or dust
- Vision obstructed by load, corner, door, or machine

Preventing Falls

The following sections discuss safety precautions to prevent falls on the jobsite.

Ladder Safety

Maintain a safe working environment and promote safety to reduce falls by observing the following guidelines when using ladders (see Chapter 31, “Ladders and Scaffolds”):

- Make sure that the ladder is not defective.
- Use a ladder with safety feet suitable for the floor or ground on which it stands.
- Tie the ladder at the base or have someone hold it.

- If the ladder is placed before a doorway, lock the door or have someone guard it. Protect the ladder base from traffic if necessary.
- When using a stepladder, ensure that the ladder is fully extended before climbing.
- Clean muddy or otherwise slippery shoes before climbing.
- Be sure that the ladder is placed at a safe angle against the wall or other solid backing. An angle of about 75 degrees to the horizontal is recommended.
- Always face the ladder and hold on with both hands, whether climbing up or down.
- Carry tools in suitable pockets, or have tools and all other objects hoisted with rope and bucket.
- When raising a long ladder, have someone hold the base or tie the base to or block it against something solid.
- Raise extension ladders to the vertical position or against the wall before extending them. Leave ample overlap between sections: for extended lengths up to 38 ft (11.58 m), allow 3 ft (0.91 m) of overlap; for 38 to 44 ft (11.58 to 13.41 m), allow 4 ft (1.22 m); and for 44 to 55 ft (13.41 to 16.76 m), allow 5 ft (1.52 m).
- Place the ladder feet parallel with the top support and on a solid footing.
- Set the ladder at the proper angle. Place the base of the ladder at a distance equal to one-fourth the height of the ladder.
- Keep the trunk of your body between the side rails of the ladder.

Stair Safety

Maintain a safe working environment and promote safety to reduce falls by observing the following guidelines regarding stairs:

- Install stairs at an angle between 30 and 50 degrees (30 to 35 degrees is preferred).
- A handrail that is 30 to 34 inches (76.20 to 86.36 cm) high is required for four or more risers.
- Risers not less than 5 inches (12.70 cm) or not more than 8 inches (20.32 cm) are required.
- One-half- to 1-inch (1.27- to 2.54-cm) nosing on treads is required. One-inch (2.54 cm) nosing is preferred.
- Treads not less than 9-1/2 inches (24.13 cm) are preferred.

43

Process Safety Management Program

Purpose

To identify the guidelines for preventing or minimizing the consequences of catastrophic release of toxic, reactive, flammable or explosive chemicals. The release may result in toxic, fire or explosion hazards..

Scope

These guidelines apply to all Operating Unit facilities and project sites.

Company Commitment

Employees in a broad range of industries are exposed to safety hazards associated with the processing and use of highly hazardous chemicals. These hazardous chemicals encompass a wide variety of materials that are toxic, flammable, explosive, reactive, or a combination of these properties.

Processes handling hazardous chemicals present the potential for accidents, such as spills or other releases that could have catastrophic results for human life and the environment.

The Company is firmly committed to providing each employee a safe and healthful work environment. The Company recognizes that processes and other essential procedures frequently require the use of chemicals that have potentially hazardous properties. The Process Safety Management (PSM) Program for the use of highly hazardous chemicals has been adopted in an effort to reduce the possibility of accidents, injuries, and deaths.

Definitions

Atmospheric Tank—A storage tank which has been designed to operate at pressures from atmospheric through 0.5 psig. (pounds per square inch gauge) or (3.45 Kpa).

Boiling Point—The boiling point of a liquid at a pressure of 14.7 psia (pounds per square inch absolute) or (760 mm).

Catastrophic Release—A major uncontrolled emission, fire, or explosion involving one or more highly hazardous chemical that presents serious danger to employees in the workplace.

Facility—The buildings, containers, or equipment that contains a process.

Highly Hazardous Chemical—A substance that possesses toxic, reactive, flammable, or explosive properties and is present in quantities specified in the scope.

Hot Work—Work involving electric or gas welding, cutting, brazing, or similar flame, or spark-producing operations.

Flammable Gas—A gas that at ambient temperature and pressure forms a flammable mixture with air at a concentration of 13% by volume or less; or a gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than 12 % by volume, regardless of the lower limit.

Flammable Liquid—Any liquid having a flash point below 100°F (37.8°C); except any mixture having components with a flash point of 100°F (37.8°C) or higher, the total of which constitutes 99 % or more of the total volume of the mixture.

Normally Unoccupied Remote Facility—A facility that is operated, maintained, or serviced by employees who visit the facility only periodically to check its operation and to perform necessary operating or maintenance tasks. No employees are permanently stationed at the facility. Facilities meeting this definition are not contiguous with, and must be geographically remote from, all other buildings, processes, or persons.

Process—Any activity involving a highly hazardous chemical, including any use, storage, manufacturing, handling, or on-site movement of such chemicals or a combination of these activities. For the purpose of this definition, any group of vessels that are interconnected and separate vessels that are located such that a highly hazardous chemical could be involved in a potential release shall be considered a single process.

Requirements

Many Company clients have site-specific safety policies or procedures. In such cases, these procedures might be more stringent than similar Company procedures. To ensure that the Company performs work at client sites in a safe manner, it is imperative that employees perform work according to the most stringent safety procedures. Compliance with the contractor requirement portions of the PSM standard plan will, in most cases, fulfill this safety objective.

Before beginning any project at a client site, the Company shall perform a safety review. The applicable safety policies of the client are reviewed. Specific client, applicable governmental regulatory agency (OSHA, MSHA, PSM), or other safety training requirements are determined, verified, and established before starting work on the project.

The Company shall notify the host employer (client/owner) of any unique hazards presented by the nature of the work, or if any hazards of the host employer (client/owner) were identified by the Company during the course and scope of the work.

Procedure

The major objective of process safety management of highly hazardous chemicals is to prevent unwanted releases of hazardous chemicals especially into locations which could expose employees and others to serious hazards. The work of the contractor, within a process facility, must comply with all rules and regulations of the process facility to enable the process facility to achieve this result.

An effective PSM program requires a systematic approach to evaluating the whole process. Using this approach, the process design, process technology, operational and maintenance activities and procedures, nonroutine activities and procedures, emergency preparedness plans and procedures, training programs, and other elements which impact the process are all considered and need to be incorporated into the plan.

The plan developed by the process facility must identify the procedures necessary for the contractor and its employees to follow. The plan must also identify the processes that produce highly hazardous chemicals and identify procedures to follow should there be an accidental release of that product. All employees must be knowledgeable of these procedures before starting work within the process facility.

The plan must also address hazards caused by our work activities that could have any potential safe impact on the client/operator of the process facility.

Responsibility

The project supervisor or the Safety Department must obtain and review the customer safety policies and procedures for each task to be performed at each job location. Where applicable, client area procedures or orders must also be reviewed. The job superintendent addresses specific differences between client and Company procedures.

At a minimum, the Company's project supervisor and Safety Department must review the following procedures of the client/owner of the process facility:

- Lockout/tagout
- Permits
- Confined space entry
- Emergency procedures
- Evacuation routes
- General safety procedures
- PPE
- Respiratory protection
- Hearing conservation
- Any "Highly Hazardous Chemical" exposure control and monitoring
- Hazard communication (GHS)

Training

The client/owner of the process facility might require specific safety training before Company employees perform work at their location. In such cases, the Company's project supervisor or Safety Department ensure that Company employees have completed such training.

The PSM standard specifies contractor safety training requirements. Employees who work at process facility, sites covered by the PSM standard, must complete the following client-related and Company-required PSM safety training before working at the site:

- Customer safety orientation (safety rules)
- Customer hazard communication program (GHS)
- Recognition of hazardous material labels/placards*
- Respiratory protection* (if needed)

- Hearing conservation*
- First responder (awareness) and evacuation procedures*
- Energy isolation (lockout/tagout)*
- PPE selection and use*
- Substance abuse policy
- Back injury prevention*
- Selection and use of fire extinguishers
- Confined space procedures*
- Specific job/task safety procedures
- Employee access to exposure/medical records*

*Included in 24-Hour HazWaste Operations Training when required.

Specialty safety training might be required for some job activities. In such cases, employees are required to complete appropriate training in one or all of the following areas:

- Trench and excavation safety
- Scaffolding safety
- Electrical safety
- Hoisting safety
- Manlifts (baskets)

Where possible, the PSM, specialty safety, and client safety training requirements are provided through local contractor safety councils. The Company conducts required training that is not available from such councils. The Company conducts job and task procedure safety training for applicable job procedures. All training must be documented using appropriate forms. Refer to the “Preproject Safety and Review Meeting” form, “Employee Training Record” form, and “Customer Safety Training Record” form located at the end of this chapter.

Process Training

All employees, working within a process facility, need to understand the safety and health hazards of the chemicals and processes they will be working around for the protection of their protection. Training conducted in compliance with the Company’s Hazard Communication Policy, will help employees to be more knowledgeable about the chemicals they work with as well as familiarize them with reading and understanding a Safety Data Sheet (SDS). However, additional training in subjects such as operating procedures and safety work practices, emergency evacuation and response, safety procedures, routine and nonroutine work authorization activities, and other areas pertinent to process safety and health will need to be covered. This training will be provided along with other programs of the client/owner of the process facility.

The Company, along with the client/owner of the process facility, will periodically evaluate the training program to see if the necessary skills, knowledge, and routines are being properly understood and implemented by their trained employees. The means or methods for evaluating the training should be developed along with the training program goals and objectives. Training program evaluation will help determine the amount of training the employees understood, and whether the desired results were obtained. If, after the evaluation, it appears that the trained employees are not at the expected level of knowledge and skill, then retraining will be required.

Task Evaluation

Each task requiring the use of chemicals will be evaluated to determine the chemical (or combination of chemicals) for performing the task as well as the other materials that may be used near the work.

Reporting of Accidents and Near Misses

All accidents and near misses shall be reported immediately to the client/operator of the process facility.

Nonroutine Work Authorizations

Nonroutine work that is conducted in process areas needs to be controlled by the employer in a consistent manner. The hazards identified must be communicated to those doing the work and to the operating personnel whose work could affect the safety of the process. A work authorization notice or permit must have a procedure that describes the steps that the employee needs to follow to obtain the necessary clearance to get the job started. The work authorization procedures need to reference and coordinate, as applicable, lockout/tagout procedures, line breaking procedures, confined space entry procedures, and hot work authorizations. This procedure also needs to provide clear steps to follow after the job is completed in order to provide closure for those that need to know the job is now completed and equipment can be returned to normal.

Emergency Preparedness

On all projects, within a process facility, an employee roster will be maintained daily. In the event of an emergency evacuation, the roster will be used to verify the presence of each employee and that all employees are accounted for.

The Company must address what actions employees are to take when there is an unwanted release of highly hazardous chemicals. Emergency preparedness must be part of the job pre-planning process before start of the work in any process facility. The Company must coordinate this plan with the client/owner of the process facility. All employees must be knowledgeable about this plan.

The Company and the client/owner of the process facility will need to decide if they want employees to handle and stop small or minor incidental releases related to the work they are performing. The Company and the client/owner will need to decide if they want to mobilize the available resources at the plant and have them applied on a more significant release. The Company will need to decide whether employees are to evacuate the danger area and promptly escape to a preplanned safe zone area, and whether to allow the client/owner of the process facility or local community emergency response organizations to handle the release. The client/owner of the process facility might want to use some combination of these actions.

The Company must at a minimum have an emergency action plan that will facilitate the prompt evacuation of employees when an unwanted release of highly hazardous chemical. The employer will have a plan that will be activated by an alarm system to alert employees when to evacuate. Employees who are physically impaired will have the necessary support and assistance to get them to the safe zone as well. The intent of these requirements is to alert and move employees to a safe zone quickly. Delaying alarms or confusing alarms are to be avoided.

Unwanted incidental releases of highly hazardous chemicals in the process area must be addressed by the Company, in conjunction of the client/owner of the process facility as to what actions employees are to take. If employees are to evacuate the area, then the emergency action plan will be activated. For outdoor processes where wind direction is important for selecting the safe route to a refuge area, the client/owner of the process facility might place a wind direction indicator such as a wind sock or pennant at the highest point that can be seen throughout the process area. Employees can then observe the direction that the wind is blowing and then move in the direction of cross wind to upwind to gain safe access to the refuge area because of knowing the wind direction.

Safe Work Practices

All employees will abide by the proven safe work practices of all process facilities.

Hot Work Permits

No work that involves hazards pertaining to ignition, flames, electricity or other spark causing possibilities will be performed without obtaining permission from the customer/client of the process facility where they are working. The requirements for hot work permit shall be adhered to.

Trade Secret Confidentiality

The client/operator of the process facility shall make all information necessary to comply with this section available to those persons responsible for compiling the process safety information and assisting in the development of the process hazard analysis. Information shall also be available to those responsible for developing the operating procedures and involved in incident/accident investigations, emergency planning, and emergency response. Information shall also be available to persons completing compliance audits without regard to possible trade secret status of such information.

The Company may require the employee to whom the information is made available to enter into confidentiality agreements that prohibit disclosing the information to persons outside the scope of work.

Subject to the rules and procedures set forth by the Occupational Safety and Health Administration, employees and their designated representatives shall have access to trade secret information contained within the process hazard analysis and other documents required to be developed by this standard.

Plan Review

The Company shall re-evaluate the effectiveness of the Emergency Action Plan developed on an annual basis. Employees will receive annual refresher training.

Sample 43-1. Preproject Safety and Review Meeting

Type Company Name Here

Attachment A

Preproject Safety Review & Safety Meeting

Job Location ______________________ Customer ______________________

Date: __________ Job Number __________ Job Task __________

SUPERVISOR: Complete a walk-through of the jobsite at the beginni[illegible] each day or [illegible] Use this form for guidance in identifying existing and potential hazard[illegible] jobsi[illegible] rcle Y for yes [illegible] appropriate. Review the complete form with the [illegible] re b[illegible] ing work for [illegible] Safety concerns expressed by any of th[illegible] w m[illegible] res[illegible] befo[illegible] ginning the [illegible] shift. Have all crew members sign this form

[illegible] qu[illegible] d [illegible] k N[illegible] N/A If Not A[illegible]

1.	Work Per[illegible] eq[illegible]	N	Y		
[illegible]	[illegible] lant Ala[illegible] oun[illegible] Acti[illegible]	N	Y	Describe:	
[illegible]	[illegible] nt E[illegible] s	N	Y	Numbers:	
4.	[illegible] t A[illegible] tion Loc[illegible] ons	N	Y	Locations:	
[illegible]	[illegible] mergency Evacuation Routes	N	Y	Routes:	
6.	Evacuation "Safe-Refuge" Areas	N	Y	Locations:	
7.	Slip/Trip/Fall Hazard	N	Y	Describe:	
8.	Pinch/Cut/Shear/Crush Hazard	N	Y	Describe:	
9.	Excessive Noise Hazard	N	Y	Protection:	
10.	Eye Injury Hazard	N	Y	Type & Protection:	
11.	Pressure Release Hazard	N	Y	Source:	
12.	Dust/Mist/Fume/Gas/Vapor Hazard	N	Y	Type & Protection:	
13.	Temperature Stress Hazard	N	Y	Describe:	
14.	Fire Hazard	N	Y	Describe:	
15.	Fire Extinguisher	N	Y	Location:	

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Preproject Safety and Review Meeting (Continued)

16.	Electrical Hazard	N	Y	Describe:
17.	Overhead Hazard	N	Y	Describe:
18.	Traffic/Moving Vehicle Hazard	N	Y	Describe:
19.	Static Grounding Needed	N	Y	Location:
20.	Barricade/Signs Required	N	Y	Type & Location:
21.	Lockout/Tagout Required	N	Y	Hazard & Location:
	a. Procedure Available	N	Y	Attach Procedure:
22.	Chemical Hazard	N	Y	
	a. Chemical Identified	[illegible]	Y	[illegible]y:
	b. MSDS reviewed	[illegible]	Y	[illegible]on:
	c. Irritant or Corrosiv[illegible] [illegible] Skin	[illegible]	Y	S[illegible]y:
	[illegible]/Fume/[illegible] /Vapor/Oxygen [illegible]rd	[illegible]	[illegible]	S[illegible]y:
	[illegible]plosive/[illegible]tive [illegible] Haz[illegible]	[illegible]	[illegible]	Specify:
	f. Sa[illegible]owe[illegible] Was[illegible]aila[illegible]	N	Y	Location:
2[illegible]	[illegible]ace [illegible]			
	[illegible]mit Required	N	Y	Source:
	b. Procedure Available	N	Y	Attach Procedure:
24.	Job Procedure			
	a. Verbal/Written Job Procedures Required	N	Y	Specify:
	b. Safety Procedures Reviewed	N	Y	Describe:
	c. Special Equipment Required	N	Y	Comment:
	d. Tools/Equipment Inspected	N	Y	Specify:
25.	Protective Equipment Required	N	Y	Describe:
26.	Other Contractors/Workers in Area	N	Y	

Job Leader/Supervisor ____________ **Crew Member** ____________

1. In the blank space to the right of each "N/Y," comment on the reason for each circled yes (Y) on the sheet If more space is needed, use the back of this sheet.
2. Retain this sheet at the jobsite until the job is complete Include this sheet in the Job Package.

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Sample 43-2. Employee Training Record

Company Name

Attachment B

Employee Training Record

Employee Name ____________________ Employee Number ____________________

	Training Date	Employee Initials	Instructor Initials
1. Safety Orientation			
2. Hazard Communication			
3. Respiratory Protection*			
4. Personal Protective Equipment			
5. Hearing Protection [illegible]ervation*			
6. L[illegible]/Tagout			
7. [illegible] Spaces [illegible]es			
8. First Responder [illegible] Awar[illegible])*			
9. [illegible]ety			
10. [illegible]uis[illegible]			
11. Com[illegible] Su[illegible]nce Abu[illegible] Policy			
12. [illegible] Oper[illegible]			
13. [illegible]nching/Excavation Safety			
14. Scaffold Safety			
15. Hoisting/Lift Safety			
16. Hazardous Waste Site Operations*			
17. Other			
18. Job Skill or Task and Safety			
Skill/Task ____________________			
Skill/Task ____________________			
Skill/Task ____________________			

NOTE: Date and initial each block after completion of the training.

*Requires annual refresher training.

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Sample 43-3. Customer Safety Training Record

Type Company Name Here

Attachment C

<u>Customer Safety Training Record</u>

Customer: ____

Employees are required to complete specific training before working in locations containing highly hazardous chemicals.

To ensure compliance, a review of the applicable customer safety procedures has been c... ...ased on the review, customer-specific safety training has been completed by the fo...wing empl... who will be working within the customer location that contains highly hazardous ch...als:

____

____

____

____

C...let... ...stome... ...af... ...rainir	Date Completed
1. ...stomer Safety O...tati	______
2. ...azard... ...on P...am	______
3. ...rmit	______
4. Custom... ...er... ...y Proce...	______
5. ...stom... ...vac... ...n Procedures	______
6. ...Benzene Safety Procedures	______
7. ...omer LO/TO Procedures	______
8. Customer Confined Space Procedures	______
9. Customer Heavy Metal Safety Procedures	______
10. Other Applicable Safety Procedures	______

______________________ ______________________________

Date Representative

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44

Mine Safety

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

General Requirements

These guidelines are intended to communicate to all employees some of the responsibilities and requirements necessary for working in a mine safety and health-regulated environment. In most countries, mine safety is governed by a separate governmental regulatory agency. The differences between the agencies are minor, but they should be known and understood by employees before they begin work in a surface or underground mining atmosphere. Required training and documentation are paramount in mining operations. At times, there is not a clear dividing line between which governmental regulatory agency has jurisdiction over the work activities. The governmental regulatory agency with jurisdiction should be determined before the project begins.

Regulatory Requirements

Training

The Company must develop a training plan specific to the type of mining exposure (surface or underground) in which they will be working. The Company must have instructors qualified to conduct training in a mining environment. Before anyone begins work in a mining environment, employees must complete training consisting of any or all of the following topics:

- Newly employed (experienced or inexperienced) miners
- New task
- Supervisor (surface and/or underground certification)
- Electrical

- Lockout and tagout
- Hazard (should be obtained at each mine site)
- Employees must be task-trained on equipment and tools
- All training must be documented

Injury Reporting

Reportable injuries must be reported according to the requirements of the governmental regulatory agency with jurisdiction over the work.

The Mine Safety and Health Act

The Mine Safety and Health Act (MSHA) in the Unites States and the equivalent regulations in other countries govern the process for addressing violations of mine safety and health policies. Inspectors use this act as the document governing the delivery of citations and orders and reference it to determine types and severity of violations.

Summary

When working in any environment, the Company is committed to the safety and health of each employee. When used correctly, the *Safety, Health, and Environmental Program Manual* provides the detailed information needed to meet that commitment. The *Safety, Health, and Environmental Program Manual* provides the foundation for a safe and healthy mine safety and health regulated workplace.

45

General Safety Issues

Purpose

To identify the guidelines relating to policies and procedures for safety, health, and environmental processes.

Scope

These guidelines apply to all Operating Unit facilities and project sites.

General

This section outlines general safety practices that can be followed when working in specific environments.

Contents

The safety issues covered in this section are:

- Abrasive blasting
- Barricades
- Drinking water, toilets, and washing facilities
- Fire protection
- Floor and wall openings
- Hole protection
- Lifting and material handling
- Office safety
- Off the job safety
- Permits
- Rock drilling, pavement breaking and jackhammer operations

- Signs
- Stairs
- Steel erection
- Storage of materials
- Working on/over water

Abrasive Blasting

Abrasive blasting involves forcefully projecting a steam of abrasive particles onto a surface, usually from compressed air or steam.

Only trained and authorized personnel may operate abrasive blasting equipment. The training program will include classroom instruction, including a discussion of the hazards and possible health effects of abrasive blasting, and practical field operations.

The physical hazards of abrasive blasting include:

- Bouncing media
- High noise levels
- High-pressure dangers
- Reduced visibility
- Possible heat stress
- Respiratory distress
- Lead inhalation
- Inhalation of other paint pigments

Silica sand has been fairly common in abrasive blasting for many years. Inhalation of silica dust can lead to the formation of silicosis in the lungs. Silicosis is characterized by shortness of breath, fever, and bluish skin. Silica dust can also lead to severe fungal infections, which can also be fatal. Doctors may mis-diagnose this condition as edema, pneumonia, or tuberculosis.

Whenever possible, the use of silica sand as a blasting medium will be restricted. Silica sand can only be used with the prior approval of the Corporate Safety Department. Blasting media that can be used include:

- Black Beauty
- Metal shot
- Glass beads
- Plastic pellets
- Carbon dioxide
- Walnut shells
- Orange peels
- Baking soda
- Others as approved by Corporate Safety Department

Containment structures, shield walls, and other protective barriers should be used whenever feasible to protect other workers and the environment from the hazards of the blasting operation.

High-pressure air hoses and blast hoses cause a potential problem during abrasive blasting. Hoses can break or separate from the couplers; couplers can come apart. Whip checks and coupler pins must be used to reduce this exposure.

Cleanup must be performed by following appropriate federal, state, and local laws.

High-pressure blast hoses have the potential to build up static electricity and other potentially explosive mixtures. The problem is more prevalent when certain blast media are used. For this reason, organic abrasives that are combustible are to be used only in automatic systems. When this occurs, the blast nozzle shall be bonded and grounded to prevent the buildup of static charges. Whenever blasting occurs in an indoor facility, the ventilation and exhaust systems shall be in accordance with NFPA guidelines.

Monitoring

The Company will perform periodic monitoring of the abrasive blasting process. The monitoring will determine if airborne dust exposure for employees exceeds the Permissible Exposure Limit (PEL). Should monitoring determine that employees are being exposed to airborne dust above the PEL, more stringent engineering controls will be implemented.

Abrasives and the surface coatings on the materials being blasted are shattered and pulverized during blast operations, and the dust that is formed will contain particles of respirable size which creates additional potential health hazards. The monitoring performed must also evaluate the composition and toxicity of the dust from these sources and shall be considered in making an evaluation of this potential hazard.

PPE Requirements

Observe the following PPE requirements when performing abrasive blasting:

- Wear appropriate personal protective clothing.
- Operators must be equipped with heavy canvas or leather gloves and aprons, or equivalent protection to protect themselves from the impact of abrasives.
- Safety shoes must be worn where there is a hazard of foot injury.
- Equipment for protection of the eyes and face must be supplied to the operator and to other personnel working near abrasive blasting operations when the respirator design does not provide such protection.
- An abrasive blast hood with positive pressure breathing quality air-supplied is required.
- A respiratory protection program shall be established whenever respiratory equipment is used. (See requirements for a respiratory protection program in Chapter 41).
- Do not eat, drink or smoke in an abrasive blasting work area.
- Wear appropriate hearing protection.

Where helpers are used to assist the blaster, and/or other employees are working downwind or in close proximity to a blasting operation, PPE requirements shall be considered and implemented for all in the affected area, if appropriate.

Blast Hoods and Breathing Air

CE type blast hoods and/or helmets are required for abrasive blasting.

At a minimum, breathing air used for blast hoods must meet the following criteria:

- Compressed and liquid oxygen must meet the United States Pharmacopoeia requirements for medical or breathing oxygen.
- Compressed breathing air must meet the requirements for Type 1-Grade D breathing air described in ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1 and must include:
  - Oxygen content of 19.5 to 23.5%
  - Hydrocarbon content of 5 mg/m^3 of air or less
  - Carbon monoxide (CO) content of 10 ppm or less
  - Carbon dioxide (CO_2) content of 1,000 ppm or less
  - Lack of noticeable odor
  - Free of harmful quantities of dust, mists, or noxious gases

Blast Nozzles

Blast nozzles shall be equipped with an operating valve that must be held open manually (deadman control). This deadman must be in operable condition at all times. A support shall be provided on which the nozzle may be mounted when not in use. Employees shall not tape down or otherwise make the deadman control inoperative.

Restricted Work Zones

When abrasive blasting or a similar operation is conducted outside a structure, the process must be restricted to a work zone that is identified by signs or similar means as being a contaminated area.

When abrasive blasting operations are being conducted, only properly protected workers who are necessary to perform the work are permitted inside an enclosure or a restricted work zone.

Equipment

Abrasive blast equipment shall be inspected before use. All fittings and hoses shall be in good condition and tightly attached.

Compressors shall deliver the volume and pressure of air required to perform work effectively and safely. Oil-lubricated compressors shall have an overheat sensor or carbon monoxide sensor if a respirator (other than air-supplied) is used in poorly ventilated areas. A regulator valve shall be used at the compressor, set to manufacturer specifications, to provide adequate air pressure to abrasive blast equipment.

The abrasive blast-cleaning nozzle shall be equipped with an operating valve that must be held open manually.

The air intake shall be remotely located from all vehicle/equipment exhaust systems to ensure harmful emissions are not taken into the work area.

Contamination of inlet air to the compressor can adversely affect purifier performance. The compressor intake shall be located to avoid intake of contaminated air and to ensure air with adequate oxygen content.

Cleanup

Dust and debris shall not be allowed to accumulate in or around a blast enclosure. This area includes floors, ceilings, and ledges around the enclosure. Dust spills must be cleaned immediately. The area must be cleaned at a minimum on a daily basis.

Aisles and walkways shall be kept clear of any abrasive material which may create a slip/trip falling hazard.

The preferred method of clean-up is vacuuming. Vacuums used for cleanup of abrasive dust particles should be equipped with a HEPA filter.

When sweeping is the method used, wetting agents should be used to retard the spread of the dust.

Compressed air shall not be used for cleaning purposes except when the pressure has been reduced to less than 30 psi and then only with effective chip guarding and proper personal protective equipment (PPE).

Barricades

Observe the following safety practices when working with barricades:

- Place barricades around excavations, holes, or openings in floors or roofs, elevated platforms, around certain types of overhead work, and wherever necessary to warn people against falling.
- Ensure that barricades are 42 inches (106.68 cm) high, square, and level.
- Place barricades 6 ft (1.83 m) back from the edge of excavations, holes, platforms, and roofs unless a protective barricade is used.
- Erect barricades before holes are cut and extend the barricades as the excavation progresses.
- Remove barricades when they are no longer needed.
- Effectively barricade numerous excavations in one area by erecting a barricade around the general area.
- Use blinking lights on roadblocks after dark.
- Provide an access opening or gate where practical.

Drinking Water, Toilets, and Washing Facilities

Drinking Water

The following guidelines must be observed regarding drinking water:

- An adequate supply of potable water must be provided at all jobsites.
- Potable drinking water containers must be capable of being closed tightly and be equipped with a tap.
- Drinking water containers must be cleaned daily.
- A common drinking cup is prohibited.
- Unused disposable cups must be kept in sanitary containers, and a receptacle must be provided for used cups.

Toilets

Toilets are provided according to the following requirements:

- 20 or fewer persons—One facility
- 20 or more persons—One toilet seat and one urinal per 40 persons
- 200 or more persons—One toilet seat and one urinal per 50 persons

These requirements do not apply to mobile crews having transportation readily available to nearby toilet facilities. Some states and/or other governmental regulatory agencies may have more stringent requirements.

Washing Facilities

The Company provides adequate washing facilities for employees engaged in operations involving harmful substances. Washing facilities must be in close proximity to the work site and equipped to enable employees to remove all harmful substances.

Fire Protection

General

- Permits are required before lighting an open flame.
- Welding permits are required.

Alarms

All personnel must know the following concerning fire alarms:

- The location of the nearest fire alarm box
- How to turn on an alarm

- The alarm, evacuation, and disaster signals for each work area
- The proper exit route
- The location of the disaster assembly area

Extinguishers

The following guidelines must be observed regarding extinguishers:

- Supervisors must instruct each person about the locations of the nearest fire extinguisher, how it operates, and the type of fire on which it should be used.
- All employees shall receive training on the general principles on the proper use of fire extinguishers and the hazards associated with their use. Training shall be part of the company's new-hire orientation program with annual refresher thereafter.
- All employees should understand the hazards with fire fighting techniques associated with the use of fire extinguishers.
- Fire extinguishers of the proper type and size must be within 30 ft (9.14 m) of each open flame operation.
- Extinguishers must be recharged or replaced promptly after use.
- Extinguishers must be visually inspected on a monthly basis and that inspection documented on the extinguisher.
- Extinguishers must have an annual maintenance inspection and the inspection documented on the extinguisher.

Combustibles

Combustible (burnable) material must be kept away from steam lines, radiators, heaters, and hot process and service lines. All exposed combustible materials below welding and burning areas must be removed to a safe location at least 35 ft (10.67 m) away where possible, covered with a fire-retardant material or protected by containing all sparks and slag in an approved spark catcher. A fire watch must be stationed to observe the area for at least 30 minutes after work has ended.

Smoking

Smoking is not allowed except in designated areas.

Fueling

A piece of equipment must never be refueled while its engine is running or hot. Smoking, sparks, or open flames are prohibited when fueling.

Floor and Wall Openings

Observe the following practices when protecting against hazards associated with wall openings:

- Guard all wall openings from which the drop is more than 4 ft (1.22 m) and where the bottom of the opening is less than 3 ft (0.91 m) above the working surface.

- Provide a standard or intermediate rail when the height and placement of the opening in relation to the working surface is such that one or both rails effectively reduce the danger of falling.

Protect the bottom of a wall opening that is less than 4 inches (10.16 cm) above the working surface with a standard toe board or an enclosing screen.

Hole Protection

Observe the following practices in the use of hole protection:

- Provide properly identified hole covers or barricades for all holes or openings in floors, decking, or walls less than 3 ft (0.91 m) above the floor at all elevations. Never store material or equipment on a hole cover.
- Secure covers so they cannot slip and ensure that they extend adequately beyond the edges of the holes they are covering.
- Use covers fabricated from 3/4-inch (1.91-cm) plywood, provided one dimension of the opening is less than 18 inches (45.72 cm); otherwise, use 2-inch (5.08-cm) lumber for covers.
- Use warning cones or other barricades around hole covers when vehicles or other construction equipment are present.

Lifting and Material Handling

The following sections provide guidelines for lifting and material handling operations.

Mechanical Devices

Using mechanical aids, such as cranes, hoists, elevators, conveyors, and lift trucks, is one solution for preventing injuries while handling materials. Such devices are not always practical or suitable for the work site; however, lifting or carrying injuries can be minimized by substituting mechanical for manual lifting. When mechanical devices are used, injuries to workers from lifting are reduced.

Weight Limits

The physical condition, build, and stature of the individual may affect the person’s ability to lift heavy objects or to work on a repetitive lifting job. Workers with known physical weaknesses should not work on materials handling jobs. How much or how long a person can lift safely depends on the individual and the weight, shape, and size of the material being lifted.

Teamwork

When the load or material is too much for one person to handle safely and the use of mechanical lifting equipment is not practical, as many additional workers as required should be assigned to assist in the job. Select workers of approximately the same size and train them in how to work together as a team to prevent injury. For example, if one worker lifts too soon, shifts the load, or lowers the load improperly, either the worker or a partner can be overloaded and strained. One person on the team should be assigned to give orders (directions or lift commands) to ensure the necessary coordination.

Lifting

By always using proper lifting methods, employees can complete their jobs more easily and without injury.

Proper lifting methods include the following techniques:

1. Pre-plan the lift. Make sure the route is clear and the destination is prepared for receipt of the material.
2. Evaluate the size, weight, and cumbersomeness (bulkiness) of the load. Do not attempt to lift it alone if there is any doubt in your mind about your ability to do so.
3. Make sure that your footing is secure. Ensure a good balance by placing your feet 8 to 12 inches (20.32 to 30.48 cm) apart.
4. Place your feet close to the base of the object to be lifted. This position prevents the back muscles from carrying the entire load.
5. Bend your knees and squat—but do not stoop—keeping the back straight and as nearly vertical as possible. If necessary, spread the knees or lower one knee to get closer to the object.
6. When you have a firm grip on the object, start pushing up with your legs, thereby using your strongest set of muscles. Keep the load close to your body as you lift.
7. Lift the object to the carrying position. To change your direction when in the upright position, do not twist your body. Turn your body by changing foot position.
8. If you deposit the load on a bench or table, place the load on the edge to make the table take part of the load. Then push the load forward with the arms or, if necessary, with part of your body.
9. When putting the load on the floor from a waist-high carrying position, bend the knees and, with a straight back and the load close to the body, lower the load with the arm and leg muscles.

Proper Position for Lifting

Position and technique probably hold equal rank with the other factors of safe lifting. An example of technique, or “tricks of the trade,” can be illustrated by grain workers who, by taking the proper stance and grip, swing heavy sacks of grain up onto their shoulders. Inexperienced persons can barely move the sacks. These skills require training and practice. Taking the proper stance and using the muscles most capable of performing the job are the most important factors in using safe lifting methods.

Summary

- Always carry the load close to the body.
- Keep the back as straight as possible.
- Lift with strong leg muscles and the arms rather than with weaker back muscles.
- Always have a clear vision over the load.
- If the load interferes with normal walking, get help.
- Never be afraid to ask for help in handling a load. Ask for help if you feel the load is too heavy for one person.
- Offer suggestions when you think some type of mechanical equipment will help to complete the job.

- Maintain effective housekeeping—tripping hazards or objects on the floor can cause persons carrying a load to fall and be injured seriously.

Office Safety

General

- Report all safety hazards to your supervisor without delay.
- All injuries, regardless of severity, shall be reported to your supervisor.
- The location of portable fire extinguishers shall be noted by all employees.
- Emergency exits shall be plainly marked and each employee shall be acquainted with these exits.
- Employees should walk slowly and cautiously up and down stairs using the handrail.
- Running in an office shall not be permitted.
- Exercise caution when walking around blind corners. Always keep to the right.
- Do not stand in front of closed doors which may be opened suddenly.
- Employees shall not climb on or jump from chairs, tables, benches, other furniture or equipment. When it is necessary to reach things in high places, a step ladder shall be used.
- Extension or lead cords shall not be stretched across the floor where they will create a tripping hazard.
- Smoking is not allowed except in designated smoking areas.

Indoor Housekeeping

Good housekeeping is one of the first requirements of sound accident prevention. Supervisors shall see that their responsible area is kept clean and orderly at all times. Never allow anything to be placed or stored in aisles, walkways, or on stairways. Washrooms shall be kept neat and clean at all times.

Office Equipment and Furniture

- All exposed moving parts of power driven office machines shall be covered with suitable guards. Operators shall be instructed in safe operation of office machines.
- Loose fitting clothing, neckties, rings, and dangling jewelry may cause serious injury to employees operating or working around power driven machines.
- Always open and close drawers with the handle to avoid pinched fingers or hands.
- Only one file drawer shall be opened at a time unless the file cabinet is properly ballasted or anchored to prevent tipping over.
- File cabinets and desk drawers shall be closed when they are not in use.
- All defective equipment and furniture shall be tagged and reported to the supervisor.
- Desk drawers and file cabinets should be opened slowly.

- Never tilt a straight chair backward onto the two rear legs while you are sitting in it.
- Defective electric cords shall be reported and repaired without delay.
- No employee shall attempt to repair an office machine unless authorized and trained to do so, and then only when the power has been cut off and the machine stopped.

Floors

- Water, oil, or other liquid spilled on floors present a dangerous slipping hazard and shall be cleaned up immediately.
- Loose objects such as matches, pencils, paper, and paper clips shall not be left on stairs or floors as they may cause slipping and bad falls.
- Treated floor surfaces shall be done with a slip-resistant preparation.
- Where runners are used on floors, they shall be checked often to prevent loose strips which may cause a fall.

Sharp and Pointed Objects

- A safety razor blade shall not be used for cutting paper, for sharpening pencils, or for other cutting operations unless it is secured in a holder. When not in use, the blade should be drawn into the holder out of sight.
- Caution shall be exercised when a person uses a paper cutter. The cutting edge shall never be left raised while unsupported. It shall always be closed when not in use.
- Razor blades or other sharp instruments shall not be kept loose in desk drawers.
- Broken glass or other sharp objects shall never be placed in waste baskets with other material.
- Paper cuts on fingers, hands, or lips occur frequently when a person is handling paper or sealing envelopes. Gummed strips or envelopes should be moistened with a suitable device, not with the tongue. Avoid opening envelopes with fingers and sliding hands along edges of paper.

Off the Job Safety

Driving

Each year, approximately 40,000 persons are killed and more than 2,000,000 are injured on our nation's highways. Drive defensively and drive friendly. Obey all traffic laws. Maintain your vehicle in a safe operating condition.

Remember: Always wear your seatbelt. It is the law.

At Home

The following guidelines are recommended to promote safety at home:

- Eliminate hazards that could cause falls and fires.

- Keep medicine, household cleansers, and poisons out of the reach of children.
- Read labels carefully before using new household products, such as drugs, cleansers, insecticides, adhesives, and paints. Many of these products are hazardous if not used as directed.
- Use extreme caution when mowing your lawn or when working with other power equipment. Wear safety glasses, long pants and slip-resistant footwear when mowing.
- Store gasoline only in an approved container.
- Install at least one or more working smoke detectors at home.
- Keep first aid kits, fire extinguishers, gloves, and safety glasses ready for use at home. These items are available for purchase through the Company Safety Department by payroll deduction.
- Install child-proof locks on all doors and cabinets if young children are in the house.
- Install trigger locks on all firearms.

At Play

Boating, water skiing, fishing, hunting, camping, and other forms of recreation all have certain related hazards. Take measures necessary to ensure safety, and your fun time will not turn into a tragedy.

Permits

Some work processes require written, properly authorized, and current permits before work may proceed on a jobsite. These permits may be a requirement of the Company or client or customer. To prevent unnecessary delay, early consultation with the Company Safety Department regarding required permits is desirable. Permits will be posted at a designated spot at the work site, and the instructions provided must be followed.

The following permits might be encountered on a Company jobsite:

- **Cold Work Permit**—Required before any type of work can be performed in any operating plant.
- **Hot Work Permit**—Required where open flames (burning) or spark-producing activity (grinding, welding, and so on) may occur. Motorized vehicles, cranes, hoists, or other equipment involving internal combustion engines are not to be taken into or started in any operating area unless a Hot Work Permit has been issued.
- **Excavation Permit**—Required before any digging, paving, break out, or drilling is performed inside or outside of building areas.
- **Smoking Permit**—Required for areas where smoking is restricted or limited.
- **Confined Space Permit**—Required before entering any vessel or confined space.

Rock Drilling, Pavement Breaking and Jackhammer Operations

Definitions

Hand-Arm Vibration Syndrome—The typical health effects of hand-arm vibration syndrome are episodic numbness, tingling, and blanching of the fingers (sometimes called vibration white fingers), with pain in response to cold exposure, reduction in grip strength and finger dexterity. Advanced cases of hand-arm vibration syndrome can indicate neurological, vascular, and musculoskeletal damage.

Engineering Controls

Obtain equipment that reduces noise levels and has vibration dampening features such as flex handled models. The substitution of mechanized rock drilling equipment for manually operated equipment eliminates or significantly reduces the potential for vibration maladies.

Personal Protective Equipment

Wear face shield, hearing protection, hard hat, safety glasses, safety-toe shoes or work boots and metatarsal guards when operating pavement breakers, jackhammers, or similar equipment. Gloves should also be worn to reduce vibration health effects on the hands and arms.

Administrative Controls

Implement frequent rest breaks or rotation of functions between vibratory and non-vibratory tasks in order to reduce vibration health effects on the hands and arms.

Work Practice Controls

Wetting reduces the levels of airborne dusts which could contain silica. Where feasible, the surface material shall be sprinkled or wetted to reduce fugitive dust emissions from the drilling or pavement breaking process.

Respiratory Protection

Before commencing work, a determination must be made to evaluate the need for respiratory protection. The material involved and the ability or inability to wet the material will assist in determining potential worker exposure and the need for respiratory protection. Questions regarding the potential for worker exposure to silica should be addressed to the Supervisor and/or the Safety Department.

Signs

Before work begins, place legible signs on barricade stands, posts, or other suitable stanchions and remove them promptly upon completion of the work.

Barricade tape may be used in lieu of permanent barricades when approved by jobsite management and the Safety Department, but only when the use is for temporary, short durations.

All signs placed on the roadway/highways must be in compliance with and conform to the rules and regulations of the Manual of Uniform Traffic Control Devices (MUTCD), Federal Highway Administration, and/or the federal/state Department of Transportation (DOT).

All signs used during night work activities must be reflective.

Stairs

The following guidelines must be observed with regard to stairs:

- Every flight of stairs having four or more risers must be equipped with standard stair railing or standard handrails:
    - On stairways less than 44 inches (111.76 cm) wide having one side open, at least one stair railing is required on the open side.
    - On stairways less than 44 inches (111.76 cm) wide having both sides open, one stair railing is required on each side.
    - On stairways more than 44 inches (111.76 cm) wide but less than 88 inches (223.52 cm) wide, one handrail is required on each enclosed side and one stair railing is required on each open side.
- Stairways, ladders, or ramps must be provided on all structures 20 ft (6.10 m) or more in height.
- Riser height and tread width must be uniform throughout any flight of stairs.
- Hollow pan-type stairs must be filled to the level of the nosing with solid material.

Steel Erection

Observe the following guidelines when erecting structures composed of steel:

- Install permanent floors so there are no more than eight stories between the erection floor and the uppermost permanent floor, except when structural integrity is maintained by the design.
- During skeleton steel erection, maintain a tightly planked temporary floor within two floors or 30 ft (9.14 m), whichever is less, below and directly under that portion of each tier of beams on which any work is being performed.
- During skeleton steel erection, where the requirements of the preceding paragraph cannot be met and where scaffolds are not used, install and maintain safety nets whenever the potential fall distance exceeds two stories or 25 ft (7.62 m).
- Install safety railing of 1/2-inch (1.27-cm) wire rope or equivalent around the perimeter of all temporarily floored buildings, approximately 42 inches (106.68 m) above the floor, during structural steel assembly.
- When placing structural members, do not release the load from the hoisting line until the member is secured by at least two bolts or the equivalent, drawn up wrench tight at each connection.

Storage of Materials

The following guidelines must be observed regarding the storage of materials:

- All materials stored in tiers must be secured to prevent sliding, falling, or collapse.

- Aisles and passageways must be kept clear and in good repair.
- Storage of materials must not obstruct exits.
- Materials must be stored according to their fire characteristics.
- Weeds and grass in outside storage areas must be trimmed and watered regularly.
- Avoid storage of material under or near overhead power lines.

Working On/Over Water

Observe the following safe practices when employees are exposed to a water hazard:

- When employees are engaged in work activities on/over water, the employees are required to wear a U.S. Coast Guard approved personal flotation device (PFD).
- When employees are being transported over water in boats and/or barges to their work location, the employees are required to wear a U.S. Coast Guard approved PFD.
- When employees are engaged in work activities close enough to water that the hazard of drowning exists, the employees are required to wear a U.S. Coast Guard approved PFD.
- Before and after each use, PFDs should be inspected for defects that would alter their strength or buoyancy. Defective units should not be used.
- Ring buoys with at least 90 ft (27.43 m) of line should be provided and readily available for emergency rescue operations. The distance between ring buoys should not exceed 200 ft (60.96 m).
- Warning signs should be posted at the entrance to the work area to provide notification about the requirement: ***PFDs Required Beyond This Point.***
- At least one lifesaving skiff should be immediately available at locations where employees are working over or adjacent to water.
- When employees are being transported over water to their work location, employees should remain seated in the boat at all times.
- Make sure that a means of communication is established between the work barge and/or boat and a land base. Alternative means of communication such as air horns and/or flairs can be acceptable under certain conditions.
- Provide adequate number of fire extinguishers and/or other suitable means of fire protection on the boat and/or barge.
- A stokes basket (or other acceptable stretcher) should be available when employees are working from a barge platform. The basket should have means for lifting injured employees on/off the barge to a land base. Items to include are the following:
    - Permanent bridle with lifting chains (capable of lifting 1000 lbs)
    - Blanket or other suitable covering
    - Patient restraints

<u>Work Practice Controls</u>

- Keep all walking and working surfaces clean, dry, and unobstructed.

- Keep all areas free of debris.
- Clean up and/or report any spill immediately.
- Stack materials in a stable manner.
- Secure gear and equipment when not in use.
- Secure ramps during loading/unloading operations.
- When possible, coat the deck surface with a non-skid material.

Other Personal Protective Equipment (PPE) Considerations

- Wear safety shoes or boots with slip-resistant soles as appropriate.
- Keep shoes clean of mud, snow, ice spilled liquids, and debris.

Remember: Hard hat and safety glasses are always required. Other PPE is required when necessary. For questions regarding other PPE requirements, see Chapter 25.

Preventing Falls

- Always maintain three (3) points of contact when stepping on/off a barge or boat.
- Avoid overextending the body for additional reach.
- Walk at a normal rate and keep your hands out of your pockets.
- Slow down when moving between two (2) elevations.
- Avoid sharp turns.
- Do NOT jump to/from the dock when getting on/off a boat or barge.
- Do NOT jump to/from the shoreline when getting on/off a boat or barge.
- Avoid stepping on hatch covers.
- Avoid walking on an unguarded side of a work barge.
- Use extreme care when visibility is reduced.

Appendix A

Best Practices

The Company participates in an OSHA partnership comprised of electrical transmission and distribution construction contractors, trade associations, unions, and government representatives.

A "best practice" is a process or method that, in the judgment of the Partnership members, incorporates the soundest methods for reducing the frequency of incidents and ensuring employee safety.

This appendix contains best practices that have been developed, and will continue to be developed, for safe work practices in the industry.

Index of Best Practices

1. Administrative Controls
2. Job Briefings
3. Pre-Use Inspection of Rubber Protective Equipment
4. Qualified Observer
5. Insulate & Isolate Safety Performance Check
6. Cradle-to-Cradle Use of Insulating Rubber Gloves and Sleeves
7. Lock-to-Lock Use of Insulating Rubber Gloves and Sleeves
8. Rubber Insulating PPE for the Live Line Tool Method on Distribution Lines
9. Safety at Heights - Wood Poles
10. Safety at Heights - Lattice Structures

BEST PRACTICE #1

SUBJECT: ADMINISTRATIVE CONTROLS

PRACTICE STATEMENT: Injuries to personnel from improper job planning and risk assessment.

PRACTICE DESCRIPTION: Identify type and quantity of Insulate and Isolate components

A. Pre-planning to begin at the pre-bid meeting

B. Preliminary job site analysis

C. Contractor shall request information from the Host Employer so that the Contractor may be able to conduct adequate risk assessments prior to beginning operations.

D. Line work on conductors or equipment shall be performed when they are de-energized or a portion is de-energized and grounded when possible.

BENEFITS:

Eliminate injuries resulting from improper planning by ensuring key job hazards are identified and controlled and provide support to contractors in obtaining needed information for effective risk assessments.

REFERENCES:

National Electric Safety Code (NESC, ANSI C2 – Part 4)

Approved August 2006

BEST PRACTICE #2

SUBJECT: JOB BRIEFINGS

PRACTICE STATEMENT: Provides a uniform methodology and outlines key components of job briefings.

PRACTICE DESCRIPTION: Document job sequence, hazards to be encountered, and steps taken to control or eliminate hazards by doing the following:

A. Define task

B. Identify roles and responsibilities

C. Identify hazards

D. Determine risk mitigation

E. Documentation shall include I & I to be used

F. Personal Protective Equipment to be used

G. Emergency response information

H. Number of briefings to be held

NOTE: Job briefings need to be conduct when work changes significantly.

All crewmembers shall participate in a documented job briefing. Job briefings are to be held at the start of the work shift, as work tasks or hazards differ from original briefing, and as additional personnel arrive at the job site. These job briefings shall include the components of a hazard analysis, or use you can use your company-specific hazard analysis program associated with the work steps, hazards associated with the work step, and ways to eliminate or control the hazards. The job briefing form shall have a provision for each employee to sign to verify they have participated in the job briefing. Each ET&D Partnership company's management shall establish a review process to ensure that the documented job briefing process is effective.

BENEFITS:

- Provides essential job safety planning guidelines and lists key elements.
- Enhances compliance with OSHA regulatory requirements.
- Incorporates use of a specific hazards identification process in the job planning process that will provide enhanced controls for risks.
- Proper pre-planning reduces the risk of injury.
- The process and required documentation enhances inclusion and participation of job team members in the safety planning processes associated with the job.

REFERENCES: National Electric Safety Code (NESC, ANSI C2 – Part 4)

Approved August 2006

Frequently Asked Questions

Job Briefings

1. Do I have to document a job briefing when the tasks are repetitive?
   - Yes, all job briefings shall be documented. The job briefing form shall have a provision for each employee to sign to verify that they understand the job briefing. If, during the course of performing the planned task, conditions change that will affect the safety of the personnel, a new job briefing shall be conducted and documented (original document may be amended to reflect content of the new job briefing).
2. Do I need to do separate job briefings for repetitive tasks?
   - Yes, a job briefing shall be held each day at the beginning of each shift. If, during the course of performing the task, conditions change that will affect the safety of personnel, a new job briefing shall be conducted and documented.
3. Must I sign the job briefing?
   - Yes, to verify presence and understanding of the job briefing. When individuals sign the job briefing, they are acknowledging an understanding of the pertinent information covered during the job briefing.
4. Must the foreman lead the job briefing?
   - The supervisor is always in control of job briefings; however, participation by everyone is encouraged.
5. Can the form be "passed around" and everyone just look at it?
   - No. Verbal communication must take place—speaking and listening.
6. Where should the job briefing be conducted?
   - A pre-job discussion shall be conducted at the "show up." The task-specific job briefing shall be conducted at the location where the task is going to be performed.
7. Must I do a job briefing if I'm working alone, and shall it be documented?
   - Yes, to insure that hazards have been properly identified and that the countermeasures will be effective. This job briefing shall also be documented.
8. What should be done if someone who was not at the job briefing shows up, such as an engineer, new crew member, property owner, or OSHA?
   - Communicate with crew the necessary steps they must take to maintain personnel safety. Brief the new arrival as necessary with regard to the job briefing. Request the new arrival's signature, indicating their presence and understanding of the hazards and countermeasures.
9. Where should the job briefings be kept?
   - A current job briefing shall be kept with the crew at the jobsite.
10. Do I need to do a Job Hazard Analysis (JHA) for every job?
    - Yes. Job briefings shall include the components of a JHA, or use your company-specific hazard analysis program associated with the work steps, hazards associated with the work step, and ways to eliminate or control the hazards. The JHA may be included with the job briefing document, or the JHA may be a separate document.

January 2007

BEST PRACTICE #3

SUBJECT: PRE-USE INSPECTION OF RUBBER PROTECTIVE EQUIPMENT

PRACTICE STATEMENT: Protocols related to the effective inspection of insulating protective equipment.

PRACTICE DESCRIPTION: All rubber protective equipment shall be inspected prior to each use. All rubber/plastic insulating equipment shall be inspected for any damage, wear or contamination that would compromise its ability to insulate or isolate the linemen from different potentials. Applicable service dates shall be observed. If upon inspection insulating protective equipment is found to be defective the equipment shall be identified and removed from service.

BENEFITS:

Provides for uniform inspection guidelines that can be applied industry wide

REFERENCES:

ASTM F478 – 1999 Standard Specification for In-Service Care of Insulating Line Hose and Covers
ASTM F479 – 2001 Standard Specification for In-Service Care of Insulating Blankets
ASTM F496 – 2002 Standard Specification for In-Service Care of Insulating Gloves and Sleeves
ASTM F1236 – 2001 Standard Guide for Visual Inspection of Electrical Protective Rubber Products
National Electric Safety Code (NESC, ANSI C2 – Part 4)

Approved August 2006

Frequently Asked Questions

Pre-Use Inspection of Rubber Goods

1. Who does this inspection?
   - A qualified crew member shall perform a pre-use inspection prior to each time insulating rubber goods are used.
2. Why are there two dates on insulating rubber goods?
   - One is the test date. Where applicable, there will also be an issue date.
3. Which date should I use?
   - This depends on the contractor and state that you are working in. If you are not sure, ask your supervisor.

January 2007

BEST PRACTICE #4

SUBJECT: QUALIFIED OBSERVER

PRACTICE STATEMENT: Identify and utilize qualified observer for critical tasks.

PRACTICE DESCRIPTION: A member of the crew shall be identified to act as an observer to ensure clearances are maintained, PPE is used, and effective cover-up is installed. The observer shall be capable of identifying nominal voltages, energized components, minimum approach distances, and proper safe work practices while crewmembers are working on energized lines.

NOTE: This section is not intended to mandate staffing requirements.

A. The term “effective cover up” is used to describe the installation of phase-to-phase rated insulating protective cover on energized conductors or equipment of different potentials when the lineman is within reaching distance or in areas extended by handling conductive objects.

B. The term “extended reach” is used to describe being within five feet of energized conductors or equipment or having a conductive object within five feet of energized conductors and/or equipment.

BENEFITS:

- Eliminate injuries from unrecognized hazards or changes in conditions.
- Clarify duties and provides guidance as to when observers are beneficial.
- Provide guidance on observer qualifications.

Approved August 2006

Frequently Asked Questions

Qualified Observer

1. What qualifications does the qualified observer need?

    - The observer shall be capable of identifying nominal voltages, energized components, minimum approach distances, and proper safe work practices while crew members are working on energized lines, give warning, and are able to initiate the emergency action plan.

2. Is a qualified observer needed for every task?

    - No, only during critical tasks as defined in the job briefing process.

3. Who may be a qualified observer?

    - Anyone crew member who meets the criteria of a qualified observer.

4. While personnel are performing critical tasks that would require a qualified observer, can the wualified observer have other duties?

    - No. While performing the functions of a qualified observer, the qualified observer shall not perform other tasks.

January 2007

BEST PRACTICE #5

SUBJECT: INSULATE & ISOLATE SAFETY PERFORMANCE CHECK

PRACTICE STATEMENT: Review of qualification and performance criteria to ensure compliance with Isolate and Insulate procedures.

PRACTICE DESCRIPTION: A safety review process shall be in place that will be performed by a competent person. Included in the review process will be assurances that the company safety rules and proper cover up procedures are being followed. Additionally, documentation such as job briefing forms and job safety analysis forms shall be reviewed.

BENEFITS:

- Routine auditing provides for performance and regulatory assurance for critical control techniques
- Effective auditing enables enhanced and consistent performance

Approved August 2006

Frequently Asked Questions

Insulate and Isolate Performance Check

1. Who can be a “competent person”?

    - A person designated by the employer who has the ability -- by reason of training or experience -- to identify existing and predictable hazards in the workplace and has the authority to take quick, prompt, and effective action.

January 2007

BEST PRACTICE #6

SUBJECT: CRADLE-TO-CRADLE USE OF INSULATING RUBBER GLOVES AND SLEEVES

PRACTICE STATEMENT: Protocols related to effective use of insulating rubber gloves and sleeves.

PRACTICE DESCRIPTION:

1. When employees are working on energized circuits or equipment using the rubber glove method, rubber protective-insulating gloves and sleeves rated for the exposure of the highest nominal voltage shall be worn cradle-to-cradle when working from an aerial platform.

    a. Rubber protective insulating sleeves are not required when employees are working circuits with a potential of 600 volts or less if there is no upper arm exposure and the worker will not encroach the 5-foot primary zone.

    b. The term “effective cover up” is used to describe the installation of phase-to-phase rated insulating protective cover on energized conductors and/or equipment of different potentials when the lineman is within reaching distance or in areas extended by handling conductive objects.

    c. The term “extended reach” is used to describe being within five feet of energized conductors or equipment or having a conductive object within five feet of energized conductors and/or equipment.

2. Electrical class rating of the insulating rubber sleeves shall meet or exceed the electrical class rating of the insulating rubber gloves when working on primary conductors.

BENEFITS:

- Provides specific use requirements that are proven methods for reducing electrical contact injuries and fatalities.
- Provides for uniform use guidelines that can be applied industry wide.

Approved August 2006

Frequently Asked Questions

Cradle-to-Cradle Gloves & Sleeves

1. Can I swing the bucket out of the energized zone and remove gloves and sleeves to smoke, dip, etc.?
    - The bucket must be repositioned to the cradle or lowered to its lowest possible elevation before gloves and sleeves may be removed.
2. Are there examples when gloves and sleeves are required when working in a bucket (cradle-to-cradle)? When can I remove rubber gloves and sleeves while in the bucket?
    - When the bucket has been repositioned to the cradle or lowered to its lowest possible elevation.
    - When the circuit has been de-energized, grounded, and an EPZ has been established.
    - Refer to company policies for specific work procedures.
3. When ascending to perform work on a transmission line with energized under build, do I need gloves and sleeves while moving past the energized under build?
    - No, as long as the five (5)-foot primary zone is not encroached.

January 2007

BEST PRACTICE #7

SUBJECT: LOCK-TO-LOCK USE OF INSULATING RUBBER GLOVES AND SLEEVES

PRACTICE STATEMENT: Protocols related to effective use of insulating rubber gloves and sleeves.

PRACTICE DESCRIPTION:

1. When employees are working on energized circuits or equipment using the rubber glove method, rubber protective-insulating gloves and sleeves rated for the exposure of the highest nominal voltage shall be worn "lock-to-lock" when employees are working energized URD equipment.

   The term "lock-to-lock" is used to describe the use of rubber gloves and sleeves, when required, prior to the time the pad mounted equipment is unlocked until work is complete and the pad mounted equipment is relocked. Additionally, rubber gloves and sleeves shall be worn when working on or within the extended reach of the conductor or piece of equipment. The term "extended reach" is used to describe being within five feet of energized conductors or equipment or having a conductive object within five feet of energized conductors and/or equipment.

2. Electrical class rating of the insulating rubber sleeves shall meet or exceed the electrical class rating of the insulating rubber gloves.

3. When the above conditions cannot be met, alternative work methods ensuring worker safety shall be identified, communicated to all affected workers, implemented, and documented as part of the job briefing process.

BENEFITS:

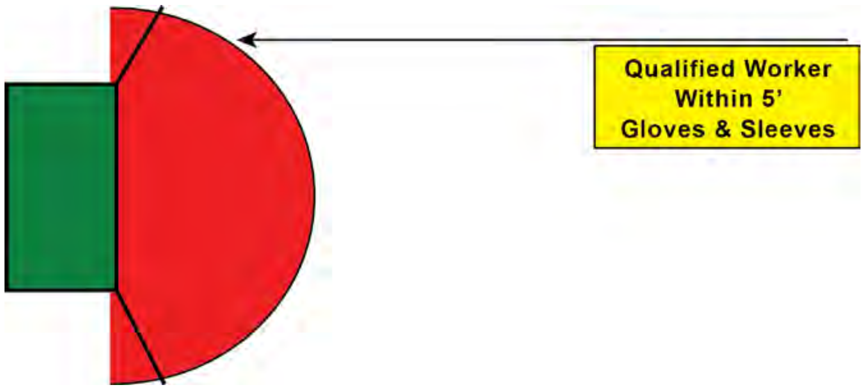
- Provides specific use requirements that are proven methods for reducing electrical contact injuries and fatalities.
- Provides for uniform use guidelines that can be applied industry wide.

Approved August 2006

Frequently Asked Questions

Lock-to-Lock

1. If I'm walking past the back of a open pad mounted transformer, do I need rubber insulating gloves and sleeves?
   - No, there is no exposure as long as the employee does not touch the cabinet.



2. Can insulating rubber gloves and sleeves be removed when terminating primary cable?
   - After secondary bushings and primary terminations have been effectively covered, the cable being terminated has been tested and grounded, and the cable has been pulled beyond the face of the transformer, rubber gloves and sleeves may be removed.
3. Can I pull elbows by hand if I wear insulating rubber gloves and sleeves?
   - No. Fiberglass work sticks of six foot length (minimum) shall be used for switching in URD pad mount transformers.
4. Do I need to wear rubber gloves and sleeves to unlock and open the pad mount equipment when work to be performed is to be done with live line tools?
   - Yes. Rubber gloves and sleeves shall be worn when unlocking, opening, and closing the pad mount equipment regardless of the work practice to be conducted.

January 2007

BEST PRACTICE #8

SUBJECT: Rubber Insulating PPE for the Live Line Tool Method on Distribution Lines

PRACTICE STATEMENT: Use of rubber insulating gloves and sleeves while performing distribution power line tasks via the live line tool method.

PRACTICE DESCRIPTION:

When working primary voltages aloft:

For the purpose of this document, M.A.D. is defined as the Minimum Approach Distance defined by applicable Federal, State, or Local regulation. M.A.D. may also be known as "Primary Contact Zone," "Minimum Working Distance," "Within Reach," "Extended Reach," and so on.

This best practice only applies to those applications where power line workers are using the "live line tool work method," also known as "hot sticking." Workers using the live line tool work method ("hot sticking") use insulating tools designed and intended for use while working on energized equipment or conductors. Workers using the live line tool work method are not permitted to make direct contact with energized equipment or conductors with their hands and are not permitted to be in a position where the worker can reach into, extend any conductive object into, or extend any other part of the body into the M.A.D. as prescribed in applicable Federal, State, and Local Regulatory Standards.

It is not intended nor required that the Strategic Partnership *Cradle-to-Cradle Rubber Glove Work Method* best practice be applicable when power line workers are using the live line tool work method. The *Cradle-to-Cradle Rubber Glove Work Method* best practice applies only when work is to be done using the rubber glove work method. When a task requires the worker to reach into, extend any conductive object into, or extend any other part of the body into M.A.D. while using the live line tool work method, the use of rubber insulating gloves or rubber insulating gloves and sleeves rated for the voltage are required to be used as described in this best practice.

Donning of such PPE shall be done in a safe location so that M.A.D. requirements are not violated. This may include repositioning of the aerial lift to its cradled position. It should be noted, however, that incident investigations have revealed M.A.D. violations have occurred during live line tool work method operations. The intent of this best practice is to eliminate both M.A.D. encroachment violations and subsequent injuries.

Live Line Tool Method

1. Rubber insulating gloves and sleeves are not required when working from a position where the worker cannot reach into, extend any conductive object into, or extend any other part of the body into the M.A.D. while using fiberglass insulating live line tools ("hot stick" method).

2. Before getting into a position where the worker can reach into, extend any conductive object into, or extend any other part of the body into the M.A.D., approved protective equipment shall be used to insulate and isolate energized conductors or parts.

3. Rubber insulating gloves shall be worn when tasks require the worker to reach into, extend any conductive object into, or extend any other part of the body into the M.A.D. when there is no upper arm exposure, even when proper cover is used.

4. Rubber insulating gloves and sleeves shall be worn when tasks require the worker be in a position where the worker can reach into, extend any conductive object into, or extend any other part of the body into the M.A.D. when all the above precautions have been taken and upper arm exposure still exists.

BENEFITS:

- Provides specific use requirements that are proven methods for reducing electrical contact injuries and fatalities.
- Provides for uniform use guidelines that can be applied industry wide.

Approved June 3, 2008
Effective Date: December 31, 2008

Frequently Asked Questions

Rubber Insulated PPE and the Live Line Tool Method

1. When operating GOAB switches from the ground, do I need gloves and sleeves?

    - No, only rubber insulating gloves are required.

2. What is “upper arm” exposure?

    - When working within reach or extended reach of the M.A.D. of energized conductors or parts, the area on the arms not protected by rubber insulating gloves that would be covered by rubber insulating sleeves.

3. I’m wearing rubber insulating gloves and the conductor is covered. Do I need rubber insulating sleeves?

    - No, if there is no upper arm exposure. Yes, if upper arm exposure exists. Rubber insulating gloves and sleeves shall be worn when tasks require the worker to enter the M.A.D. and there is the potential of upper arm exposure regardless of the whether the conductors and equipment are covered. Covering of conductors and equipment add an additional barrier or safeguard but is not considered the primary form of protection for the worker.

4. I am performing “hot stick” work and need to encroach M.A.D. and perform a task by hand. What position do I need to be in to don my rubber insulating gloves or gloves and sleeves?

    - Performing “hot stick” work does not require the use of rubber insulating gloves or gloves and sleeves. If, during this operation, a task requires the worker to enter into the M.A.D., rubber insulating gloves or gloves and sleeves shall be donned prior to encroaching the applicable M.A.D. The worker shall maintain or move to a safe position so as not to encroach M.A.D. during the donning of the PPE.

June 3, 2008

Frequently Asked Questions

Rubber Insulated PPE and the Live Line Tool Method

General Use of Insulating Rubber Gloves and Sleeves

NOTE: Although rubber insulating gloves and sleeves are not normally required when using the "hot sticking" work method, the following details are provided for informational purposes only.

1. Insulating Rubber gloves shall never be worn inside out or without leather protectors. They shall be exchanged at any time they become damaged or the employee to whom they are assigned becomes suspicious of their condition.
2. Leather protectors or over gloves shall not be worn except over insulating rubber gloves.
3. Insulating rubber gloves and sleeves rated at the highest nominal anticipated voltage shall be worn at any time they are required by supervision.
4. Dielectric testing dates of insulating rubber gloves and sleeves shall be current.
5. Insulating rubber gloves and sleeves shall be visually inspected and gloves shall be air tested before each use.

June 3, 2008

BEST PRACTICE #9

SUBJECT: SAFETY AT HEIGHTS - WOOD POLES

INTRODUCTION:

The Partnership is committed to the practice of Safety at Heights wherever the potential exists for personnel falling from heights. A series of Best Practices will be developed that will address fall hazards associated with the Electric Transmission and Distribution industry. Best Practices will address fall hazards associated with, but not limited to, aerial tasks performed while working on wood/steel poles, metal/lattice structures, transformers, vehicles, and associated equipment. The Best Practices will use fall protection hierarchy of fall hazard elimination or control of the fall hazard. The following shall be considered in designing a fall protection solution: elimination or substitution, passive fall protection, fall restraint, fall arrest, and administrative controls. First consideration shall be given to the elimination of fall hazards. Where elimination of the fall hazard is not practical, effective control of the fall hazard shall be used at all times.

SUBJECT: FALL PROTECTION WHEN PERFORMING AERIAL WORK ON WOOD POLES

PRACTICE STATEMENT: Fall Protection Equipment (FPE) shall be used when ascending, descending, changing position, and when in the working position while on a wood pole.

PRACTICE DESCRIPTION: Wood Pole Fall Restriction Device shall be "engaged" ground-to-ground when ascending, descending, changing position, and when in the working position.

- When in the working position, Work Positioning Equipment may be used when rigged such that an employee cannot fall more than two feet.
- When climbing wood poles that have pole steps or other obstructions, the hitchhike climbing method, utilizing the Work Positioning Equipment, may be used to ascend or descend when rigged such that an employee cannot fall more than two feet.
- Wood pole climbers shall be trained and competent in the care, use, and inspection of components used to conform to this Best Practice. Employers should obtain comprehensive training from the manufacturer as to the equipment's proper use (to include "train the trainer"). Employees must be trained in the selection and safe use of the equipment/system. This should include the following: application limits; techniques used for proper adjusting of the equipment, methods of use, inspection, storage of the device, and a demonstration of competency of device usage. Training shall only be conducted by qualified trainers. Refresher training shall be provided that will maintain the employee's competency in the use of required equipment.
- Prior to climbing any wood pole, an inspection of the pole shall be conducted. All components of the Fall Protection Equipment shall be inspected by the climber (per manufacturers' specifications) to ensure the device is fit for use.

- This Best Practice applies to all climbers including those who perform pole top rescue on wood poles. Rescue application should be pre-determined (as early as possible but no later than during the pre-job briefing) based on rescue needs such as timeliness and consideration given to the characteristics of the structure the rescue is being performed on. Employers shall address rescue considerations and develop appropriate procedures that will allow successful performance of a given rescue technique for varied field conditions. Climbers shall be qualified in the methods identified to be used for rescue.
- Company policies shall apply when the conditions of this Best Practice cannot be met. Alternative work methods ensuring worker safety shall be identified, communicated to all affected workers, implemented, and documented as part of the job briefing process.

BENEFITS:

To eliminate injuries and fatalities associated with falls from wood poles.

REFERENCE:

ANSI Z359 - 2007
CSA Z259.14-01
29 CFR 1926.500 - 503
The Texas A&M University System;
Texas Engineering Extension Service; Engineering, Utilities and Public Works Training Institute
Best practices utilized by OSP members for climbing wood poles.
IEEE 1307–IEEE Standard for Fall Protection for Utility Work

DEFINITIONS AND CONSIDERATIONS:

- **Fall Protection Equipment (FPE)—**Any equipment, device or system that prevents an accidental fall from elevations or that mitigates the effect of such fall.
- **Wood Pole Fall Restriction Device—**A device that, when properly adjusted and combined with other subcomponents and elements, allows the climber to remain at his or her work position with both hands free and that performs a fall restriction function if the climber loses contact between his or her gaffs and the pole.
- **Work Positioning Equipment (WPE)—**Equipment used to support a worker on the pole so that the worker's hands are free when he or she reaches the work position. A pole strap, a lineman's body belt, and a lineman's harness and hooks/gaffs constitute Work Positioning Equipment.

Safety at Heights - Wood Poles
Executive Committee approved date: September 22, 2010
Effective date: March 31, 2011

Frequently Asked Questions

Safety at Heights - Wood Poles

1. What are examples of suitable Wood Pole Fall Restricting Devices used while climbing wood poles?
   - Buckingham Bucksqueeze, Miller Stop Fall, Jelco Pole Choker, Scepter Pole Shark, Bashlin Pole Lariat, etc. These and other devices are commercially available today. Other devices may become available.
2. Will using two skids (pole straps) satisfy this best practice?
   - No. One device must be approved Fall Restricting Equipment (for example, Buckingham Bucksqueeze, Miller Stop Fall, Jelco Pole Choker, Scepter Pole Shark, Bashlin Pole Lariat, etc.).
3. How do I pass over an obstruction on the pole?
   - The Work Positioning Equipment (WPE) shall be installed over an obstruction when ascending, prior to disengaging the Wood Pole Fall Restricting Device.
4. What does "engaged" mean?
   - Engaged is defined as Wood Pole Fall Restricting Device being properly mounted on the wood pole and used per manufacturer's instructions at all times while the climber is ascending, descending, changing position, and when in the working position while on a wood pole.
5. In the Practice Description, what is meant by "unless Work Positioning Equipment is rigged such that an employee cannot fall more than two feet"?
   - Work Positioning Equipment shall be installed over an obstruction on the pole (telephone attachment, steps, arms, braces, etc.). The distance between the work positioning equipment and the obstruction shall be kept to a minimum so that it will not permit a worker to fall more than two feet.
6. What is meant by inspection?
   - All poles shall be carefully inspected before climbing to ensure they are in safe condition for climbing.
     a. Examples of equipment inspection include but are not limited to:
        - Manufacturers' user instructions
        - Checking of tool holders and loops, snaps, stitching, straps, D-rings, and buckles for excessive wear or damage.
        - Identifying proper fit and condition of the fall protection equipment.
7. Should fall protection be included in the pre-job briefing?
   - Yes, fall protection should be planned and discussed, including appropriate rescue methods that apply to the conditions presented in the field. (Visually determine the climbing route, identify all potential hazards, and determine the control measures to be used).
8. Is Fall Protection Equipment required when transitioning from the pole to another device (for example, baker board, ladder, and so on)?
   - Yes. Fall Protection Equipment shall be continuous by design (100% fall protection is maintained) for the purpose of transitioning.

9. Is a fall restriction device required during a pole top rescue?

    - Yes, unless existing field conditions exist that would impact the timeliness (or other critical criteria) of the rescue in such a way that use of the device would make the rescue procedure ineffective. If an alternate method (due to field conditions) is to be used, it must be discussed and documented and assurances made that rescue personnel are qualified to perform the rescue technique defined in the daily pre-job briefing.

Safety at Heights - Wood Poles
Executive Committee approved date: September 22, 2010
Effective date: March 31, 2011

BEST PRACTICE #10

SUBJECT: SAFETY AT HEIGHTS - LATTICE STRUCTURES

INTRODUCTION:

The Partnership is committed to the practice of Safety at Heights wherever the potential exists for personnel falling from heights. A series of Best Practices will be developed that will address fall hazards associated with the Electric Transmission and Distribution industry. Best Practices will address fall hazards associated with, but not limited to, aerial tasks performed while working on wood/steel poles, metal/lattice structures, transformers, vehicles, and associated equipment. The Best Practices will use fall protection hierarchy of fall hazard elimination or control of the fall hazard. The following shall be considered in designing a fall protection solution: elimination or substitution, passive fall protection, fall restraint, fall arrest, and administrative controls. First consideration shall be given to the elimination of fall hazards. Where elimination of the fall hazard is not practical, effective control of the fall hazard shall be used at all times.

SUBJECT: FALL PROTECTION WHEN PERFORMING AERIAL WORK ON LATTICE STRUCTURES

PRACTICE STATEMENT: Fall Protection Equipment (FPE) shall be used when ascending, while in the work position, when changing positions, descending, or performing rescue operations while on a lattice structure.

PRACTICE DESCRIPTION: Fall hazards associated with aerial work performed on lattice structures shall be assessed and fall hazard mitigation plans developed.

- Climbers shall be competent in the application of all necessary fall protection methods used for the fall hazard mitigation of the tasks that will be performed on a given lattice structure.
- A Fall Hazard Analysis (FHA) shall be completed. As a function of the planning/job site analysis, the following information should be obtained and included with the FHA:
    - Identify tasks to be performed on given lattice structures.
    - Document client/owner fall protection policies, procedures, and hazard analysis as applicable.
    - Identify suitable anchorage points that are going to be used for the task to be performed on any given lattice structure.
    - Employers shall address rescue considerations and develop appropriate procedures that will allow successful performance of a given rescue technique for varied field conditions.
    - Determine/identify necessary FPE or Work Positioning Equipment (WPE).
    - Determine climber qualification in the use of FPE or WPE.
- FPE/WPE shall be inspected and used in accordance with the manufacturer's instructions and guidelines.

- Company policies shall apply when the conditions of this best practice cannot be met. Alternative work methods ensuring climber safety shall be identified, communicated to all affected climbers, implemented, and documented as part of the job briefing process.
- Lattice structure climbers shall be trained and competent in the care, use, and inspection of the equipment used to conform to this best practice. Climbers must be trained in the selection and safe use of the equipment and system. Training shall only be conducted by qualified trainers.
- This best practice applies to all climbers, including those who perform rescue on lattice structures. Rescue applications should be predetermined as early as possible but no later than during the pre-job briefing, based on rescue needs such as timeliness and consideration given to the characteristics of the structure that rescue is being performed on.

BENEFITS: To eliminate injuries and fatalities associated with falls from lattice structures.

REFERENCES:

ANSI Z359.2 – 2007
CSA Z259.14-01
29 CFR 1910.66 App C
BLM 1292-1
Best practices used by OSP members for lattice structures
IEEE 1307 – IEEE Standard for Fall Protection for Utility Work
Example FHA attached

DEFINITIONS AND CONSIDERATIONS:

- **Anchorage—**A secure point of attachment on the lattice structure to which the fall protection system is connected.
- **Fall Hazard Analysis (FHA)—**Analysis conducted to identify the integrity of the structure. Identify the fall hazards based on the type of structure and tasks to be performed on a given structure, as well as equipment and procedures necessary to control the fall hazards.
- **Fall Protection Equipment (FPE)—**Any equipment, device, or system that prevents accidental falls from elevations or that mitigates the effect of such a fall.
- **Personal Fall Arrest System (PFAS)—**A system used to arrest a fall from a working level. It consists of an anchorage point, connectors, body harness, and may include a lanyard, deceleration device, lifeline, or a suitable combination of these.
- **Work Positioning Equipment (WPE)—**Equipment used to support a climber on the lattice structure so that the climber's hands are free when he or she reaches the work position. A safety strap (skid), a lineman's body belt, and a lineman's harness constitute WPE.

Safety at Heights - Lattice Structures
Executive Committee approved date: 01-24-2012
Effective Date: 01-24-2013

Frequently Asked Questions

Safety at Heights - Lattice Structures

1. Does this best practice apply to all climbers?
    - This best practice applies to all climbers of lattice structures.
2. What type of training is required?
    - Climber training in the selection and use of PFAS is imperative. Before the equipment is used, climbers must be trained in the care, use, and inspection of the equipment and system. This should include the following: application limits; WPE, anchorage points—including determination of deceleration distance—and total fall distance to prevent striking a lower level; and methods of use, inspection, and storage of the system and rescue procedures.
3. What type of fall protection is required?
    - All equipment identified in the FHA. The FHA must include plans to perform a rescue as well as identify all rescue equipment to be readily available in the event of an emergency.
4. What are examples of climbing methods and suitable FPE to be used while climbing and working on lattice structures?
    - Full-body harness with double (2) lanyards and proper snap hooks
    - Rebar hooks and belay line with full-body harness and double lanyards
    - Temporary horizontal lifelines
    - Self-retracting lifelines (SRLs)
    - Double safeties (skids) are acceptable when the safety is rigged such that a climber cannot fall more than two feet
    - Vertical lifelines, rope grabs, body harnesses with frontal and dorsal D-rings
5. What should be considered when selecting the use of anchor points?
    - The supervisor or person in charge of the work being performed will identify what structural members will be used as anchorage points and document those on the FHA.
    - An anchor point used where the line passes over or around rough or sharp surfaces should be avoided or adequately padded or protected.
    - Depending on their geometry and angle of sag, horizontal lifeline systems might be subjected to greater loads than the impact load imposed by the attached equipment. The use of these methods must be designed by a qualified person.
    - The potential free fall distance when using PFAS should be kept to a minimum and shall not be in excess of 6 feet (1.8 m).
    - The location of the anchor point should also consider the hazard of obstructions in the potential fall path of the climber. Consideration should be given to anchor point that minimize the possibility of exaggerated swinging.
6. What is meant by the WPE limiting the fall to less than two feet?
    - WPE may be used when rigged such that a climber cannot fall more than two feet.

7. Must I maintain 100% fall protection when I pass over an obstruction or maneuver on lattice structures?
    - Yes. Follow your employer's FHA.
8. What is meant by "visual inspection"?
    - All lattice structures shall be carefully inspected before climbing to ensure they are in safe condition for the work to be performed:
        1. Verify step bolts are secure and in acceptable condition.
        2. Verify acceptable condition of footers.
        3. Verify steel members are secure on each end before applying or transferring weight.
        4. Check for damage or distortion to the structure members.
9. Does fall protection have to be included in the pre-job briefing?
    - Yes. Fall protection should be planned and discussed during the job briefing. Visually determine the climbing route, create FHA documents, identify all potential hazards, and determine the control measures to be used.
10. Is FPE required when transitioning from the lattice structure to and from another device being used on the structure (such as a spacer buggy, dead end ladder, and so on)?
    - Yes. FPE shall be used continuously when transitioning to and from the structure and while on the devices.
11. Does this include transferring to and from helicopters and aerial lifts?
    - No. These transfers will be addressed in a separate best practice.

Safety at Heights - Lattice Structures

Executive Committee approved date: 01-24-2012

Effective Date: 01-24-2013

Sample A-1. Lattice Structure Fall Hazard Safety Analysis

Supervisor: ______________________________ Qualified Climbers: YES ☐ NO ☐ Personnel Trained in use of FP equipment: YES ☐ NO ☐ Location/WO#	Visual Inspection performed: YES ☐ NO ☐ Identified Anchorages: YES ☐ NO ☐
Task Description:	

Examples of Lattice Structure Fall Protection Equipment to be available and/or Climbing Methods for consideration:

- Work Positioning Equipment (Harness/Body Belt & Safety)
- PFAS: Retractable Lanyard(s), Fully Body Harness with Lanyard, Full Body Harness with Double Lanyard
- Horizontal Lifeline w/PFAS(s), Vertical Lifeline w/rope grabs
- Travel Restriction Equipment
- Three Points of Contact for Qualified Climbers
- Guard/Handrails, Safety Nets

Task Step	**Fall Hazard Control Measures**
Ascending	
Work Positioning	
Maneuvering	
Descending	
Rescue	

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