UTILITY COMMITTEE

The Utility Committee Meeting was held on July 23, 2012 at 6:00 p.m. with Chairman Bonar presiding. Members present were Mr. Perza, Mrs. Williams, Mr. Blakeman, and Mr. Snaman. Members of Council present were Council President Leary (departed at 6:04 p.m. and returned at 6:12 p.m.), Mr. Hare (arrived at 6:20 p.m.), Mr. Hutchison, and Mrs. Russell. Mayor Carey was also present.

AGENDA ADDITIONS/DELETIONS

By unanimous consent, the agenda was approved as presented.

Proposed Resolution No. 2012-11 - Adoption of the American Public Power Association (APPA) Safety Manual

Mr. Scott Koenig, City Manager, submitted proposed Resolution #2012-11 for the adoption of the American Public Power Association (APPA) Safety Manual. He advised members that the provisions of the APPA Safety Manual were currently being utilized as policy within the City's Electric Department. He explained that the Manual consisted of over 200 pages and provided the best practices to ensure the safety of the City's electrical workers, as well as the system, and that adoption of the Resolution would solidify support of the Manual and allow the City to meet the requirements of the Reliable Public Power Provider (RP3) Program.

Mr. Blakeman moved to recommend adoption of proposed Resolution #2012-11 *(Attachment #1)*, seconded by Mrs. Williams and unanimously carried.

Presentation - Energy Commodity Risk Management Policy Modifications (The Energy Authority)

Mr. Jamie Mahne, Chief Client Officer for The Energy Authority (TEA), reviewed a Presentation - Dover Risk Policy Modifications. As the City's Energy Manager, he explained that TEA had recommendations for modifications to the City's Energy Risk Policy.

Mr. Bonar indicated his firm opposition to redacting anything involving public policies related to management of the City's electricity, noting that this was "the people's electric department for the foreseeable future." Responding, Mr. Mahne stated that TEA was owned by and served public power organizations exclusively and was sensitive to and agreed with Mr. Bonar's concern. He advised members that this was one of the overriding reasons for recommending the policy modifications and that another reason was to bring Dover's Risk Policy up to the industry's best practices.

In response to Mr. Blakeman, Mr. Mahne indicated that City staff (City Manager, Utility Managers, and the Controller/Treasurer) and representatives of TEA, who serve as the Executive Committee, were involved in the rewriting of the policy and approved it for presentation to members of the Utility Committee.

No further action was taken by the Committee. *(City Clerk's Office Note: In accordance with the policy, the Utility Committee must conduct an annual review and approval of the Governing Policy For Energy Commodity Risk Management; therefore, this item has been scheduled for consideration by the Committee on August 13, 2012)*

Review of Utility Related Capital Investment Plan (CIP) ***(Electric and Water/Wastewater)***

Members were provided a Project Tracking Report, as of May 31, 2012, for the Utility (Electric and Water/Wastewater) Related Capital Investment Plan (CIP).

Mrs. Williams questioned the number of projects and the fact that so many were in a waiting status. Responding, Mr. Scott Koenig, City Manager, reviewed some of the projects listed, explaining that the new Library was nearing completion, and that some projects, such as the roof replacement at Dover Park, had been deferred. He noted that the City Hall Fire Sprinkler System was being presented to City Council during their meeting later in the evening. Mr. Koenig explained that staff had been attempting to complete several street program projects and had initially intended to use General Fund monies; however, prior to beginning the projects, various legislators submitted Community Transportation Funds, which resulted in the ability to use alternative funding. Referring to the Water Street Brick Sidewalk that had been pending for some time, Mr. Koenig explained that this was a very historic sidewalk that was located against a very historic wall (Christ Church wall along Water Street), which created a major problem. Mrs. Williams requested that staff determine if the wall referred to was indeed historic, noting that it was built several years after the Church. She expressed her concern that some of these projects never seem to be completed, and thus the City's objectives are not accomplished.

Continuing, Mr. Koenig noted that the City did not plan to build a parking lot at Schutte Park and would transfer this funding to sidewalk work at Schutte Park. He explained that since Wyoming Mill Road had been relocated, staff could continue installing the sidewalk along that roadway, noting that the intent was to begin a sidewalk to the south. Referring to the Route 13/North State Street-Kings Highway project, he advised members that originally the State planned to pay the City to pave Route13; however, there had since been a supplemental agreement to transfer monies back to the State to handle this project. He noted that the City had been running behind on the Street Program due to contract response issues, staff commitments, and issues with the State regarding the roundabout at Eden Hill on North Street.

Responding to Mr. Bonar regarding the North Street Project, Mr. Koenig noted that this project was separate from the CIP, explaining that the North Street Project referred to by Mr. Bonar would be financed by a grant through the Downtown Dover Partnership. He confirmed that this project would require the City to make adjustments to the water system because there was not a great deal of space in North Street, and Verizon had installed their conduit bank on top of the City's water line in this area. It was his understanding that equipment was being brought in to begin construction on this portion of the project this week and that completion would be expected within the next week or so.

Mr. Bonar recalled concerns regarding a traffic signal in front of the new Dover High School and that the Delaware Department of Transportation (DelDOT) had indicated that this would require a process. Regardless of the process required of DelDOT, he indicated his desire for the traffic signal to be installed prior to the school opening, noting that there was a true safety issue involved and his feeling that the State's bureaucracy on several of these types of projects was not necessary.

Concurring with the safety concerns involving the new Dover High School, Mrs. Williams questioned if City Council could take temporary safety measures, such as providing additional police

officers during the times when students would be entering and exiting the school, in an attempt to mitigate these risks. Responding, Mr. Koenig felt that staff could meet with representatives of DelDOT and the Capital School District to discuss this issue. He advised members that recent conversations with DelDOT indicated that DelDOT was attempting to move these projects, such as the installation of traffic signals, forward. He stated that DelDOT was relying heavily on the engineering study and warrant analysis that was completed by the engineers for the Capital School District to determine where traffic signals should be installed. In accordance with the warrant analysis, a traffic signal should be installed on the west end of the property; however, since the traffic coming out of the east end would be only intermittent, it did not meet the warrant analysis. It was his understanding that the warrant analysis serves as a legal test for DelDOT; therefore, if DelDOT were to install a traffic signal in a location that did not meet the warrant analysis and an accident occurred, DelDOT could be held liable. As a result, DelDOT was very reluctant to perform work that did not meet a warrant analysis.

As mentioned by the City Clerk, Mr. Bonar noted that since this matter was not included in the CIP, members should refrain from any further discussion. He suggested that this issue be considered by the Safety Advisory and Transportation Committee. Responding, Mr. Hutchison reminded members that the Safety Advisory and Transportation Committee had recently considered this matter and as a result, City Council authorized a letter to be sent to DelDOT relaying the City's concerns.

Referring to the Water/Wastewater CIP, Mr. Koenig noted that although there had been a 50% reduction in the City's engineering staff, projects were moving forward and, although the backlog was not complete, there had been a reduction. He noted that most of the Electric CIP projects were on schedule and within budget.

In response to Mr. Blakeman regarding the Life Extension of Units 1 and 2, Mr. Koenig stated that discussions on this matter were continuing and he anticipated that members would be provided related information to consider between now and the end of the year.

Responding to Mrs. Williams, Mr. Koenig stated that the Fox Hall Pump Station Upgrade had been completed and that staff was working on the contract documents to close the project. He anticipated the roadway to be repaved as a part of a repaving project in the future.

No further action was taken by the Committee.

Update - Garrison Oak Technical Park Project

Mr. Scott Koenig, City Manager, stated that staff was working through the engineering consulting reviews of the Garrison Oak Technical Park Project and anticipated bringing forward amendments to the engineering contract to facilitate the design of the pump station. In addition, staff would be presenting a supplemental contract for the construction of an elevated water tower for the property. He noted that the engineering analysis which was completed indicated the need for a 12-inch water line and an elevated storage tower and that long-term improvements to the plant were a part of the City's CIP proposals. Mr. Koenig stated that staff was working with Kent County to develop a sewer alignment and pump station that would allow the City to tie into the East Dover bypass and to abandon the station on White Oak Road.

It was Mr. Koenig's understanding that Calpine's air permit would be reviewed by the Delaware Department of Natural Resources and Environmental Control (DNREC) during the month of August. He advised members that Calpine was securing their purchases and working through issues related to the natural gas line extension.

By unanimous consent, the meeting adjourned at 6:27 P.M.

David L. Bonar
Chairman

DLB/TM/jg/js/dd
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Attachment to Original
Attachment #1 - Proposed Resolution No. 2012-11

City of Dover

MAYOR AND COUNCIL

DRAFT PROPOSED COUNCIL RESOLUTION NO. 2012-11

A RESOLUTION ADOPTING THE AMERICAN PUBLIC POWER ASSOCIATION (APPA) SAFETY MANUAL FOR THE CITY OF DOVER ELECTRIC UTILITY

WHEREAS, the City of Dover owns a municipal electric utility employing a number of dedicated employees in the electric trade; and

WHEREAS, it is the City's goal to employ safe practices that will ensure the highest level of protection possible to all electrical utility employees; and

WHEREAS, provisions of the American Public Power Association (APPA) Safety Manual are currently being utilized as policy within the City's Electric Utility Department; and

WHEREAS, official adoption of the APPA Manual will allow the City to meet the requirements of the Reliable Public Power Provider (RP3) Program.

NOW, THEREFORE, BE IT RESOLVED BY THE MAYOR AND COUNCIL OF THE CITY OF DOVER, IN COUNCIL MET:

That the American Public Power Association (APPA) Safety Manual is adopted as the governing set of safety rules for its municipal electric utility employees.

ADOPTED: *

S:\RESOLUTIONS & PROCLAMATIONS\2012\Draft\2012-11 - Adoption of American Public Power Association (APPA) Safety Manual.wpd

CARLETON E. CAREY, SR.
MAYOR

THOMAS J. LEARY
COUNCIL PRESIDENT

Draft

American
Public Power
Association

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1875 Connecticut Avenue, NW
Suite 1200
Washington, DC 20009-5715

June 1, 2012

Dear Electric Utility Professional:

When it comes to employee safety, you know there is no room for compromise. Developed by electric utility professionals, for electric utility professionals, APPA's *Safety Manual for an Electric Utility* has been the premier source of information for safety compliance for more than four decades. I am pleased to announce the latest version is now available for purchase.

The 15th edition of the *APPA Safety Manual* features a number of new and revised sections, including:

- Energized substation work guidelines – New
- Bucket truck/aerial lift rescue – New
- Control of Hazardous Energy (Lockout/Tagout) – Revised
- Wireless electronic devices – Revised
- First Aid, CPR, and AED – Revised
- Pole-top rescue – Revised
- Security/NERC/FERC – Revised
- Personal Protective Equipment (including clothing) – Revised
- Use and care of rubber gloves – Revised

Additionally, APPA's Reliable Public Power Provider (RP_3) program requires applicants to acknowledge the use of an accurate, up-to-date safety manual in order to receive the maximum number of points in the "Safety" section. RP_3 applicants referencing APPA's safety manual must be using APPA's *Safety Manual for an Electric Utility, 15th Edition.*

I applaud the many municipal electric utilities that continuously endorse a culture of safety compliance and strongly encourage those that aren't to start today. Ordering the APPA Safety Manual is easy; simply visit the APPA Product Store at www.PublicPower.org, mail or fax the order form on the reverse side of the enclosed flyer, e-mail Products@PublicPower.org or call the APPA Product Store at 202/467-2926.

Thank you for all that you do to promote safety in the workplace.

Regards,

Michael J. Hyland

Michael J. Hyland
Senior Vice President, Engineering Services

Enclosure

Safety Manual
For An Electric Utility

The 2007 revisions to this manual were prepared by:

John Borowski, CIH, CSP
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Overland Park, Kansas

APPA would like to thank those who have contributed to the content of this document. Invaluable assistance was provided by members of the APPA Safety Committee.

Rev. 14, 2007

APPA Safety Manual
Fourteenth Edition 2007

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Suite 1200
Washington, DC 20009-5715
www.APPAnet.org

(202) 467-2926

Rev. 14, 2007

Safety Manual Receipt

I, _____, acknowledge receipt of this copy of the
(Print Name)
APPA Safety Manual. I understand that it is my duty to read, study, and abide by these safety rules and work procedures and other employer policies and procedures as they apply to the duties that I shall perform for _____. I further understand that failure
(Name of Utility)
to abide by these rules and the employer rules and procedures shall result in disciplinary action as determined by employer policy.

_____
Signature of Employee

_____
Date

_____
Department

_____
Supervisor

Rev. 14, 2007

FOREWORD

This manual has been prepared for the guidance and safety of all employees of publicly-owned electric utilities. Strict observance of safety rules is necessary to prevent accidents. Lack of enforcement or repeated and flagrant violations of rules can only result in accidents, with accompanying injury and economic loss. In order to facilitate the implementation of the requirements of this manual, a qualified person shall be assigned by the Utility to coordinate the implementation.

An accident is defined as an unplanned event invariably preceded by an unsafe act(s) and/or unsafe condition(s) that frequently results in injury or damage and interrupts the completion of an activity. Accidents are an unnecessary waste of both our human and economic resources. Though many accidents are due to unsafe conditions and can be minimized with periodic inspections and preventive maintenance, the majority of accidents are due to unsafe acts and human failure. It is the responsibility of every employee to comply with safety and health standards and all rules that are applicable to their own actions and conduct.

In the preparation of this manual, it is recognized that local conditions, laws, and regulations may cause some minor conflicts. In the event of such conflict, you are advised to adhere to the most restrictive regulations governing the situation in question. The publicly-owned electric utility has the responsibility for making interpretations of the rules contained in this manual.

This manual shall be observed in all situations to which it applies, without respect to where statements may appear.

The American Public Power Association (APPA) has acted as the publisher of this *Safety Manual* for its member utilities since 1977. The *Manual* is provided as part of an *advisory* service of APPA; the use of the *Safety Manual* by any APPA member is strictly *voluntary*. Each APPA member and its employees decide the obligations and sanctions that emanate from the use of this *Manual*. APPA, its Safety Committee

members, and authors are providing safety rules and work procedures that they believe promote greater safety and economic welfare, but APPA, its Safety Committee, members, and authors are not attempting to render engineering, legal, or other professional services. If such services are required, the assistance of an appropriate professional should be sought.

While APPA, its members, its Safety Committee, and authors have exercised a high degree of care in developing this *Manual*, none of these parties accept any liability resulting from compliance or non-compliance with the policies and procedures set forth herein, for any restrictions imposed on material or processes or for the completeness of the text. This publication is provided **"AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE**. The entire risk for the quality, performance and accuracy of the *Manual* and all reproductions or adaptations of the *Manual* is with the user.

APPA has no power or authority to police or enforce compliance with the contents of this document, and any certification of compliance with requirements of this document is made at the peril of the certifier.

References to the National Electrical Safety Code (NESC) are to highlight the use of an industry consensus document in the implementation of a safety program. APPA recommends that utilities purchase the latest edition of the NESC and use the code in its entirety to complete their safety program.

Addendum to the
Santee Cooper Safety Manual

The Santee Cooper Corporate Safety Committee has chosen **not** to adopt the following safety rules from the 14th edition of the American Public Power Association's Safety Manual:

Section #	Rule #	Title
2.	**206**	**Hours of Service Act**
4.	**401**	**Personal Protective Equipment (PPE)**
5.	**503.5 f)**	**Parking -- Only letter 'f' of this rule is not adopted.**
5.	**507.21 a)**	**Metering – Santee Cooper does not require long sleeved shirt for this application due to the protection of rubber gloves.**

In addition, **Rule 113** in **Section 1** has been amended to read:

113. Cellular Telephones

a) Use of cellular telephones will be limited to the following guidelines:

(1) Cellular telephones should be used only for business or high priority personal communication and not for casual use.

(2) The volume of the ringer on the cellular telephone must be kept at a minimum as not to startle other workers performing tasks.

(3) If a call must be received or made, the worker must ensure that the work area and all personnel in the work area are safe before answering or calling.

(4) Cellular telephones will be turned off or placed on voice mail any time you are working with a crew or by yourself where the call would create a safety issue or unnecessary work stoppage.

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DEFINITIONS

Aerial Device: Any piece of equipment utilizing a bucket or platform to place the worker(s) at an elevated worksite.

Affected Employee: An employee whose job requires him to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout, or whose job requires him to work in an area in which such servicing or maintenance is being performed.

Alive or Live: Electrically connected to a source of potential difference or electrically charged so as to have a potential significantly different from that of the earth in the vicinity. The term "live" is sometimes used in place of the term "current-carrying," where the intent is clear, to avoid repetition of the longer term.

Anchorage: A secure means of attachment for lifelines, lanyards, and straps.

ANSI: American National Standards Institute.

Approved: The term "approved," when used in connection with methods, tools, or equipment, refers to the methods, tools, or equipment approved by the Utility through committee, departmental action, or safety rule.

Attendant: An employee assigned to remain immediately outside the entrance to an enclosed or other space to render assistance as needed to employees inside the space.

Authorized Person: One who has the authority to perform specific duties under certain conditions or who is carrying out orders from the responsible authority and who is knowledgeable in the construction and operation of the equipment and the hazards involved.

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

Backreamer: A downhole tool that increases the diameter of a pilot bore hole to accommodate the size of the product being pulled.

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

Barricade: A physical obstruction such as tapes, cones, or A-Frame type wood or metal structures intended to warn and limit access to a hazardous area.

Benching (Benching System): A method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near vertical surfaces between levels.

Body Belt (Safety Belt): A strap that both secures around the waist and attaches to a lanyard, lifeline, or strap.

Body Harness: Straps that are secured about an employee in a manner that distributes the arresting forces over at least the thighs, shoulders, and pelvis with provisions for attaching a lanyard, lifeline, or deceleration device.

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

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

Bushing: An insulating structure, including a through conductor or providing a passageway for such a conductor, with provision for

mounting on a barrier, conducting or otherwise, for the purposes of insulating the conductor from the barrier and conducting current from one side of the barrier to the other.

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 (may consist of multiple layers, one or more of which is conductive).

Catastrophic Release: A major uncontrolled emission, fire, or explosion involving one or more highly hazardous chemicals that presents serious danger to employees in the workplace.

Cellular Telephone: A type of short-wave analog or digital transmission in which a subscriber has a wireless connection from a mobile telephone to a relatively nearby transmitter. The transmitter's span of coverage is called a cell. (also see Mobile Telephone and Wireless Telephone)

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

Clear Hot Stick Distance: The minimum distance for the use of live-line tools held by linemen when performing live-line work.

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

Clearance: (between objects) The clear distance between two objects measured surface-to-surface.

Combustible Liquids: Any liquid having a flash point at or higher than 140° F and less than 200° F. (also see Flammable Liquid)

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

Communication Lines: The conductors and their supporting or containing structures that are used for public or private signal or communication service.

Note: Telephone, telegraph, railroad signal, data, clock, fire, police-alarm, community television antenna, fiber-optics and other similar systems are included.

Conductor: A material, usually in the form of a wire, cable, or busbar, suitable for carrying an electric current.

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.

Confined Space: An enclosed space that is large enough and so configured that an employee can bodily enter and perform assigned work; has limited or restricted means for entry or exit (some examples are tanks, vessels, silos, storage bins, hoppers, vaults, pits, and dike areas); is not designed for continuous employee occupancy; and has one or more of the following characteristics: contains or has a known potential to contain a hazardous atmosphere, contains a material with the potential for engulfment of 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, or contains any other recognized serious safety or health hazard. (also see Enclosed Space)

Contractor: Organization contracted by Utility to perform work on Utility property.

Current-Carrying Part: A conducting part intended to be connected in an electric circuit to a source of voltage. Noncurrent-carrying 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 different from that of the earth.

Designated Person: Refer to Authorized Person.

Directional Boring Machine: A steerable, horizontal boring machine that allows trenchless installation of underground utilities.

Disciplinary Action: Administrative action taken by the employer against the employee; may vary from verbal reprimand to dismissal.

Disconnected: A separated or broken connection from any energy source.

Effectively Grounded: Intentionally connected to earth though a ground connection or connections of sufficiently low impedance and having sufficient current-carrying capacity to prevent the buildup of voltages that may result in undue hazard to connected equipment or to persons.

Electric Line Truck: A truck used to transport personnel, tools, and material for electric supply line work.

Electric Supply Equipment: Equipment that produces, modifies, regulates, controls, or safeguards supply of electrical energy.

Electric Supply Lines: Conductors used to transmit electrical energy and their necessary supporting or containing structures. Signal lines of more than 400 volts are always supply lines within this section, and those with less than 400 volts are considered as supply lines if so run and operated throughout.

Electric Utility: An organization responsible for the installation, operation, or maintenance of an electric supply system.

Emergency: An emergency occurs when an unusual condition exists that endangers life and/or property.

Employee: In the broad sense, any person employed by or representing the Utility. In general usage, a person employed by the Utility and below the level of supervisor.

Employer: Utility.

Enclosed: Surrounded by a case, cage, or fence, which will protect the contained equipment and prevent accidental contact of a person with live parts.

Enclosed Space: A working space such as a manhole, vault, tunnel, or shaft that has a limited means of egress or entry, that is designed for periodic employee entry under normal operating conditions, and that under normal conditions does not contain a hazardous atmosphere but may contain a hazardous atmosphere under abnormal conditions. (also see Confined Space)

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.

Energy Isolating Device: A physical device that prevents the transmission or release of energy, including, but not limited to, the following: a manually operated electric circuit breaker, a disconnect switch, a manually operated switch, a slide gate, a slip blind, a line valve, blocks and any other similar device with a visible indication of the position of the device (push buttons, selector switches, and other control circuit type devices are not energy isolating devices).

Energy Source: Any electrical, mechanical, hydraulic, pneumatic, chemical, nuclear, thermal, or other energy source that could cause injury to personnel.

Equipment (Electric): A general term including material, fittings, devices, appliances, fixtures, apparatus, etc., used as part of or in connection with an electrical installation.

Excavations: Any man-made cut, cavity, trench, or depression in an earth surface formed by earth removal.

Exposed: (a) In such a position that in case of failure of supports or insulation, contact with another circuit or line may result, or (b) An object or device that can be inadvertently touched or approached nearer than a safe distance by any person. Applied to objects not suitably guarded or situated. Not isolated or guarded.

Exposure: Exposure occurs whenever and wherever a person is subjected to electric, magnetic, or electromagnetic fields or to contact currents other than those originating from physiological processes in the body and other natural phenomena.

Eye Loupe: A small, high-powered magnifying lens held close to the eye.

Fall Arrest System: (fall from one level to another) The assemblage of equipment such as line worker's body belt or full body harness in conjunction with a deceleration device and an anchorage to limit the forces a worker experiences during a fall from one elevation to another.

Fall Protection Program: A program intended to protect workers from injury due to falls when working at elevations.

Fall Prevention System: (prevents fall from one level to another) A system intended to prevent a worker from falling from one elevation to another. Such systems include positioning devices, guardrails, barriers, and restraint systems.

Fall Protection System (Hardware): Consists of either a fall prevention system or a fall arrest system.

Fell: The process of severing a tree from the stump so that it drops to the ground. "Feller" is the person who fells the tree.

Flammable Liquid: Any liquid having a flash point less than 140° F and having a vapor pressure not exceeding 40 pounds per square inch (absolute) at 100° F. (also see Combustible Liquid)

Flares: The word "flares" shall be used to indicate flares, torches, fuses, red lanterns, reflectors, or any other equipment that is adaptable for the purpose intended. To give a visible source of light for warning or notification.

Foreman or Supervisor: Any person, regardless of classification, who is directly in charge of a specific job or specific jobs. (Depending upon local classification, this person may be a "lead man," working foreman, foreman, general foreman, supervisor, or superintendent.)

Free Fall: The act of falling before the personal fall protection system begins to arrest the fall.

Governmental: Any type of political agency having control over a certain activity, including federal, state, county, township, city, etc.

Ground: (noun) The connection, established either intentionally or accidentally, of an electric circuit or equipment with reference ground through a conductor, or other conducting object or substance.

Ground: (reference) That conductive body, usually earth, to which an electric potential is referenced.

Ground: (verb) Connecting or establishing a connection, either intentionally or accidentally, of an electric circuit or equipment to

reference ground. Connect to earth or some conducting body that serves in place of earth.

Grounding Electrode (Ground Electrode): A conductor embedded in the earth, used for maintaining ground potential on conductors connected to it and for dissipating into the earth current conducted to it.

Grounded System: A system of conductors in which at least one conductor or point (usually the middle wire or neutral point of transformer or generator winding) is intentionally grounded, either solidly or through a current-limiting device (not a current-interrupting device).

Guarded: Protected by personnel, or covered, fenced, or enclosed by means of suitable casings, barrier rails, screens, mats, platforms, or other suitable devices in accordance with standard barricading technique designed to prevent dangerous approach or contact by persons or objects. (Wires that are insulated but not otherwise protected are not considered guarded.)

Hands Free Cellular Telephone: A device that allows a cellular telephone user to transmit and receive aural messages without the need for physically holding the telephone. Usually in the form of a headpiece with a microphone.

Hazardous Atmosphere: An atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (escape unaided from an enclosed space), injury or acute illness from one or more of the following causes: (1) Flammable gas, vapor or mist in excess of 10 percent of its lower flammable limit (LFL); (2) Airborne combustible dust at a concentration that meets or exceeds its LFL; (3) Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent; (4) Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in Subpart G, Occupational Health and Environmental Control, or in Subpart Z, Toxic and Hazardous Substances, of this part and which could result in employee exposure in excess of its dose or PEL; (5) Any other atmospheric condition that is immediately dangerous to life or health.

Hazard Communication Program: Utility-developed program to ensure that information concerning hazardous chemicals (material) is transmitted to employees through the use of warnings, procedures, Material Safety Data Sheets (MSDSs), and employee training.

Hazardous Material (Substances): Any substance that is a physical hazard or a health hazard. A substance is a physical hazard when there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive), or water reactive. The substance is a health hazard when it is determined to be a carcinogen, a toxic or highly toxic agent, a reproductive toxin, irritant, corrosive, sensitizer, hepatotoxin, nephrotoxic, neurotoxin, an agent that acts on the hematopoietic system, or an agent that damages the lungs, skin, eyes, or mucous membranes.

Highly Hazardous Chemical: A substance possessing toxic, reactive, flammable, or explosive properties that are listed in OSHA Standard 29 CFR 1910.119.

High Power Test: Tests in which fault currents, load currents and line dropping currents are used to test equipment, either at the equipment's rated voltage or at lower voltages.

High Voltage Test: Tests in which voltages of approximately 1000 volts are used as a practical minimum and in which the voltage source has sufficient energy to cause injury.

High Wind: A wind of such velocity that an employee would be exposed to being blown from elevated locations, an employee or material handling equipment could lose control of material being handled, or an employee could be exposed to other hazards not controlled by the standard involved. Winds exceeding 40 mph, or winds exceeding 30 mph if material handling is involved, are considered to be high winds unless precautions are taken to protect employees from the hazardous effects of the wind.

Hold Cards (Hold Tags): A card or tag type device, usually having a predominant color of white or red, which warns or cautions against the operation of a particular switch, device, circuit, tool, machine, etc. The use of such tags must be respected; equipment or items so tagged must not be activated or used without full and proper authority from a responsible person.

Hot-Line Tools and Ropes: Those tools and ropes that are especially designed for work on energized high voltage lines and equipment. Insulated aerial equipment especially designed for work on energized high voltage lines and equipment shall be considered "hot-line."

Hot Work Permit: A permit to do work that may result in temperatures or sparks capable of supporting ignition of flammable or combustible materials.

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 that would interfere with an individual's ability to escape unaided from a permit space.

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: A circuit or object that is not readily accessible to persons unless special means of access are used.

Jobsite: The point where the employees are assembled to perform the work.

Lanyard (Strap): A flexible line used to secure a body belt or body harness to a lifeline or directly to a point of anchorage.

Lifeline: A line provided for direct or indirect attachment to a worker's body belt, body harness, lanyard, or deceleration device. Such lifelines may be horizontal or vertical in application.

Line Clearance Tree Trimmer: An employee who, through related training or on-the-job experience or both, is familiar with the special techniques and hazards involved in line clearance.

Line Clearance Tree Trimming: The pruning, trimming, repairing, maintaining, removing or clearing of trees or the cutting of brush that is within 10 feet (305 cm) of electric supply lines and equipment.

Load Dispatcher--Power Dispatcher--System Operator: Person designated by the employer as having authority over switching and clearances of high voltage lines and station equipment.

Load Tap Changer (LTC): A connection point along a transformer winding that allows the number of turns to be selected. By this means, a transformer with a variable turns ratio is produced, enabling voltage regulation of the secondary side

Manhole: A subsurface enclosure, which personnel may enter, that is used for installing, operating, and maintaining equipment and/or cable.

Manhole Opening: An opening through which persons may enter into a confined or enclosed space.

Material Safety Data Sheet (MSDS): A document provided by manufacturers and importers of chemicals to convey information to the users of their products. The information includes data on physical characteristics, fire and explosion hazards, reactivity, and health hazards; special precautions; and fire and spill procedures.

Maximum Permissible Exposure Limits (MPE): The maximum electric and magnetic field strengths or their 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 FCC's 1997 Regulation.

Minimum Approach Distance: The closest distance an employee is permitted to approach an energized or a grounded object.

Mobile Telephone: A telephone that uses a satellite service to access a network of communication towers. Intended for use with mobile and wireless telephones. (also see Cellular Telephone and Wireless Telephone)

National Electrical Safety Code (NESC): NESC sets the ground rules for practical safeguarding of persons during the installation, operation, or maintenance of electric supply and communication Lines and associated equipment. The NESC contains the basic provisions that are considered necessary for the safety of employees and the public under the specified conditions.

Near Miss: An unintended, unplanned, or unexpected event that could have, but did not, result in personnel injury or property damage.

Occupational Safety and Health Act (OSHA) of 1970: Requires employers to provide to employees a workplace free from recognized hazards and to comply with safety and health standards established by the Act. The Act also charges each employee with a legal duty to comply with the Act's safety and health standards. The federal Act pertains to most employers but specifically excludes federal, state, and local government employees. However, numerous states have developed safety and health standards that require compliance by all government entities.

Pad Mount: Transformer or equipment in a surface-mounted enclosure normally worked from ground level.

Pager: A small telecommunications device that receives (and, in some cases, transmits) alert signals and/or short messages.

Permit-Required Confined Space: A confined space that has one or more of the following characteristics: (1) contains or has a potential to contain a hazardous atmosphere; (2) contains a material that has a potential for engulfing an entrant; (3) has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor with slopes downward and tapers to a smaller cross section; or (4) contains any other recognized serious safety or health hazard.

Personal Monitoring Device: A battery operated Radio Frequency Exposure (RFE) monitoring device that is designed to be worn on a person and which will alarm when the RFE exposure exceeds 50 percent of the Maximum Permissible Exposure Limit (MPE) for occupational environments.

Personal Protective Equipment (PPE): Protective clothing, helmets, goggles, or other gear designed to protect the wearer's body or clothing from injury by electrical hazards, heat, chemicals, and infection, for job-related occupational safety and health purposes.

Polychlorinated Biphenyls (PCBs): A hazardous nonconductive and noncombustible liquid used in some transformers and capacitors. It has several trade names--Pyranol, Askeral, Inerteen, etc.

Physically Render Inoperative: The use of locks, blind flanges, or other similar devices or procedures to prevent the operation of switches, breakers, valves, and operating controls.

Positioning Device: A body belt or body harness system rigged to allow an employee to be supported on an elevated vertical surface such as a wall or pole and to work with both hands free.

Primary Compartment: A compartment containing voltages greater than 600 volts.

Primary Voltage: Any electrical circuit that normally operates at more than 600 volts.

Protective System: A method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

Public: Any individual not an employee or representative of the Utility.

Qualified Person (for Electric Power Generation, Transmission and Distribution): One knowledgeable in the construction and operation of the electric power generation, transmission, and distribution equipment involved, along with the associated hazards. Qualified employees shall be trained and competent in: (1) the skills and techniques necessary to distinguish exposed live parts from other parts of electrical equipment; (2) the skills and techniques necessary to determine the nominal voltage of exposed live parts; (3) the minimum approach distances corresponding to the voltages to which the qualified employee will be exposed; and (4) the proper use of precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools for working on or near exposed energized parts of electric equipment. An employee who is undergoing on-the-job training and who, in the course of that training, has demonstrated an ability to perform duties safely at his level of training and who is under the direct supervision of a qualified employee is considered to be a qualified employee for the performance of those duties. An employee undergoing on-the-job training must meet the full requirements for fall protection.

Qualified Person (in general): A qualified person is one who is specifically qualified to do a particular job because of education, training and/or experience. It is possible, even likely, that a qualified person in one context or situation would not be a qualified person in another situation.

Radio Frequency (RF): For the purposes of the Federal Communications Commission (FCC) standard, the frequency range is from 3 kHz to 300 GHz.

Reduced Visibility: Times when normal visibility is reduced because of insufficient daylight (dawn or dusk) or adverse weather conditions such as fog, heavy rainfall, or snow.

Registered Professional Engineer: A person who is registered as a professional engineer in the state where the work is to be performed. However, 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" to be used in interstate commerce.

Road: The paved or unpaved surface of a roadway upon which vehicles are intended to travel. When the road is paved, the entire surface is thus included.

Roadway: The road and the areas immediately adjacent thereto, such as the shoulder of the road, parking strip, etc. This area normally extends approximately 15 feet from the road.

Rope Grab: A device that attaches to a lifeline as an anchoring point to provide a means for arresting a fall.

Safety Can: An approved closed container of not more than 5 gallon capacity having a flash-arresting screen, spring-closing lid, and spout cover and designed so that it will safely relieve internal pressure when subjected to a fire.

Safety Rule: A positive rule requiring compliance by all employees concerned. Deviation from safety rules is not permitted and is subject to disciplinary action.

Secondary Compartment: A compartment containing voltages less than 600 volts.

Secondary Voltage: Any electrical circuit that normally operates at less than 600 volts.

Shall: When the word "shall" appears in the wording of a rule, the rule is to be obeyed as written. (A mandatory requirement.)

Shield (Shield System): A structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structure. Shield structures can be permanent or portable and moved along as work progresses.

Shoring (Shoring System): A structure such as a metal hydraulic, mechanical, or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.

Should: When the word "should" appears in the wording of a rule, the rule is to be obeyed as written when it is reasonable or practical to do so. (An advisory requirement.)

Sloping (Sloping System): A method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as soil type, environmental conditions of exposure, and application of surcharge loads.

Snap-Hook: A self-closing device with a keeper, latch, or other similar arrangement that will remain closed until manually opened. Such devices include self-closing, single-action, double-action, or double-locking snap-hooks.

Stable Rock: Natural solid mineral material that can be excavated with vertical sides and which 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 or

movement by rock bolts or by another protective system that has been designed by a registered professional engineer.

Step Bolt: A bolt or rung attached at intervals along a structural member and used for foot placement during climbing or standing.

Strike Sensing System: A system with dual circuits to measure elevated electrical potential on the directional boring machine and current flow along the drill string.

Supervisor: See Foreman.

Switch: A device for opening and closing or changing the connection of a circuit. In these rules, a switch is understood to be manually operable, unless otherwise stated.

Swivel: Joins a backreamer assembly to a conduit adapter, and permits the backreamer to rotate without turning the conduit that is being pulled in. It is also a device that can be placed between a pull line and a conductor being strung to allow the pull line and conductor to rotate.

System Operator: A qualified person designated to operate the system or its parts.

Tailboard Safety Talk: A short informal discussion of the work to be accomplished and the safety measures to be incorporated. Normally conducted by the foreman, these discussions are sometimes referred to as “tailgate talks,” “tool box talks,” or “5 minute safety talks.” Refer also to Paragraph 1405, Job Briefings.

Transferring: The act of moving from one distinct object or location to another.

Transitioning: The act of moving from one location to another on equipment or a structure while going around or over an object.

Transformer: A device used to transfer electric energy from one circuit to another.

Underground Residential Distribution (URD): A general term that covers the necessary facilities to furnish underground service, generally to residential and commercial customers and usually through directly buried cable.

Unsafe Conditions: Used to indicate dangerous conditions, hazardous conditions, defective conditions, or unusual conditions that could be conducive to accidents.

Utility: The employer. The entity having jurisdiction and control over the operation of the utility (including such entities as municipal utilities, electrical cooperatives, etc.).

Vented Vault: A vault that has provision for air changes using exhaust flue stacks and low level air intakes operating on differentials of pressure and temperature, providing for airflow which precludes a hazardous atmosphere from developing.

Vault: An enclosure above or below ground, which personnel may enter, used for installing, operating, and/or maintaining equipment and/or cable.

Voltage: The effective (RMS) potential difference between any two conductors or between a conductor and ground. The voltage specified in this manual shall mean the maximum effective voltage to which the personnel or protective equipment may be subjected. Low voltage includes voltages up to 600 volts. High voltage shall mean voltages in excess of 600 volts.

Voltage of an Effectively Grounded Circuit: The voltage between any conductor and ground, unless otherwise indicated.

Voltage Limiter: A device used to detect potential differences between the directional boring unit and ground.

Warning Signs: For the purpose of these rules, any sign or similar means of employee or public notification alerting an employee to an actual or possible hazard. Included are "Danger" signs, "Caution" signs, traffic protection signs, instructional signs, and informational signs.

Wireless Telephone: Telecommunications in which electromagnetic waves (rather than some form of wire) carry a signal over a part or all of the communication path. (also see Cellular Telephone and Mobile Telephone)

Worksite: The location on the structure or equipment where, after the worker has completed climbing (horizontally and vertically), the worker is in position to perform the assigned work or task.

INTRODUCTION

Accident Prevention

No phase of operations is of greater importance than accident prevention. The degree of safety and the results accomplished are directly proportional to the effort expended to control the conditions, practices, and human actions that are responsible for accidents.

Purpose

The purpose of this manual is to assist in the elimination or prevention of accidents.

Effectiveness

a) This manual shall be effective as of the date of issuance; compliance by every employee is mandatory and is considered a requirement for employment.

b) Existing governmental codes, statutes, rules, and orders shall be considered a part of this manual, and where any conflict exists between the two, those of governmental status shall prevail.

Emergency Conditions

In case of emergency involving hazard to life, a supervisor or employee in charge of any work may modify or suspend such portion of this manual as may be considered temporarily necessary to permit proper handling of the specific emergency. In any such case, the person so acting shall be fully accountable for the reasonableness of his/her actions.

Occupational Safety and Health Requirements

The Utility is responsible to have its employees comply with all aspects of Occupational Safety and Health Act rules (or as modified by the state) and may be subject to severe penalties for violation of these requirements by any employee. As stated in the Occupational Safety and Health Act, "Each employee shall comply with occupational safety and health standards and all rules, regulations, and orders issued

pursuant to this Act which are applicable to their own actions and conduct."

Those employees who do not abide by the safety rules of this manual or other Utility safety requirements shall be subject to disciplinary action, which may include dismissal.

Supervisor Responsibilities

Supervisors shall be responsible not only for their own safety but also for the safe work performance of other employees under their supervision. Before assigning work to an employee, the supervisor shall be sure the employee knows and understands the hazards associated with the work and the proper procedures to perform the work safely.

Supervisors at all levels shall accept, in a cooperative manner, all reports of hazards; and employees shall not be reprimanded or penalized for reporting hazards.

Responsibility of Employees

Employees share with the employer the responsibility for safety. Each employee is responsible for their own safety, the safety of their fellow employees, and the safety of the general public. Employees shall become familiar with and use all the protective devices which are provided for their protection.

Employees shall report all unsafe equipment, unsafe tools, and hazardous conditions that come to their attention.

Knowledge of Safety Rules

Every employee shall become thoroughly familiar with the contents of this manual as they apply to their work activities.

Conditions Not Covered

Although each employee is primarily responsible for their own safety, in all instances where conditions are not covered by this *Manual* or the job is not completely understood, the employee shall obtain specific instructions from a supervisor before proceeding with the work.

Qualifications for Duty

Any supervisor, having reasonable grounds to suspect that an employee under their jurisdiction is either mentally or physically unfit for the work assigned, shall prohibit such employee from working until satisfactory medical or other evidence indicating employee fitness is secured.

Care in Performance of Duties

Each employee shall use reasonable care in the performance of their duties and act in such a manner as to assure at all times maximum safety to themselves, their fellow employees, and the public.

Resources

The contents of this *Safety Manual* were developed from various sources, which included the Occupational Safety and Health Act of 1970. To assist the user of the *Manual* to obtain additional information concerning a specific section, the applicable Occupational Safety and Health Act (OSHA) standard reference number has been included in the respective section. Sections without reference numbers fall under the Act's "General Duty Clause," which states that employees shall be provided a workplace free of recognized hazards.

Gender Wording

The male or masculine pronoun is used throughout this *Safety Manual* for convenience. The reference applies equally to males and females.

Section 1 GENERAL RULES

101 Application

a) Every employee shall carefully study (not merely read) those safety rules applicable to their assigned duties. Compliance with these safety rules is mandatory and is considered a requirement for employment.

b) If an employee is called upon to perform work that could be considered hazardous and proper protection is not provided, the matter should be brought to the attention of their supervisor before starting the work. If questions arise, interpretation rests finally with the supervisor.

c) These rules represent minimum requirements and are only intended to cover average conditions. Employees shall use good judgment in dealing with conditions not covered in these rules. Additionally, employees shall follow all Utility policies and procedures.

102 Employee's Responsibility for Safety

a) Before beginning a job, employees shall satisfy themselves that they can perform the task without injury. If they are in doubt as to their ability to perform the work, they shall call this to the attention of their Supervisor.

b) Before starting a job, employees shall thoroughly understand the work to be done, their part in the work, and the safety rules that apply.

103 Reporting Employee Injuries

a) Injuries, no matter how slight, shall be reported to the person in charge as soon as practical.

b) All minor injuries shall be properly treated and reported to the employee's supervisor.

c) When professional medical services are necessary, a physician designated by the Utility should be used whenever possible. Such injuries shall be reported to management immediately.

d) In case of serious or fatal accidents to employees, appropriate action shall be taken promptly. The accident shall be reported immediately to the department head or manager.

e) Near misses as well as actual injuries should be reported.
f) Employees shall refer to Utility policies for additional requirements.

104 Reporting Hazardous Conditions

a) When a hazardous condition that may cause injury or property damage or interfere with services is observed, regardless of the department in which the condition exists, the employee shall report it promptly to a proper authority and, when necessary, guard the area.
b) An employee who receives a report of any hazardous emergency condition shall obtain the name of the informant, the exact location, and the nature of the trouble. The employee shall immediately refer this information to the person having responsibility for such matters.

105 Taking Chances

a) Before commencing any work that may be hazardous, care shall be taken to establish a safe procedure. When more than one employee is engaged in the same job, all employees concerned shall understand the procedures to be followed (tailboard conference). Under no circumstances shall safety be sacrificed for speed.
b) Employees shall always try to place themselves in a safe and secure position.

106 Practical Jokes

Employees shall not engage in practical jokes or “horseplay.”

107 Guards

a) No guard shall be removed from any machine or piece of equipment except to perform required maintenance.
b) Guards removed to perform maintenance operations shall be replaced immediately, and the machine shall not be operated while the guards are removed (except for maintenance certification).
c) For additional information concerning guarding requirements, refer to OSHA Standards 29 CFR 1910.243 and 29 CFR 1910, Subpart 0.

108 Warnings

a) Warning signs shall be heeded. Persons seen in a dangerous situation shall be warned without being startled. Employees not required to be near potentially dangerous places shall keep away from them.

b) For additional information concerning warning signs, refer to OSHA Standard 29 CFR 1910.145.

109 Intoxicating Beverages and Drugs

Being under the influence of or the use of intoxicating beverages or drugs on Utility premises or on the job or during working hours is prohibited and shall be sufficient cause for disciplinary action. Any employee taking drugs prescribed by a physician or over-the-counter drugs that could impair assigned work shall report this fact to the supervisor.

110 Housekeeping

Work locations and both the inside and outside of vehicles and buildings shall be kept clean and orderly at all times:

a) Combustible materials, such as oil soaked rags, waste, and shavings, shall be kept in approved metal containers with metal lids. Containers shall be emptied as soon as practicable.

b) Both clean rags and used rags shall be kept in metal or metal-lined bins having metal covers.

c) Flammable liquids shall be used only for their designed purposes. Gasoline, benzene, naphtha, lacquer thinner, etc., shall not be used for cleaning purposes or for starting or kindling fires.

d) Permanent floors and platforms shall be kept free of dangerous projections or obstructions and shall be maintained reasonably free from oil, grease, or water. Where the type of operation produces slippery conditions, mats, grates, cleats, or other methods shall be used to reduce the hazard of slipping.

e) Stairways, aisles, permanent roadways, walkways, and material storage areas in yards shall be kept reasonably clear and free from obstructions, depressions, and debris.

f) Materials and supplies shall be stored in an orderly manner to prevent their falling or spreading and to eliminate tripping and stumbling hazards.

g) No clothing shall be allowed to hang on walls, behind doors, or in the space back of switchboards. No matches shall be left in clothes placed in lockers. Rubbish and unused clothing shall not be allowed to accumulate in lockers.

h) Paper and other combustible materials shall not be allowed to accumulate, and weeds or other range vegetation shall not be permitted to grow in or around the neighborhood of substations, pole yards, buildings, oil tanks, or other structures.

i) UL approved, properly labeled safety cans shall be used for the handling and use of flammable liquids such as gasoline, naphtha, and lacquer thinner in quantities greater than 1 gallon. For quantities of 1 gallon or less, only the original container or UL approved, properly labeled safety shall be used. All solvents should be kept in approved, properly labeled containers. Gasoline, naphtha, lacquer thinner, and other solvents of this class shall be handled and dispensed only in UL approved, properly labeled (yellow letters), red metal safety cans.

j) Paragraph 110-i does not apply to kerosene and cleaning agents of the "Stoddard" solvent class; however, not more than 1 gallon of such liquids shall be kept in any open container. The container shall be provided with a proper cover and be kept securely covered except when in actual use.

k) In any building, except one provided for its storage, no more than 25 gallons of flammable or combustible liquids shall be stored in a room outside of an approved storage cabinet. No more than 60 gallons of flammable or 120 gallons of combustible liquids shall be stored in any one storage cabinet. Not more than three such cabinets may be located in a single storage area. Quantities in excess of this shall be stored in an inside storage room designed for storage of flammable and combustible liquids.

l) When pouring or pumping gasoline or other flammable liquids from one container to another, metallic contact shall be maintained between the pouring and receiving containers. Transferring of flammable liquids from one container to another shall be accomplished only in properly ventilated spaces free from ignition sources.

m) Flammable or combustible liquids shall not be stored in areas used for exits or stairways or areas normally used for the safe passage of people.

n) Strict adherence shall be paid to "No Smoking" and "Stop Your Motor" signs at fuel dispensing locations.

o) For additional information concerning housekeeping requirements, refer to OSHA Standards 29 CFR 1910.141 and 29 CFR 1910.106.

111 Smoking

Smoking or open flames shall not be permitted in areas such as oil rooms, hydrogen or acetylene storage areas, or similar areas where dangerous gases might be present, nor in storerooms, battery rooms, flammable liquid storage and use locations, or other areas where quantities of combustible materials are kept. Absence of "No Smoking" signs shall not excuse smoking in dangerous places.

112 Welding and Cutting--General

a) Welding and cutting shall be performed only by experienced and properly trained persons. Before welding or cutting is started, the area shall be inspected for potential fire hazards and a hot work permit will be obtained if required by company policy.

b) When welding or cutting in elevated positions, precautions shall be taken to prevent sparks or hot metal from falling onto people or flammable material below.

c) Suitable fire extinguishing equipment shall be immediately available at all locations where welding and cutting equipment is used.

d) Matches and compressed gas lighters shall not be carried by welders or their helpers when engaged in welding or cutting operations.

e) A fire watch shall be maintained wherever welding or cutting is performed in locations where combustible materials present a fire hazard. A fire check shall be made of the area 1/2 hour after completion of welding.

f) Where combustible materials such as paper clippings or wood shavings are present, the floor shall be swept clean for a radius of 35 feet before welding. Combustible floors shall be kept wet or be protected by fire-resistant shields. Where floors have been wetted

down, personnel operating arc welding or cutting equipment shall be protected from possible shock.

g) To protect eyes, face, and body during welding and cutting, the operator shall wear an approved helmet or goggles, proper protective gloves, and clothing. Helpers or attendants shall wear proper eye protection. Other employees shall not observe welding operations unless they use approved eye protection.

h) Proper eye protection shall be worn to guard against flying particles when the helmet or goggles are raised.

i) For clothing requirements see Paragraph 405

j) A shirt or jacket (nonsynthetic material), with full-length sleeves rolled down and buttoned, shall be worn when performing or while exposed to welding/cutting activities.

k) When performing welding activities, the employer shall ensure that each employee removes or renders nonconductive all exposed conductive articles such as key or watch chains, rings, wrist watches or bands, unless such articles do not increase the hazards associated with contact with the energized parts.

l) Machinery, tanks, equipment, shafts, or pipes that could contain explosive or highly flammable materials shall be thoroughly cleaned and decontaminated prior to the application of heat.

m) In dusty or gaseous spaces where there is a possibility of an explosion, welding or cutting equipment shall not be used until the space is adequately ventilated.

n) Welders shall place welding cable, hoses, and other equipment so that they are clear of passageways, ladders, and stairways.

o) Where the work permits, the welder should be enclosed in an individual booth or shall be enclosed with noncombustible screens. Workers or other persons adjacent to the welding areas shall be protected from rays by shields or shall be required to wear appropriate eye and face protection.

p) After welding or cutting operations are completed, the welder shall mark the hot metal or provide other means of warning other workers.

q) Potentially hazardous materials in fluxes, coatings, covering, and filler metals are released to the atmosphere during welding or cutting operations. While welding or cutting, adequate ventilation or

approved respiratory protection equipment shall be used. Special precautions shall be taken when using materials that contain cadmium, fluorides, mercury, chlorinated hydrocarbons, stainless steel, zinc, galvanized materials, beryllium, and lead. Employees shall refer to the Utility's Hazard Communication Program for specific requirements pertaining to the above listed hazardous materials.

r) Employees welding or cutting in confined spaces shall conform to the requirements of Paragraph 201, Confined or Enclosed Spaces.

s) Gas welding and cutting: Only approved gas welding or cutting equipment shall be used:

(1) Approved backflow check valves shall be used on gas welding rigs in both gas and oxygen lines.

(2) Welding hose shall not be repaired with tape.

(3) Matches shall not be used to light a torch; a torch shall not be lighted on hot work. A friction lighter or other approved device shall be used.

(4) Oxygen or fuel-gas cylinders shall not be taken into confined spaces.

(5) Refer to Paragraph 303, Compressed Gasses, for additional requirements concerning specific gases, and compressed gas cylinder use, care, and storage requirements.

t) Electric welding: Only approved electric welding equipment shall be used:

(1) The electric welding machine shall be properly grounded before use.

(2) Rules and instructions supplied by the manufacturer or affixed to the machine shall be followed.

(3) Welders shall not strike arc with an electrode, whenever persons are nearby who might be affected by the arc.

(4) When electrode holders are to be left unattended, the electrodes shall be removed and the holders shall be so placed or protected that they cannot make electrical contact with employees or conducting objects.

(5) When the welder must leave the work or stop work for any appreciable length of time, or when the welding

machine is to be moved, the power supply switch to the equipment shall be opened.

u) For additional information concerning the requirements for welding and cutting, refer to OSHA Standards 29 CFR 1910.252 and 29 CFR 1910.253.

113 Cellular Telephones & Electronic Wireless Communication Devices

a) Personal use of telephones will be limited to the following guidelines:

(1) Cellular telephones should be used only for high priority personal communication and not for casual use.

(2) The volume of the ringer on the cellular telephones and pagers must be kept at a minimum as not to startle other workers performing tasks.

(3) If a call must be received or made, the worker must ensure that the work area and all personnel in the work area are safe before answering or calling.

(4) Cellular telephones will be turned off or placed on voice mail while performing the following tasks: Performing and "hot work"

- Working from the bucket of an aerial lift
- Climbing or "belted off" on wooden poles or structures
- Climbing or working on steel structures of a substation
- Any time you are working with a crew or by yourself where the call would create a safety issue or unnecessary work stoppage
- While driving or operating any vehicle, unless hands free call/talk system has been permanently installed on the vehicle.

b) Work use of telephones should be covered by your utilities own telecommunication policy.

114 First Aid

114.1 Introduction

The material in this section is intended to act as an overall guide to first-aid activities. It is not designed as a self-teaching course, but merely reviews some aspects of first-aid techniques for those who have received training in first aid.

The information given is very generalized. Specific action that must be taken at the scene of an emergency cannot be predetermined and will necessarily be modified by the situation. It is important that employees be familiar with the contents of this section and local emergency procedures so as to be better prepared to assist fellow employees in the event of an accident. Employees should follow the current techniques of their employer's CPR/first aid training provider. Details for first aid may be found in the American Red Cross Textbook on First Aid and the U.S. Bureau of Mines First-Aid Manual.

114.2 General

a) Due to potential hazards associated with bloodborne pathogens that cause diseases such as Hepatitis B and AIDS, care shall be taken to limit or eliminate contact with blood or body fluids when administering any type of first aid. Use of rubber gloves, goggles or safety glasses, and a specialized mask for administering CPR is recommended. Employees shall wash hands and other potentially contaminated body areas and remove all contaminated clothing immediately after administering first aid. Employees shall immediately report all exposure to blood and body fluids to their supervisor and follow their Utility exposure control procedures. All blood, body fluids, and used first aid supplies shall be properly cleaned up and disposed of according to federal, state, and local regulations.

b) Employees shall be familiar with the basic techniques for first aid so that they may provide emergency treatment to fellow employees. Personnel should be knowledgeable of the treatment for traumatic shock, means of giving artificial respiration, and control of bleeding. Preplanning for a potential emergency situation is most valuable. All

employees should be aware of the medical services available and how to obtain them.

c) Personnel engaged in overhead line work shall know the essential elements of pole top rescue. They should also be familiar with resuscitation techniques and how to apply such techniques in an elevated position.

d) Where first-aid kits are supplied, employees shall be familiar with the location, the contents, and the instructions given with the first-aid kit. Each employee shall learn to use this equipment, so they can render treatment when needed. Except for minor injuries, the services of a physician shall be obtained.

e) The contents of the first-aid kits shall be inspected to maintain adequate supplies for employee protection. Inspections shall be conducted as frequently as necessary.

f) For additional information concerning first-aid requirements, refer to OSHA Standards 29 CFR 1910, Subpart K and 29 CFR 1910.1030.

114.3 Wounds and Control of Bleeding

a) A person can bleed to death in a very short time--less than 1 minute. Therefore, in the event of an injury that results in significant bleeding, immediate steps must be taken to prevent the loss of blood.

b) Bleeding may be controlled by the following methods:

Preferred Method:

(1) Direct pressure: Application of pressure directly on the wound. Use of a sterile dressing is preferred. In an emergency, use any dressing.

Alternate Methods:

(2) Indirect pressure on pressure points: Application of pressure on the arterial pressure points in the arm or leg. Pressure points may be combined with direct pressure to restrict severe bleeding (Refer to Figure 1.1).

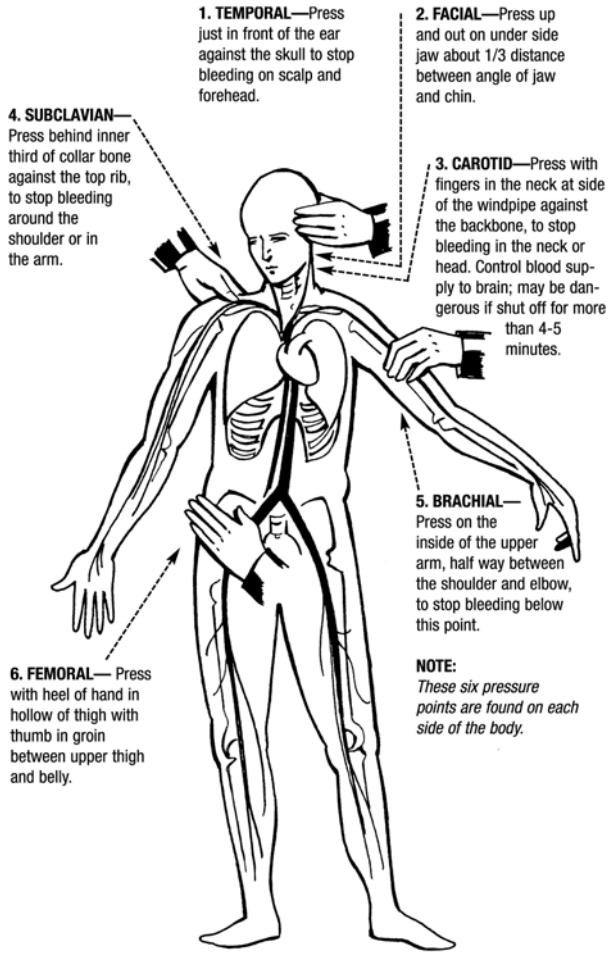
(3) Elevation: Loss of blood can be slowed by raising the wound above the level of the heart.

Extreme Method:

(4) Tourniquet: The use of a tourniquet is a desperation action. It shall be used only for severe, life-threatening

bleeding that cannot be controlled by any other means. Tourniquets should be applied as close to the wound as possible and should not be loosened except by trained, professional medical personnel, normally at the hospital. (If the tourniquet is loosened, severe shock can result.)

Figure 1.1 Six Pressure Points to Stop Arterial Bleeding



114.4 Shock

a) Shock usually occurs following a severe loss of blood or some type of serious injury. It can occur from a minor injury or even from anxiety or emotional stress. Regardless of the cause, the symptoms are the same and similar treatment is required.

b) Shock is easier to prevent than to cure. Every injured person is potentially a shock victim and should be treated as such, whether the symptoms of shock are present or not.

c) The following are symptoms of shock:

(1) Chalk-like appearance.

(2) Dull or anxious expression.

(3) Shallow breathing.

(4) Weak rapid pulse.

(5) Cold, moist skin.

d) Recommended treatment for shock includes the following:

(1) The victim should be kept warm and comfortable, but not hot. In many cases, the only first-aid measure necessary and possible is to cover the victim underneath as well as on top to prevent loss of body heat.

(2) Keep the victim's body horizontal or, if possible, position him so that his feet are at least 6 inches higher than his head. In any case, always keep the victim's head low. The single exception to this positioning is the case of a victim who obviously has an injury to his chest and has difficulty breathing. This victim should be kept horizontal with head slightly raised to make his breathing easier.

(3) Clear the victim's mouth of all foreign bodies and make sure he is breathing properly.

(4) Loosen tight clothing at the neck, the chest, and the waist.

(5) Proper transportation is never more imperative than in the case of a person who may develop shock. It constitutes the most important single measure in the prevention and treatment of shock. Use an ambulance, if possible. If other means must be used, follow the above points as closely as possible.

114.5 Eye Injuries

a) Foreign Bodies:

(1) When a small foreign body, such as dust or a wood flake, is on the eye or eyelid, moderate efforts may be made to remove it. The edge of a clean handkerchief or some similar device may be used. Never use a matchstick, knife, or other such instrument that might damage the eye.

(2) Objects embedded in the eye must not be removed, except by a physician. Both eyes of the injured employee should be bandaged loosely and the employee taken to the doctor immediately. The injured employee should be told to relax and try not to move his eyes.

b) Chemical Burns, Acid or Caustic: Immediate irrigation of the eye with large quantities of clean water is mandatory whenever a chemical substance enters the eye. Flushing of the eye with running water should continue for 15 minutes.

c) All eye injury cases, regardless of first-aid measures taken, should be taken to a physician to be checked, and applicable treatment administered.

114.6 Artificial Respiration--General

Whenever a person is found unconscious, check to determine if the person is breathing. If the person is not breathing, rescue breathing is to be started as soon as possible without endangering the rescuer.

a) In electric shock cases, do not rush in and become a casualty yourself. If possible, de-energize or insulate the power source. Remove victim from electric lines with a dry, nonconductive material. When safe to do so, start rescue breathing.

b) Attempt to stop any serious flow of blood.

c) Tilt victim's head back to open airway. Do not waste time trying to clear anything out of victim's mouth. Commence rescue breathing but if unable to get air into victim's lungs, stop and clear air passage of obstruction. Reposition the head and try again to breathe into the victim. If still unable to get air into the victim, give six to ten quick manual thrusts upward on abdomen between the rib cage and navel. Then, with a hooking motion with your finger, sweep through the victim's mouth to remove any obstruction. Retilt the victim's head

and start again to give rescue breathing. If unsuccessful, repeat the procedure until air passage is open and you can successfully inflate the victim's lungs.

d) If help is available, notify your office or the system dispatcher while one rescuer is giving rescue breathing: BE SURE TO GIVE EXACT LOCATION OF VICTIM.

e) Continue uninterrupted rescue breathing until victim is breathing without help or until additional help arrives.

f) One breath is given every 5 seconds. If another individual is available to help, changes in rescuers shall be done as smoothly as possible without breaking the rhythm. If necessary to move victim from imminent danger or to prepare him for transport, rescue breathing may be interrupted for not more than 30 seconds.

g) Watch victim carefully after he revives. Do not permit the victim to exert himself.

h) Treat victim to prevent shock. Transport the victim to a doctor or hospital for examination and disposition.

114.7 Artificial Respiration--Mouth-to-Mouth (Nose)

a) Place victim on back. Place head slightly downhill, if possible. Tilt head backward so chin points straight upward.

b) Grasp victim's jaw and raise upward until lower teeth are higher than upper teeth; or place fingers on both sides of jaw near ear lobes and pull upward. Maintain jaw position throughout resuscitation period to prevent tongue from blocking air passage.

c) Pinch victim's nose shut with thumb and forefinger, take a deep breath, and place your mouth over victim's mouth making airtight contact; or close victim's mouth, take a deep breath and place your mouth over victim's nose making airtight contact. If you hesitate at direct contact, place a porous cloth between you and victim. (For an infant, place your mouth over its mouth and nose.)

d) Breathe into the victim's mouth with two long breaths and watch for the victim's chest to rise. Each breath should last 1 to 1-1/2 seconds. Allow the victim's chest to deflate between breaths.

e) If you do not see the victim's chest rise and fall, reposition the head and try again. If repositioning the head is not effective, administer six to ten manual abdominal thrusts and sweep the mouth

for any foreign objects. Repeat this step until the victim's airway is opened.

f) If the victim's chest does rise and fall, take the victim's pulse at the carotid artery. Maintain the airway by continuing the downward pressure of your hand on the forehead. Use the hand that is holding the victim's chin up to feel for the pulse. Slide your fingers down from the chin and find the Adam's apple with your fingertips, about halfway between the victim's chin and collarbone. Draw your fingers back toward you into the groove beside the Adam's apple. Press lightly to feel the pulse with the most sensitive part of your fingertips. Remember not to use your thumb because it has its own pulse. Feel very carefully to find a pulse; take at least 5 seconds and up to 10 seconds if necessary. If there is no pulse, begin external cardiac compression as described in Paragraph 114.8.

g) If the victim has a pulse, continue rescue breathing at a rate of once every 5 seconds, or 12 times per minute. Lift your mouth away after each inflation, turn your head, and watch the victim's chest fall as you allow time for the lungs to empty after each breath.

h) Check the pulse once a minute (after every 12 breaths) to be sure that the heart is still circulating blood even though breathing has stopped. Continue to breathe for the victim as long as the breathing inadequacy continues or until additional help arrives.

114.8 Cardiopulmonary Resuscitation (CPR)

The information given in this section is not intended as instruction for the administration of cardiopulmonary resuscitation. Such treatment should be given only by persons who are properly trained and qualified. The following is a reminder to those persons of the points to be followed. If not administered properly, CPR may result in other serious injuries.

Perform CPR only when indicated.

If no pulse can be felt, CPR may be started. CPR is always accompanied by rescue breathing. If available, two persons should perform rescue efforts for the victim; one should give rescue breathing while the other performs external heart compression. Five compressions should be given for every one ventilation. If only one

rescuer is present, 30 compressions should be given for every two full breaths.

a) Place victim on back on a firm surface.

b) Put hands on breastbone. Place heel of one hand on lower one-half of breastbone with other hand on top of first.

c) Press downward. Apply pressure until breastbone moves 1-1/2 to 2 inches.

d) Lift hands and permit chest to return to normal.

e) Repeat compression 80 to 100 times per minute.

f) After the first four cycles of compressions and ventilations for one-person CPR and after 10 cycles for two-person CPR, stop and check for a spontaneous pulse. After that, pause every few mintues to check for spontaneous pulse.

CAUTION: Never begin chest compressions on someone whose heart is still beating, even if the victim's pulse is weak or irregular. Performing compressions on a person whose heart is functioning could cause the heart to stop.

115 Training

115.1 Employee Training

a) 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.

b) 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.

c) Employee training is not confined to this section and can be found throughout this *Safety Manual* in more specific sections.

115.2 Qualified Employee Training

a) Qualified employees shall be trained and competent in the skills and techniques necessary to distinguish exposed live parts from other parts of electrical equipment.

b) Qualified employees shall be trained and competent in the skills and techniques necessary to determine the nominal voltage of exposed live parts.

c) Qualified employees shall be trained and competent in the skills and techniques necessary to determine the minimum approach distances corresponding to the voltages to which they are exposed.

d) Qualified employees shall be trained and competent in 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.

e) Training may be classroom or on-the-job.

f) Training shall establish employee proficiency in the work practices required.

115.3 Safety Compliance

Regular supervision and inspections, conducted on at least an annual basis, will determine that each employee is complying with the safety-related work practices required.

115.4 Additional Training and Retraining

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

a) If supervision and annual inspection indicate that the employee is not complying with safety-related work practices.

b) If new technology, new procedures, or changes in procedures cause new safety-related work practices to be introduced.

c) If the employee must use safety-related work practices that they do not normally use (used less than once a year).

115.5 Job Briefings

a) The employee in charge shall conduct a job briefing with the employees involved before the start of each job. The job briefing will at least cover the following subjects: hazards associated with the job, work procedures involved, special precautions, energy source controls, and personal protective equipment requirements.

b) If the work or operations to be performed during the work day are repetitive and similar, at least one job briefing shall be conducted before the start of the first job of each day or shift. Additional job briefings shall be held if significant changes, which might affect the safety of the employees, occur during the course of the work.

c) A brief discussion is satisfactory if the work involved is routine and if the employee, by virtue of training and experience, can reasonably be expected to recognize and avoid the hazards involved in the job. A more extensive discussion shall be conducted if the work is complicated or extremely hazardous, or the employee cannot be expected to recognize and avoid the hazards involved in the job.

d) An employee working alone need not conduct a job briefing. However, the employee shall ensure that the tasks to be performed are planned as if a briefing were required.

115.6 Pole-Top Rescue

Electric contacts may occur at elevated locations. When such a contact does happen, immediate rescue is necessary.

Rescue operations will vary, depending upon the prevailing situation. The information in this section is intended to serve only as a guide.

Preplanning and training for a possible emergency is important.

a) Size up the situation. The rescue effort will be far more effective if a few seconds are devoted to full identification of the situation.

b) Radio for help. Prepare the equipment you will need.

c) Protect yourself. Apply necessary protective equipment. Use necessary personal protective devices. Then clear the victim from the hazards.

d) Position yourself for rescue.

e) Proceed with rescue or resuscitation as dictated by the conditons:

(1) If victim is conscious:

(a) Reassure the injured.

(b) Be watchful for shock.

(c) Help injured descend the pole.

(d) Administer first aid.

(2) If victim is unconscious and breathing:

(a) Watch breathing closely.

(b) Lower injured to ground.

(c) Give first aid.

(d) Summon medical assistance.

(3) If victim is unconscious and not breathing:

(a) Give victim two full breaths.

(b) Lower the victim to the ground as soon as possible and initiate CPR.

Note: If it becomes apparent that the victim cannot be lowered to the ground in a short period of time, it may become necessary to apply pole-top resuscitation.

f) Pole-top resuscitation:

(1) Mouth-to-mouth artificial respiration should normally be used. The method is similar to that described above, except for the position of the victim.

g) Lowering victim from the pole:

(1) For field expediency, the following method is presented:

(a) Place handline on crossarm, preferably 2 or 3 feet from pole.

(b) Make one wrap of line. Do not cross line over fall line.

(c) Pass handline under armpits.

(d) Tie three half-hitches.

(e) Cinch line tightly around victim.

(f) Remove slack in line.

(g) Cut victim's safety.

(h) Lower victim.

(2) Depending upon the situation, alternate hitching or lowering methods might be more desirable.

115.7 After Rescue

All victims of electric contact shall be transported to a doctor or a hospital for examination and observation.

115.8 Training in Resuscitation and Rescue

All employees engaged in electrical work shall receive training in resuscitation and in rescue from their working environment (poles, structures, manholes, boilers, aerial baskets, confined or enclosed spaces, etc.).

Section 2 HEALTH AND ENVIRONMENTAL CONTROL

This section deals with general health areas and depicts some of the control methods that employees must use for their protection. The general principles outlined in this section are applicable to all work activities. However, specific control measures applicable to a specific work activity are covered in the section dealing with that work activity.

Work processes and work locations can present health hazards to the employee. Because most of these health hazards do not pose an immediate danger, they are frequently not given the attention that is necessary.

In order for employees to be fully protected, they must become as knowledgeable as possible of potential health hazards. Thorough understanding of the principles of this section is essential.

201 Confined or Enclosed Spaces

A confined space is large enough for an employee to enter and perform assigned work and has limited or restricted means for entry or exit and is not designed for continuous employee occupancy. A permit-required confined space has one or more of the following characteristics:

(1) contains or has a potential to contain a hazardous atmosphere(s);

(2) contains a material that has the potential for engulfing an entrant;

(3) has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross section; or

(4) contains any other recognized serious safety or health hazard.

Determine if the space to be entered is a permit-required confined space and enter accordingly.

a) Only employees who have been properly trained on the hazards associated with confined or enclosed space work shall be allowed to enter a confined space or enclosed space.

b) Employees who enter enclosed spaces or who serve as attendants shall be trained in the hazards of enclosed space entry, enclosed space entry procedures, and enclosed space rescue procedures.

c) Before any entrance cover to a confined or enclosed space is removed, it shall be determined that there are no temperature or pressure differences, or other hazardous conditions that may injure the employees removing the cover.

d) When covers are removed from confined or enclosed spaces, the opening shall be guarded by a railing, temporary cover, or other temporary barrier.

e) Before entering a confined or enclosed space, all levels of the space shall be tested for lack of oxygen and then for the presence of flammable or toxic gases and vapors. Monitoring instrumentation must be calibrated.

f) If a hazard increasing work activity is to take place in a confined or enclosed space (i.e., welding, painting, working with solvents and coating), the air in the space shall be continuously tested for the presence of flammable or toxic gases and vapors or insufficient oxygen. Forced ventilation shall be used as required.

g) If flammable or toxic gases or vapors are detected or if an oxygen deficiency is found, the space shall be continuously tested and forced ventilation shall be used to maintain oxygen at a safe level and to prevent a hazardous concentration of flammable or toxic gases and vapors.

h) While work is being performed in an enclosed space, a person with CPR and basic first aid training shall be immediately available to render emergency assistance if there is reason to believe that a hazard may exist in the space or if a hazard exists because of traffic patterns in the area of the opening used for entry. If work is to be performed in a confined space, the Utility's written permit system shall be followed. A properly trained attendant shall be stationed outside the confined space. The attendant shall maintain continuous communication with the employees authorized to be in the confined space. The attendant shall be able to recognize confined space hazards and changing conditions in the confined space that could affect employees in the space. In the event of an emergency, the attendant shall not enter the

confined space, but shall be able to summon emergency and rescue services.

i) Entry into a confined or enclosed space with an unsafe atmosphere shall be avoided if at all possible. Employees required to enter a confined or enclosed space with an unsafe atmosphere shall be equipped with a fresh-air breathing apparatus, body harness, and lifeline monitored by a properly trained attendant. Necessary rescue personnel and equipment shall be available in the event of an emergency.

j) Electric welding, gas welding, cutting, or any other hot work shall not be performed on the interior, exterior, or near the openings of any confined or enclosed space that may contain flammable or explosive gases or vapors until the space has been properly cleared.

k) Compressed gas bottles shall not be taken into a confined space.

l) Safe access to the confined space shall be maintained at all times. If possible, all cords, hoses, leads, etc., shall be routed through an entrance other than the employee access into the confined space.

m) Before employees are allowed to enter a confined space, all electrical and mechanical energy sources that could affect the employees working in the space shall be physically rendered inoperative, locked out, and tagged. If required, the space shall be drained, vented, and cleaned.

n) For additional information concerning confined space requirements, refer to OSHA Standards 29 CFR 1910.269 and 29 CFR 1910.146.

202 Hazardous Energy Control/Lockout-Tagout (Refer to Utility Dispatching Policies)

a) Before starting work on any circuit, machine, belting, shafting, or other apparatus that is out-of-service, employees shall assure themselves that the apparatus is physically rendered inoperative and that a standard Hold Card, tag, and/or lockout device is properly attached to the apparatus control.

b) No switch, governor, valve, throttle, or other device used to put a circuit or equipment into service shall be operated while a Hold Card or similar device is attached to it.

c) A Hold Card, or similar device, that has been placed for the protection of workers shall be removed only by authorization of the person in whose name it was placed, and then only after the work has been completed and workers and tools are in the clear. (Follow Utility operating instructions pertaining to the equipment involved.)

d) Each employee in charge of work on any equipment shall have their Hold Card or similar device secured to the apparatus control.

Note: See Paragraphs 510.1, 510.2, 510.3, 510.4, and 510.15 covering Generating Stations.

e) For additional information concerning Hold Cards and tag requirements, refer to OSHA Standards 29 CFR 1910.269 and 29 CFR 1910.147.

202.1 Control of Hazardous Energy/Lockout-Tagout

Includes employees authorized to work on Utility System.

a) Safety

(1) Safety must be the first consideration. All safety rules of the company plus the APPA Safety Manual must be known and followed by each employee. Employees are expected to use judgment, common sense, and diligence in following these rules. Visually inspect all equipment for damage and identify possible problems before starting work or switching. Lines, cables, stations, or equipment are considered de-energized and ready for work only after the equipment has been identified and isolated, a clearance has been issued, and the equipment has been tested and grounded.

b) Authority

(1) Authority of the system operator: the system operator has the authority and responsibility for switching and clearances on lines, cables, stations, and equipment of 600V or above.

(2) The system operator has the authority and responsibility for switching and clearances on lines 35 kV and lower voltage. System operator shall follow operating guidelines for switching and clearance of lines above 35 kV. “System operator” refers to the employee with jurisdictional authority.

(3) System operator may authorize employees to act in the capacity of the system operator for switching and clearances in sections of the system.

(4) System operator issues orders to open and close switches (including underground elbows), to place and remove tags, and to de-energize or clear lines, cables, stations, and equipment on which employees will work, except where standing orders or regulations have been given covering such operations.

c) Interconnections with Other Utilities

(1) The designated representative has jurisdiction over interconnections with other utilities and systems. They shall arrange with other utilities for switching and clearances on all interconnections, and will inform the system operator affected system operation center of the duration and reason for the clearances.

(2) Where lines of other utilities are involved in the operation of the system, system operators shall cooperate with those of other utilities who have jurisdiction, giving and accepting switching orders through them switching connecting lines or stations.

d) Interconnections with Customer Primary Systems

(1) Where the customer primary system is mapped and identified, the system operator may issue orders for switching and clearances on the customer lines, cables, stations, and equipment.

(2) Where the customer primary system is not identified, the system operator shall not issue orders for switching and clearances. Employees must ensure the lines, cables, stations, and equipment are de-energized, then identified, isolated, tagged, tested and grounded before work begins. Customers may also have lockout and tag-out procedures that must be observed.

e) Communications

(1) Communications in connection with switching and clearances shall be given by system operator directly to the employee in charge of operating the switch or receiving the

clearance. Communications may be relayed through a third party if all parties are in agreement.

(2) Switching orders on clearances shall be repeated word for word back to the speaker, using correct designation of lines, cables, or equipment. Speakers shall identify themselves by name each time.

f) Safety Tags

(1) DANGER DO NOT OPERATE tags are red. These tags must be filled out and attached to the control device or card holder of each switch or breaker that could energize the line, cable, station, or equipment to be worked on.

(2) Equipment tagging uses the DANGER DO NOT OPERATE tag in substations, switching stations, distribution equipment, and in special situations. When the DANGER DO NOT OPERATE tag is placed on the switch and control devices normally used to energize the line, station, or equipment to be worked on.

(3) Attach the appropriate safety tags to equipment during switching and clearance operations.

(4) Attach tags to the control devices of circuit breakers and switches.

(5) Place tags in holders provided on or near the operating mechanisms of switch operating mechanisms.

(6) Attach tags to switch-operated single-pole disconnect switches in substations and other appropriate locations.

(7) Attach tags to cable or fuse handle of underground cable.

(8) Tags will be substantial enough to withstand adverse environmental conditions. Tags will have an attachment point with a breaking strength of at least 50lbs. Tags may not be reused.

g) Tagging Procedures

(1) Follow these steps to use a DANGER DO NOT OPERATE tag when obtaining clearance from the system operator.

- Name of employee in direct charge of the work who is requiring the clearance.

- Name of the system operator who is issuing the switching orders.
- Time and date that the switch is opened and closed.
- Signature of the employee operating the switch.
- System operator incident number.

(2) Complete a DANGER DO NOT OPERATE tag for each switch to be opened or verified OPEN for the purpose of issuing a clearance.

h) You *must* request a HOLD tag before performing hotline work on lines 35 kV and higher.

i) You *may* request a HOLD tag before performing hotline work on primary circuits of 35 kV and lower.

This process describes how to use a HOLD tag:

(1) Employee – Requests a HOLD tag before beginning hotline work on lines of 55 kV or higher.

(2) Orders the breaker placed on non-reclose, and a HOLD tag attached to the circuit breaker or recloser's control device.

(3) Employee – Attaches the HOLD tag.

(4) System operator – Notifies the employee that the recloser is on non-reclose and is HOLD tagged.

(5) Employee – Contacts the power dispatcher or system operator if a line relays out while under a HOLD tag.

(6) Power dispatcher or system operator – Confirms with employee that the crew is in the clear *before* re-energizing the line.

j) Self-Protection Clearance

(1) Requirements: Employees familiar with lines, cables, stations, or equipment may use optional self-protection clearances. Employees also must be familiar with Personal Protective Equipment (PPE) rules.

(2) Self-protection clearances may be used only on single-phase and three-phase radial distribution lines where other points of electrical contact or sources of hazardous induced voltage from adjacent energized lines do not exist.

(3) No more than one self-protection clearance may be taken on the same line at any one time.

(4) Requirements: The DANGER DO NOT OPERATE tag becomes the legal record of the clearance and must be completed and returned to the service center with the switching, clearance and customer outage information by the employee who obtained the clearance. These self protection tags must be retained by the service center for a minimum of three years.

(5) Follow these steps to obtain and release a self protection clearance.

- Fill out a DANGER DO NOT OPERATE tag:
- Check the “self-protection” box
- Name of employee taking the clearance
- Bounds of clearance
- Exact location
- Switch number
- Time

(6) Take a self-protection clearance by opening and tagging the section of line with the DANGER DO NOT OPERATE tag.

Visually inspect the line to ensure there are no other points of electrical contact (normal opens, etc.)

(7) Confirm that the line is identified, isolated, tested, and grounded.

(8) Proceed with and complete the job.

(9) Release self-protection clearance by removing personal protective grounds and ensuring all workers and equipment are in the clear.

10) In normal operating conditions (non-storm), verify with the system operator that the hotline work switch is in the OFF position before energizing the line, cable, or device.

k) Clearance for Interconnections with Other Utilities

(1) The Utility shall arrange with other utilities 48 hours in advance for switching and clearances on all interconnections, and will inform the affected system operations center of the duration and reason for clearances on interconnections.

(2) Follow these steps to obtain and release a clearance for non-company employees.

- System operator: Issues two clearances to the Utility employee: one for the Utility employee and one for the non-Utility employee.
- Employee: Ensures the non-Utility employee understands the full extent of the clearance, and what lines, cables, stations, or equipment are isolated and tagged.
- Issues the non-Utility employee their clearance to proceed with the work. The Utility employee may then leave the jobsite.
- Non-Utility employee: Proceeds with and completes the job.
- Releases the clearance to the same Utility employee.
- Utility employee: Inspects the lines, cables, stations, and equipment.
- Ensures the non-utility employee is clear and understands the system is to be re-energized.
- Releases the clearance to the system operator.
- System operator: Orders both sets of tags removed and the system restored to normal.

202.2 Distribution Switching Procedures

The following procedures describe basic switching orders for the underground and overhead systems. The procedures and radio communications can be modified to fit particular circumstances. Complete and detailed coverage of all possible situations have not been attempted. Radio communications appear in italics.

a) Distribution Hotline Work – Non-Reclose without Hotline Work Switch:

1) *At (substation name) place Circuit Breaker (CB) ## on NON-RECLOSE and HOLD tag for (name).*
2) To restore: *At (substation name) remove (name) HOLD tag and restore the reclosing on CB ##*

(2) Distribution Hotline Work – Non-Reclose with Hotline Work Switch:

- *At (substation name) place CB ## on NON-RECLOSE and HOLD tag for (name), and turn hotline work switch ON.*
- To restore at (substation's name) remove (*name*) *HOLD tag, restore the reclosing on CB ## and turn hotline work switch NORMAL.*

(3) Distribution Ground Overcurrent Relay and Cutout Switch: While switching in a distribution substation, ground trips should be cut only where an abnormal condition exists, where single-phase switching could trip the CB.

- *As (substation name) cut out the ground trips to CB ##.*
- To restore: At *(substation name) cut in the ground trips to CB ##.*

(4) Distribution CB Switching

To clear a Station CB Using Auxiliary Bus: Follow these steps when paralleling two CBs on the auxiliary bus that are fed from separate transformers in a two-bank station.

- Match the Load Tap Changing (LTC)
- Place the controls in the OFF position.
- Turn the reclosing OFF and hotline switch ON in each CB.
- *At (substation name) place CBs ## and ## on NON-RECLOSE, and hotline work switch ON. Close the auxiliary bus disconnects on CBs ## and ##. Open CB ## (the one to be cleared). Check that the contact position indicator shows OPEN. Open its line and main bus disconnects and tag for (name). Restore the reclosing line on CB ##, and turn hotline switch OFF.*
- To Restore: At *(substation name) remove (name) tags. Check that CB ## is mechanically open and on NON-Reclose and hotline work switch is ON. Cut out reclosing on CB ##. Close line and main bus disconnects and close CB ##. Check for load. Open auxiliary bus disconnects on CBs ##*

and ##. Restore non-reclosing. Turn hotline work switch OFF in CBs ## and ##.

(5) To clear a Station CB Using an Alternate Substation's Circuit: Follow these steps to clear a station CB using an alternate substation's circuit.

- Before transferring the load, place the CB to which the load is being transferred to NON-RECLOSE.
- Place both circuits in NON-RECLOSE so that in the event of a fault on the tie switch, neither breaker would close back in.
- Place the LTC at one station (preferably the one whose CB is to be cleared) in the OFF position so the two LTCs do not interact with each other.
- *At (substation name* where the CB is being cleared) *place the CB ## on NON-RECLOSE. Turn the LTC control* OFF (have switch operator close field switch).
- *At (substation name) open CB ##* (to be cleared), *check that the contact position indicator shows OPEN. Open its line and main bus disconnects and tag for (name). Restore the LTC controls to AUTO.*
- After load transfer is complete, restore the reclosing on the CB to which the load had been transferred.
- To restore: Before transferring the load, place the CB that is carrying the load on NON-RECLOSE.
- *At (substation name* where CB is out of service) *remove (name) tag. Check that CB ## is mechanically open and on NON-RECLOSE. Turn the LTC controls OFF. Close line and main bus disconnects, and close CB ##. Check for load. (*Have switch operator open tie switch in the field). *Restore reclosing to CB ##, and restore the LTC controls to AUTO.*

- After load transfer is complete, restore the reclosing on the CB that was carrying the load.

202.3 Distribution Substation Load Tap Changing (LTC)

Whenever all load is being transferred from a distribution substation follow these steps.

- *At (substation name) place the LTC on NEUTAL and OFF. Open the bank low side switch and tag for (name). Open the bank high side switch ####, and tag for (name).*
- To restore: At *(substation name) check that the LTC is on NEUTRAL and OFF. Remove all (name) tags. Close the bank low side switch. Switch to restore load to station,* (monitor and adjust LTC voltage level as load increases). *Return LTC controls to AUTOMATIC.*

202.4 Substation Transformer High Side Protection

(1) Follow these steps to clear a station with a high side switch.

- Transfer the load.
- *At (substation name) place LTC on NEUTRAL and OFF. Open the bank low side switch* (if LTC) *load and source side disconnects. Open high side switch ####, and tag for (name).*
- To restore: At *(substation name) remove all (name) tags, check that the LTC Is on NEUTRAL and OFF. Close high side switch ####. Close band low side switch, load, and source side disconnects. Restore load to bank,* (monitor and adjust bank voltage level as load increases). *Return LTC to AUTOMATIC and close the capacitor CB.*

(2) Follow these steps to clear a station with high side CB.

- Transfer the load.
- *At (substation name) place LTC on NEUTRAL and OFF. Open the bank low side switch* (if

LTC) *load and source side disconnects. Open the bank high side CB ####, open its disconnects, and tag for (name).*

- To restore: At *(substation name) remove all (name) tags, check that the LTC is on NEUTRAL and OFF. Check the bank high side CB #### is open. Close its disconnects. Close bank high side CB ####. Close bank low side switch load and source side disconnects. Restore load to bank,* (monitor and adjust the bank voltage level as load increases). *Return LTC to AUTOMATIC and close the capacitor CB.*

(3) Follow these steps to clear a station with one or more high side fuses open (*an emergency situation*).

- Contact the system operator to de-energize the substation with a loadbreak switch.
- After he line is de-energized, open the bank high side. Notify the power dispatcher to re-energize the line. Tag the open bank high side.
- Place the station CBs on NON-RECLOSE. Open the CBs, and then the associated line, bus, and auxiliary disconnects.
- Restore load and issue clearances as required.

202.5 Overhead Switching Devices and Equipment

***NOTE*:** If the overhead equipment does not have additional load side disconnects, disregard references to the load side disconnect in the following switching procedures.

(1) Follow these steps to cut out reclosing on a line recloser.

- *At recloser ####, place on NON_RECLOSE and HOLD tag for (name).*
- To restore: At *recloser ####, remove (name) HOLD tag and restore the reclosing.*

(2) Follow these steps to remove a line recloser from service.

- *At recloser ####, place on NON-RELCOSE. Close the bypass disconnects. Open recloser ####. Open load and source side disconnects.*
- *To restore: At recloser ####, check open. Close the source and load disconnects. Close recloser ####. Open the bypass disconnects, and restore the reclosing.*

(3) Follow these steps to bypass a line sectionalizer.

- *At sectionalizer ####, close the bypass disconnects. Open sectionalizer ####. Open the load and source sides disconnects.*
- *To restore: At sectionalizer ####, check open. Close and load the source side disconnects. Close sectionalizer ####, and open the bypass disconnects.*

(4) Follow these steps to bypass an auto-booster.

- *At auto-booster ####, run the auto-booster to NEUTRAL* (verify with the neutral light, and leave controls on LOWER while switching). *Close the bypass switch. Open the load and source side disconnects.*
- To restore: *At auto-booster ####, close the source side disconnect. Check the auto booster* (in NEUTRAL, neutral light on and controls on LOWER). *Close the load side disconnects. Open the bypass disconnect and return the controls to AUTOMATIC.*

202.6 Underground Switching Procedures

(1) Padmount Gang Switch: At *switch ####, open/close position #, cables ###. Check open/close.*

(2) Padmount Three-Phase Solid Blade Switch: *At switch ####, open/close position #, cables ###. Check open/close.*

(3) Padmount Single-Phase Solid Blade Switch: *At switch ###, open/close cable ###.*

(4) Underground Loadbreak Elbow: *At (vault identification or location, e.g. south or north end) of cable ###, open and park cable ###.*

(5) Underground Termination: *Open/close underground termination (UGT) switch ###, cables ###.*

202.7 Transmission Switching Procedures

(1) Follow these steps to clear and restore a substation CB.

- At breaker ####, place breaker on NON-RECLOSE.
- Open the CB by supervisory, or obtain an order to open it locally.
- Place supervisory control on LOCAL.
- Check that the CB is mechanically open.
- Open line and main bus disconnects, and tag. (Hang a "DANGER DO NOT OPERATE" tag on the control handle inside the control house if applicable).
- To restore: Check that the CB is mechanically open.
- Remove all tags.
- Close line and main bus disconnects.
- Restore supervisory control to REMOTE.
- Close the CB by supervisory or obtain an order to close it locally.
- At breaker ####, restore reclosing.

(2) Clearance cannot be issued on any line that has a motor operated switch on any terminal until the following switching has been done.

- Open the switch. Turn supervisory to LOCAL and automatic transfer to MANUAL if appropriate.
- Cut out power to the motor operator.
- Disengage the linkage.
- Lock the switch in the open position.

- Tag.
- To restore: remove tags.
- Unlock the switch.
- Engage the linkage.
- Cut in the power to the motor operator.
- Close the switch. Turn supervisory to REMOTE and automatic transfer to AUTOMATIC if appropriate.

(3) Follow these steps to clear a transmission line that has a CB at one or more terminals.

- Open and tag all sources of feed.
- Disengage motor operated switches.
- Test for voltage.

(4) Transmission Hotline Work –Non-Reclose

- *At (substation name) on (line name) place CB ## on NON-RECLOSE and HOLD tag for (name).*
- *To restore: At (substation name) on (line name) remove (name) HOLD tag and restore the relcosing on CB ##.*

203 Fall Protection

a) When an employee is exposed to a fall in excess of 4 feet and protective measures such as catch platforms, guardrails, and safety nets are not practical, the employee shall be protected by the use of fall arrest equipment or positioning devices such as body belts, body harnesses, lanyards, lifelines, and rope grabs. When choosing fall arrest equipment or positioning devices, consideration should be given to the type of work to be performed and limiting the shock load on the body of the wearer in the event of a free fall. Employees working from aerial lifts shall wear full body harnesses with a shock-absorbing lanyard, attached to the appropriate anchor point on the aerial lift.

b) All fall protection equipment shall be inspected prior to use by the wearer as required by the manufacturer and applicable ANSI standard.

c) Employees shall rig fall arrest equipment so that they cannot free fall more than 6 feet or contact any lower object. When positioning devices are used, they shall be rigged to limit free fall to 2 feet. Anchorage points for fall arrest equipment and positioning devices shall be capable of supporting a shock load and located above the employee's body belt or harness attachment point.

d) Body belts shall be worn snug just above the wearer's hips.

e) Employees shall avoid the following lanyard snaphook connections to help eliminate the possibility of accidental disengagement (roll-out):

(1) Snaphooks without locks.

(2) Two (or more) snaphooks connected to one D-ring.

(3) Two snaphooks connected to each other.

(4) A snaphook connected back on its integral lanyard.

(5) Improper dimensions of the D-ring, rebar, or other connection to the snaphook dimension.

f) Snaphooks may not be connected to loops made in webbing type lanyards.

g) When vertical lifelines are used, each employee shall be protected by a separate lifeline. The lifeline shall be properly weighted at the bottom and terminated to preclude a device such as a rope grab from falling off the line.

h) Horizontal lifelines should be limited to two persons at one time between supports.

i) Fall arrest equipment shall be used on poles by qualified employees when such conditions as ice, high winds, design of structure (such as no hand holds) or the presence of contaminants exist that could cause the employee to lose his grip or footing.

Exclusion: Fall arrest equipment is not required for qualified climbers who are climbing or changing positions on poles, towers, or similar structures unless conditions such as those listed above exist. This exclusion does not apply to un-qualified climbers undergoing on-the-job training, even though they may be considered qualified employees for other purposes.

204 Lighting

Where natural illumination is not sufficient, artificial lighting shall be used. Temporary lighting (excepting battery powered) shall be protected with approved guards. In areas where flammable or combustible vapors, liquids, gases, dust, or fibers may be present, only intrinsically safe equipment approved for the hazardous location shall be used.

205 Exhaust Ventilation

a) Exhaust systems, when provided at the work location, shall be used.

b) When an exhaust system does not provide adequate protection, other protective means, such as an approved respirator, shall be used in addition to (or in lieu of) the exhaust system.

c) For additional information concerning ventilation requirements, refer to OSHA Standard 29 CFR 1910.94.

206 Hours of Service

a) No employee should work more than a total of 16 hours time on duty, immediately preceded by 8 or more consecutive hours off duty time.

b) Duty begins when the employee reports to work and ends when the worker is released from work, and includes breaks, interim periods, or time spent engaged in any service for the employer.

207 Fire Protection

207.1 Fire Protection and Emergency Plans

a) Employees shall become familiar with and follow all Utility emergency procedures and plans.

b) Employees shall familiarize themselves with the emergency exits, alarm signals, and escape procedures when working inside a building or structure.

c) In buildings or structures, all fire exits and escape routes shall be visibly marked and shall be kept free of obstructions. Fire exits or doors shall not be locked, chained, or barricaded at any time.

d) Employees shall be familiar with both the location and the operation of all fire protection equipment in the vicinity of their work area.

e) Fire protection equipment shall be properly located at all times. Except for actual use, employees shall not move or remove such equipment without proper authority.

f) Only properly trained employees equipped with the necessary protective equipment shall attempt to extinguish or contain a fire.

g) Fire brigade members shall follow the Utility's established policies and procedures.

h) For additional information concerning fire protection and emergency plans, refer to OSHA Standards 29 CFR 1910.38 and 29 CFR 1910.156.

207.2 Fire Extinguishers

a) All employees shall know the classes of fire, their burning characteristics, and the proper extinguishing agent to be used:

(1) Class "A" fires involve ordinary combustibles, such as wood, paper, some plastics, and textiles. Extinguishing agents include water, multipurpose dry chemical, high-expansion foams, and Halon.

(2) Class "B" fires involve flammable liquid and gas fires, such as oil, gasoline, paint, and grease. Extinguishing agents include carbon dioxide, dry chemical, low-expansion foam, and Halon.

(3) Class "C" fires involve energized electrical equipment. Extinguishing agents include carbon dioxide, dry chemical, and Halon.

(4) Class "D" fires involve combustible metals, such as magnesium, potassium, zinc, and titanium. Extinguishing agents include dry powder.

b) Halon is a gaseous extinguishing agent suitable for combating both Class "B" and "C" fires, especially at indoor locations. Both agents are slightly toxic in low concentrations (less than 5 percent) and will cause unconsciousness in a short period of time when the concentration is above 15 percent. When the extinguishing agent is released, precautionary measures similar to those for toxic confined spaces should be used.

c) Employees shall not enter confined spaces after using carbon dioxide extinguishers until the area has been thoroughly ventilated.

d) Fire extinguishers must not be blocked or hidden behind material or machines.

e) All fire extinguishers shall be conspicuously marked and shall be located close to the fire hazard, but not so close that they would be damaged or cut off by the fire.

f) Extinguishers that contain carbon tetrachloride or chlorobromomethane shall not be used.

g) Inverted type extinguishers such as self-generating soda acid or self-generating foam or gas cartridge water shall not be used.

h) All employees shall be trained on the operation of the fire extinguishers in their work area. The following general guidelines shall be considered when using a portable fire extinguisher:

(1) Look to see what is burning and be sure to use the correct extinguisher.

(2) Approach the fire from upwind if possible. Try to get approximately 6 to 8 feet close to the fire (depending on the size and type of the fire).

(3) Hold the extinguisher upright and aim it at the base of the fire.

(4) Be efficient. Most fire extinguishers are emptied in a few seconds.

i) Fire extinguishers shall be inspected visually at least once a month and thoroughly inspected at least annually.

j) For additional information concerning the requirements for fire extinguishers, refer to OSHA Standard 29 CFR 1910.157.

207.3 Hydrants, Standpipes, and Hose Stations

a) Vegetation, snow, and stored equipment shall be kept away from hydrants, hydrant houses, and valve and hose stations.

b) Control valves shall be tested frequently and shall be maintained in the proper position.

c) Connections should be checked with the local fire department to be sure that they are of a size and thread that will fit their equipment.

d) Only lined hose shall be used for hose stations.

e) Fire hose station hose and nozzles shall not be used for any other purpose.

f) When water flows through a fire hose and nozzle, the reverse action of the nozzle, called “nozzle reaction,” can be considerable, tiring a person in a short period of time. A minimum of two persons should be available to eliminate this effect.

g) All movements involving an operating hose line shall be accomplished with slow deliberate movements.

h) The hose line should be kept in line with the direction of the nozzle stream flow. A sharp bend directly behind the nozzle will cause severe pressure to turn the nozzle and create excessive work and potential danger to the user.

i) After use, all hose shall be thoroughly dried and properly racked in the hose station.
j) For additional information concerning hydrants, standpipes, and hose stations, refer to OSHA Standard 29 CFR 1910.158.

207.4 Sprinkler Systems

a) Sprinkler system valve stations shall be kept free of all obstructions.
b) Valves for sprinkler systems shall be maintained in the proper position.
c) A minimum clearance of 36 inches shall be kept between the top of material storage and a sprinkler head deflector.
d) For additional information concerning sprinkler systems, refer to OSHA Standard 29 CFR 1910.159.

208 Security

208.1 General

a) Any individual or group with the intent to attack employees and damage/destroy your plant in order to achieve economic and psychological effects and which also possesses the capability (organizational structure, motivated and trained personnel, weapons, explosives, intelligence and logistical support) is a threat to your plant and personnel.
b) The threat's capabilities, target the plant's overall physical security traits, the physical environment (geography, urban, rural, transportation infrastructure, etc.), how susceptible you the plant is to surveillance, weather and other tangible and intangible items add up to just how vulnerable the plant really is. In terms of tangible traits, the perceived value of the plant as target and the amount of economic and psychological damage that its destruction could bring to a community, region, state or even a nation. The attitudes of plant personnel regarding security awareness and their willingness to maintain a proactive approach toward security are also an intangible, but vital, part of your facility's overall vulnerability.
c) In order to determine the level of threat that may be imposed on the plant, consider the following:

- How critical is the plant, in terms of target value? Would severe damage or total loss impact significantly on local, regional, or national economies, politics, government operations and civil society?
- How accessible is the plant, physically to surveillance? Is it easy to bring vehicles into and out of the facility? How effective is the access control program? How vulnerable are our IT systems to hacking and penetration? Are handheld and vehicular radios routinely used, and, if so, can the transmissions be encrypted?
- How long would it take to recupe and return to full operational status following a disaster or attack? How long to repair or by-pass (if possible) critical mechanical or control systems within the plant? What components would take the longest to repair or replace and are, therefore, most critical?
- How vulnerable is the plant to an attack that could achieve a significant level of damage?
- If an attack is successful, what is the potential effect? Political, economic, psychological, symbolic, or all of the above?
- How easy is it to recognize the plant and critical nodes/components within the facility? Signs that identify critical components/offices and a website "gives away" critical information.

d) For further information on cyber or physical security refer to the North American Electric Reliability Corporation Security Guidelines. See the NERC website for more information at www.nerc.com.

208.2 Personal

a) Although the technical portions of vulnerability identification and mitigation recommendations fall to the plant's Security Director/Manager and/or a contract security consultant, there is much that can be done by everyday plant employees and plant management. It starts with the simple principle of awareness of ones' surroundings. Awareness of what goes on inside and in the immediate area within a

distance of about 200 meters from the plant, in all directions should be maintained at all times. Making a general note of conditions of fencing and gates, security lighting, surveillance systems and alarm systems is a great way to make strides toward identifying vulnerabilities.

b) Include in this effectiveness of security procedures, a lock and key control program, professional security guard services, a layered system of access control measures, and pre-hire background investigations.

c) Never lose sight of the fact that protection of people takes precedence over protection of things. Employees are the greatest assets within any business and their safety and welfare always comes first. In most cases, positive access control to the facility is the single most critical element, along with well-trained security officers, and a proactive background investigation policy for new hires and contractors.

208.3 Generating Facilities

a) Determine how susceptible to surveillance your plant is. Look for vulnerabilities in procedures or barrier systems. Remember that in order to assess vulnerabilities effectively, one must fully understand the nature of any threat against your plant, whether terrorist or criminal.

b) Assessing vulnerabilities has to be done in concert with local, state and federal law enforcement, other private or public utilities in your area, industrial facilities and any professional associations in an aggressive program of information and intelligence sharing. Federal Emergency Management Agency (FEMA), local fire and emergency service providers, regional and local Red Cross, hospitals and others can complete the picture as to overall vulnerability to attacks and the potential impact on your personnel and the community as a whole.

208.4 Emergency

a) In the event of a terrorist attack on your plant, your goal is to respond, mitigate and restore. Also, nothing you do regarding security can be guaranteed to prevent an attack.

Section 3 CHEMICAL AND PHYSICAL HAZARD CONTROL

301 Material Handling and Storage

a) An employee shall obtain assistance in lifting heavy objects or use power equipment.

b) When two or more persons carry a heavy object that is to be lowered or dropped, there shall be a prearranged signal for releasing the load.

c) When two or more persons are carrying an object, each employee, if possible, should face the direction in which the object is being carried. Employees shall not attempt to lift beyond their capacity. Caution shall be taken when lifting or pulling in an awkward position.

The right way to lift is easiest and safest. Crouch or squat with the feet close to the object to be lifted; secure good footing; take a firm grip; bend the knees; keep the back vertical; and lift by bending at the knees and using the leg and thigh muscles.

d) Employees should avoid twisting or excessive bending when lifting or setting down loads.

e) When moving a load horizontally, employees should push the load rather than pull it.

f) When performing a task that requires repetitive lifting, the load should be positioned to limit bending and twisting. The use of lift tables, pallets, and mechanical devices should be considered.

g) When gripping, grasping, or lifting an object such as a pipe or board, the whole hand and all the fingers should be used. Gripping, grasping, and lifting with just the thumb and index finger should be avoided.

h) In areas not restricted to qualified employees only, materials and equipment may not be stored closer to energized lines or exposed energized parts of equipment than the following distances plus the maximum sag and side swing of all conductors and providing for the height and movement of material handling equipment:

(1) For lines and equipment energized at 50 kV or less, the distance is 10 feet.

(2) For lines and equipment energized at more than 50 kV, the distance is 10 feet plus 4 inches for every 10 kV over 50 kV.

i) Materials stored near energized lines or equipment must meet the spacing requirements of OSHA Standard 29 CFR 1910.269 (k) and 1910.176.

302 Explosives

a) The transportation, handling, storage, and use of dynamite and other explosives, including blasting agents, shall be directed and supervised by persons of proven experience and competency in blasting and use of explosives.

b) A blaster shall be qualified, by reason of training, knowledge, or experience, in the field of transporting, storing, handling, and use of explosives, and have a working knowledge of state and local laws and regulations which pertain to explosives. Blasters shall be required to furnish satisfactory evidence of competency in handling explosives and performing, in a safe manner, the type of blasting that will be required. In addition, blasters shall be able to give and understand written and verbal orders; shall be in good physical condition; and not addicted to, or under the influence of, intoxicants, narcotics, and similar drugs. (Similar drugs may include certain prescription drugs if such drugs diminish the physical ability or mental capacity of the blaster.)

c) Notification shall be made before any explosives or blasting agents are brought on the jobsite. Such notification should accompany a comprehensive detailed blasting program. The required program must, as a minimum, show proposed methods and procedures for conforming with these and referenced standards and regulations, including the following:

- Method and equipment for transporting explosives and detonators.
- Type and location of storage facilities.
- Type and quantity of explosives and detonators.
- Primer assembly procedure and location.
- Employee training programs.
- Provisions for protecting persons, structures, and private and public property.

- Provisions for developing and distributing a daily blasting plan covering hole diameter, spacing, loading, and delay patterns.
- Provisions for disposal of explosives, blasting agents, and associated materials.

d) The contractor shall provide such reasonable and adequate security as is necessary to prevent loss or theft of explosives. He shall maintain an inventory of all explosives on the jobsite, including a record of explosives received and withdrawn from the magazines.

e) Blasting operations in the immediate vicinity of buildings, public roads, overhead power lines, utility services, or similar facilities shall not be undertaken until the owners and/or the operators have been notified and all necessary precautions taken for safe control of the blasting operations.

f) Explosives are intentionally manufactured to explode, and when supplied with sufficient initiating energy, will do so. Furthermore, explosives will not distinguish between initiating energy supplied purposely and initiating energy supplied accidentally. Therefore, the burden of protecting explosives from accidental sources of initiating energy must rest with those who handle and use explosives.

g) Only persons authorized by the Utility to do so shall use explosives or explosive material. These persons shall be qualified by training and experience in the safe handling, transporting, storing, and use of explosives and shall have a working knowledge of applicable federal, state, and local laws. Many jurisdictions require the qualified person to hold a license. These persons shall be a minimum of 21 years of age; not addicted to narcotics, intoxicants, or similar types of drugs; and able to understand and give written and verbal orders.

h) Explosives and blasting caps (detonators) shall not be transported on the same vehicle, except by permission of the authority having jurisdiction. Blasting supplies shall not be transported with other materials or cargoes.

i) Explosives and detonators shall be carried and transported in the original manufacturer's container or other approved container.

j) Vehicles transporting explosives, detonators, and other blasting supplies shall have any exposed spark-producing metal on the

inside of the body covered with nonsparking material; be marked or placarded on both sides, the front, and the rear with approved "explosives" signs; be equipped with fire extinguishers in good mechanical condition; and be driven by an appropriately licensed driver.

k) Motor vehicles or conveyances containing explosives, blasting agents, or blasting supplies shall not be taken inside a garage or shop. No repairs shall be performed on a motor vehicle or conveyance loaded with explosives, blasting agents, or blasting supplies.

l) Motor vehicles or conveyances containing explosives or blasting agents shall at all times be attended.

m) Because electric blasting caps, when not shielded by a closed metal box, have been known to be detonated by the operation of two-way radios in vehicles as well as by regular radio transmitter stations, no vehicle equipped with a radio transmitter shall be allowed within 100 feet of blasting operations or exposed electric caps, while the transmitter is in operation.

n) When electric blasting caps are used, adequate signs warning against the use of mobile radio transmitters shall be prominently displayed.

o) The blaster, prior to connecting the charge or initiating the explosives, shall ensure the protection of both the public and Utility employees through the use of warning signs and/or personnel stationed around the perimeter of the danger area.

p) Electrical connections shall be made only after the hole has been charged and the area is clear.

q) Before the blast is fired, a loud signal shall be given by the blaster who shall have made certain the area is clear of persons and extraneous materials. Blasting signals shall be posted as follows:

(1) Warning Signal: A 1 minute series of long blasts given 5 minutes prior to blast signal.

(2) Blast Signal: A short signal of blasts 1 minute prior to the shot.

(3) All Clear Signal: A prolonged blast following the inspection of the blast area.

r) In cases of misfires, no person shall return to the blast area until permitted to do so by the blaster. Misfires shall not be inspected

until a sufficient waiting period has elapsed. For nonelectric blasting, the minimum waiting period is 1 hour; for electric blasting, the minimum period is 30 minutes.

s) Blasting cap leg wires shall be kept short-circuited (shunted) until they are connected into the circuit for firing.

t) For additional information concerning explosives, refer to OSHA Standard 29 CFR 1910.109.

Note: In addition to the above, all local, state, and federal laws covering the transportation and use of explosives shall be observed.

303 Compressed Gasses

a) Care shall be exercised in handling all compressed gas cylinders. They shall not be dropped, jarred, or exposed to temperature extremes.

b) Cylinders shall have the valve cap or valve protection device in place at all times, except when in actual use or connected to a welding set.

c) Cylinders shall not be rolled and shall not be lifted by the valve or valve cap; a suitable cradle or other device shall be used.

d) Cylinders shall have their contents properly identified.

e) Cylinders not having fixed handwheels shall have keys, handles, or nonadjustable wrenches on the valve stems while the cylinders are in service.

f) Compressed gas cylinders, whether full or empty, shall be stored in an upright position and chained or otherwise secured so that they cannot fall or be upset.

g) When cylinders are transported by powered vehicles, they shall be secured in a vertical upright position with the valve cap or valve protection device in place.

h) Oxygen cylinders in storage shall be separated from fuel-gas cylinders or combustible materials (especially oil or grease) by a minimum distance of 20 feet or by a 5 foot high noncombustible barrier.

i) Cylinders shall not be placed where they might become part of an electric circuit or within 5 feet of an electrical outlet.

j) Hydrogen and fuel-gas cylinders shall be stored only in a separate room, compartment, building, or shelter specifically designed for that purpose as described in OSHA Standard 29 CFR 1910.253(B)(3).

k) Employees shall never force connections that do not fit nor shall they tamper with the safety relief devices of cylinder valves.

l) Before the regulator is removed from a cylinder, the valve shall be closed and all pressure released from the regulator.

m) A leaking cylinder shall not be used. Such cylinders shall be taken outdoors away from sources of ignition. The supervisor shall be notified.

n) A flame shall never be used to detect gas leaks.

o) The recessed top of cylinders shall not be used as a place for tools.

p) No attempt shall be made to mix gases in a cylinder or to transfer gas from one cylinder to another.

q) A sign "Danger--No Smoking, Matches, or Open Lights" or one with equivalent wording shall be conspicuously posted in rooms or at entrances to areas where fuel gas is used and/or stored.

r) Hydrogen: Special precautions shall be taken when using hydrogen to avoid the possibility of fire and explosion. "Danger--No Smoking" signs shall be posted where hydrogen is used and/or stored.

s) Oxygen: Oil, grease, or similar materials shall not be allowed to come in contact with any valve, fitting, regulator, or gauge of oxygen cylinders:

(1) Oxygen shall never be used as a substitute for compressed air.

(2) When an oxygen cylinder is in use, the valve should be opened fully to prevent leakage around the valve stem.

t) Acetylene: Acetylene cylinders shall be properly secured and always used, transported, or stored in a vertical position. Cylinders shall be protected from sparks, flames, and contact with electrical equipment:

(1) An acetylene cylinder valve shall not be opened more than one and one-half turns of the spindle and preferably no more than three-fourths of a turn.

(2) Employees shall not use acetylene in a free state at pressures higher than 15 psi.

u) Chlorine: Also refer to Paragraph 312, Chlorine:

(1) Chlorine containers shall be stored and properly secured in a cool place protected from moisture.

(2) Every precaution shall be taken to prevent accidental discharge of the gas, and protective equipment shall be readily available for use in an emergency.

(3) Only employees who have been properly trained and provided with the necessary protective equipment shall attempt to stop cylinder leaks.

(4) Should a chlorine leak develop, the cylinder shall be placed so that only "gas" escapes. (An ammonia swab may be used to detect leaks.) Water should not be sprayed or poured on chlorine leaks.

(5) Chlorine cylinders shall never be used or stored near flammable materials.

(6) Dry chlorine shall be stored in an isolated area as mixing it with anything but water could cause a fire or explosion.

v) See Paragraph 304, Hazardous Materials, for additional information concerning hazardous compressed gases.

w) For additional information concerning compressed gas requirements, refer to OSHA Standard 29 CFR 1910.252.

304 Hazardous Materials

a) Employees shall become knowledgeable in the use and handling of all chemicals including oils, greases, acids, solvents, aerosol products, paints and any other product of this nature prior to using the product.

b) Chemicals as mentioned above shall be disposed of using proper methods and in accordance with current regulations.

c) To reduce the risks of working with hazardous materials, manufacturers of hazardous materials are required to convey hazard information to the users of their products. This is accomplished through the use of Material Safety Data Sheets (MSDSs) and container labeling. Employees shall refer to the Utility's Hazard Communication

Program for specific requirements for working with hazardous materials.

d) Employees can obtain a list of hazardous materials known to be in their work area from their supervisor.

e) The Material Safety Data Sheet is the main vehicle for communicating the hazards, safety handling requirements, and emergency procedures for each hazardous material. Employees shall know the location of the Material Safety Data Sheets for all hazardous materials known to be in their work areas.

f) Material Safety Data Sheets shall be made available to contractors working on Utility property.

g) Proper labels shall be attached to all containers and shall be legible at all times. Employees shall not use materials they find in unlabeled containers. Employees shall report unlabeled containers and containers with damaged labels to their supervisor.

h) Employees shall not transfer a hazardous substance from a labeled container to an unlabeled container within their work shift unless the unlabeled container will be under the exclusive control of the employee.

i) Employees shall take special precautions as defined in the Utility's Hazard Communication Program when working on or around unlabeled pipes.

j) Employees shall report all hazardous material spills and follow appropriate company emergency response procedures. Employees shall not attempt to control or clean up spills unless they have been properly trained and have the required personal protective equipment.

k) All products shall be stored in accordance with the rules outlined in Paragraph 110.

l) For additional information concerning the requirements for working with hazardous materials, refer to OSHA Standards 29 CFR 1910, Subpart Z and 29 CFR 1910.120.

305 Fuels and Lubricants

a) Fuels shall be stored in accordance with Paragraph 110.

b) When draining containers on vehicles and equipment, special procedures shall be used to prevent explosions. Inert gases may be required to purge fuel containers when work is being performed on them.

c) Fuel tanks on vehicles and equipment shall be secured to prevent vapors from escaping during welding or cutting operations in the area.

d) Sorbent materials shall be maintained in the immediate area where bulk containers of fuels and/or lubricants are stored and in use.

e) Areas where fuels or lubricants are spilled shall be cleaned up immediately and materials shall be disposed of properly.

f) Waste fuels shall not be stored in open containers.

306 Noise

Table 3.1 Permissible Noise Exposures

Duration per day, hours:	Sound level dBA slow response
8	90
6	92
4	95
3	97
2	100
1-1/2	102
1	105
1/2	110
1/4 or less	115

Note: 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, the employee

shall wear proper ear protection when exposed to excessive noise.

a) Ear protection must be worn when there is a possibility of hearing damage, which can occur during continuous exposure to noise or impulse exposure to loud impact noise. When exposed to noise of 90 dBA (decibels) for more than 8 hours, 95 dBA for more than 4 hours, 100 dBA for more than 2 hours, or 105 dBA for more than 1 hour, proper ear protection must be worn. (If normal conversation can be understood about 2 feet away, the noise level is probably less than 90 dBA.) Protection must be worn when exposed to impact noise more than 140 dBA; e.g., noise similar to a rifle or shotgun discharge.

b) Specific areas where the noise level is greater than 90 dBA shall be identified, and time limits stated. Employees shall wear proper protective devices when exposed beyond posted limits.

c) Proper ear protection may consist of any of the following: ear muffs, ear plugs, molded ear protectors, or wax type ear plugs. Plain cotton is not acceptable. Ear protective devices shall be worn properly to provide the required protection and kept clean to reduce the possibility of ear infection.

d) For additional information concerning noise, refer to OSHA Standard 29 CFR 1910.95.

307 Asbestos

Note: Asbestos fibers that are airborne (suspended in the air) in a significant quantity can cause bodily harm if the fibers are inhaled. Whenever it is known that asbestos is in a facility, it is strongly recommended that an EPA-approved contractor be consulted.

a) Only those employees who have been properly trained and equipped with the necessary personal protective equipment shall handle asbestos.

b) Insofar as practicable, asbestos shall be handled, mixed, applied, removed, cut, scored, or otherwise worked in a wet state unless this procedure would render the product useless.

c) Asbestos cement, mortar, coating, plaster, etc., shall not be removed from the shipping container unless it is wetted, enclosed, or ventilated.

d) Negative air enclosures or other engineering controls (e.g., glove bags) that reduce the concentration of airborne asbestos fibers shall always be used when working with asbestos.

e) Personal Protective Equipment: Proper protective equipment, including clothing, must be worn when working in an area where there is a significant amount of airborne asbestos fibers:

(1) Respirators: Approved respirators shall be worn when there is a possibility of airborne concentrations of asbestos fibers. The type of respirator required shall be based on the airborne concentrations of asbestos fibers. At no time shall less than a half mask air-purifying respirator with a high efficiency filter be used. Refer to the Utility's Respiratory Protection Program for additional information.

(2) Special Clothing: Employees who are exposed to airborne concentrations of asbestos fibers that exceed the action level shall use special clothing such as coveralls, head coverings, gloves, and foot coverings. Clothing shall be changed only in the designated location and shall be kept separate from street clothes. Contaminated clothing shall be properly cared for or disposed of and kept separate from other laundry or disposed materials; it shall be transported in sealed, impermeable bags or similar containers and properly labeled to identify the possible hazard.

f) Housekeeping:

(1) All external surfaces shall be maintained free of accumulations of asbestos fibers.

(2) Asbestos waste and materials contaminated with asbestos, which may produce airborne concentrations, shall be collected and disposed of in sealed impermeable bags at least 6 mils thick, or similar containers. Bags or containers shall be evacuated of all air before sealing and all bags shall be double bagged and properly labeled.

g) For additional information concerning asbestos requirements, refer to OSHA Standard 29 CFR 1910.1001 and the Environmental Protection Agency's Worker Protection Rule 40 CFR 763.

308 Polychlorinated Biphenyls (PCBs)

a) Only properly trained employees shall handle material containing PCBs.

b) Employees shall wear full protective gear (respirator, goggles, coveralls, gloves, and boots) when cleaning up after a rupture of a capacitor or transformer containing PCBs.

c) Before entering a confined space (such as a transformer vault) after the failure of equipment containing PCBs, the space shall be purged by forced ventilation, and employees entering the space shall wear proper auxiliary breathing equipment until tests indicate the space is free of fumes.

d) All materials such as rags, solvents, dirt, etc., contaminated by PCBs shall be disposed of according to Utility procedures and federal, state, and local regulations.

309 Acids and Caustics--Storage

a) Acids, in any quantity, shall be kept in an approved carboy or other container, prominently labeled. These containers shall not be used for any other purpose.

b) Acids shall not be stored near heaters, steam pipes, or other sources of heat.

c) Acid containers shall be securely stoppered or covered.

d) Acids kept on shelves shall not be stored higher than waist level.

e) If acids or caustics are spilled, they shall be flushed away with an ample supply of water--never wiped up.

f) Employees handling acids, caustics, or other corrosive, toxic chemicals shall wear approved gloves, aprons, eye and face protection and shall take precautions to prevent personal injury.

g) The use and toxic quality of new materials shall be investigated thoroughly, and personnel shall be advised of any hazards involved.

h) Chemical pumps shall be washed externally before repacking or performing maintenance work.

i) Storage areas for acids and caustics shall be posted with appropriate warning signs.

j) Areas where acid cleaning is to be done shall be barricaded by suitable means, and no smoking or open flames shall be permitted.

k) Suitable procedures shall be established to avoid explosions from released hydrogen or injuries from the chemicals.

l) Contact lenses shall not be worn when working in a laboratory or when handling acids, caustics, or other corrosive chemicals.

310 Acids and Caustics--Handling

a) Only reliable, dependable, and properly trained employees or suppliers' personnel shall operate valves or other equipment that controls the movement of chemicals.

b) Approved protective equipment and clothing shall be worn whenever acids or caustics in harmful quantities may spill, splash, fly, or drip upon the person handling them. The quantity of acid or caustic handled shall determine the kind and quantity of clothing and equipment. Minimum protection shall be chemical goggles, acidproof gloves, and apron.

c) Should any acid, caustic, or other chemical come in contact with the eyes, they shall be thoroughly washed with large amounts of running water and a physician consulted as soon as possible. DO NOT RUB THE EYES.

d) Employees shall not handle acids or caustics unless there is access to an adequate supply of water for quick drenching and flushing of the eyes and body.

e) After handling large quantities of caustics, employees shall take a shower to avoid skin irritation.

f) Before lifting or moving a carboy or other acid container, it shall be examined carefully to see that it is not in a leaky or defective condition. The wire holding the carboy stopper in place shall be checked to see that it has not corroded and that the stopper is secure. All movements shall be made slowly to avoid excessive agitation of the acid.

g) Before starting to unload a tank car or tank truck of acid, the acid storage tank shall be gauged to see if there is adequate space inside the tank to contain the acid being added without overflowing.

h) When tank cars or trucks are unloaded, warning signs shall be prominently posted and barriers placed so as to warn all personnel of the impending danger.

i) Only approved methods, tools, and equipment shall be used to extract acids and caustics from a container.

j) Acid in railroad tank cars or tank trucks shall be unloaded in accordance with the regulations of the Interstate Commerce Commission and the recommended practices of the Manufacturing Chemists Association.

311 Acids and Caustics--General

a) When mixing acid or caustic with water, the acid or caustic shall be poured into the water, not the water into the acid or caustic.

b) If it is necessary to enter a tank or vat, the person entering shall wear approved hard hat or hood; rubber gloves; rubber or plastic outer clothing; and boots, shoes, or wooden clogs. They shall also wear a supplied-air mask and a lifeline. At least one worker shall remain outside the tank or vat to attend the lifeline. Refer to Paragraph 201 for additional confined and enclosed space requirements.

c) Hydrazine and morpholine are highly toxic and caustic shall never be handled without adequate ventilation. Skin or clothing contact and the breathing of fumes shall be avoided.

d) All small containers such as bottles or jars shall be washed thoroughly when emptied. Carboys, steel drums, tank trucks, or tank cars shall not be washed but shall be completely drained of all acid before returning to the acid supplier.

e) Open flames and smoking are prohibited when working with or near acid in metal containers, such as tanks, condensers, or boilers. Sparkproof tools shall always be used where there is a danger of accumulated hydrogen.

Note: Certain acids in contact with metal produce explosive hydrogen.

312 Chlorine

a) When it is necessary to work on chlorine lines or equipment, all sources of chlorine shall be turned off at the chlorine cylinders and the lines safely discharged and purged with dry air (to normal path of usage, not to atmosphere) before any connection or pipe is opened. (Refer to Paragraph 202 for Hold Card procedure.)

b) In the event of a chlorine cylinder leak, only properly trained employees with the necessary personal protective equipment shall attempt to stop the leak. Employees shall follow the Utility's emergency response procedures.

c) Only employees who have been properly trained shall perform work on chlorine lines or equipment.

d) A chlorine system enclosure or shelter shall have available two units of approved, self-contained breathing apparatus and protective clothing. They shall be located outside the shelter or enclosure at a sufficient distance to make them approachable in the event of a chlorine leak.

e) Portable gas cylinders in storage shall have roof or shield covers for protection against the weather.

f) Chlorine system enclosures shall be posted with signs restricting entry and warning of hazard to health and the hazards of fire and explosion.

g) The number of personnel shall be limited to those necessary to accomplish the task safely.

h) Emergency repair kits shall be available near the shelter or enclosure to allow for the prompt repair of leaks in chlorine lines, equipment or containers.

i) Before repair procedure is started, chlorine tanks, pipes and equipment shall be purged with dry air and isolated from other sources of chlorine.

j) For more information on Hazardous Waste Operations and Emergency Response, refer to OSHA Standards 29 CFR 1910.120 and 29 CFR 1910.119**.**

313 Lead

a) Permissible exposure limits shall not be exceeded.

b) Monitoring for lead levels shall be conducted in compliance with existing regulations.

c) Engineering and work practice controls shall be used to minimize lead exposure.

d) Respiratory protective equipment and other personal protective equipment shall be used in accordance with existing regulations.

e) Refer to OSHA Standard 29 CFR 1910.1025 for more information on lead exposure.

f) Air monitoring during the splicing of lead-jacketed electrical lines has shown the potential for exposures to lead at or above the action level. Any soldering or heating of lead jacketed materials should be conducted using proper engineering controls (i.e. ventilation), personal hygiene, PPE, and personal monitoring.

All Utility employees involved in the disturbance of lead-containing materials or lead based paint as part of regular work activities should have at least a lead awareness training class and have blood lead levels checked initially, then at least annually thereafter.

For more information regarding the OSHA lead standard, refer to 29 CFR 1910.1025.

314 Use of Herbicides and Other Chemicals

a) Before using any herbicide or other chemical, employees shall read the label carefully and follow the directions and precautions listed. Refer to Paragraph 304, Hazardous Materials, for additional information.

b) Employees shall avoid skin contact with, or breathing mist of, spray material.

c) When working with toxic materials, proper respirator protection must be used.

d) Spray equipment shall be cleansed daily when using oil solutions.

e) Spraying shall not be done when wind exceeds 15 mph unless specifically authorized by supervisor.

f) Brush shall not be sprayed at a distance greater than 15 feet from a power spray nozzle.

g) Foliage and basal sprays shall not be used on wild cherry trees in areas where livestock may graze because of the poisonous acid that is generated.

h) Oil and other liquids spilled on power spray equipment shall be removed as soon as possible to prevent falls from slippery surfaces.

i) Walking and working surfaces of sprayers shall be covered with slip resistant material.

j) Hose connections on hydraulic sprayers shall be checked before use to prevent rupture.

k) Employees shall not smoke on or around mist-spray equipment when oil solutions are being mixed or used.

l) Herbicides and other chemicals shall never be left where they would create a hazard to persons or property.

m) Empty containers shall be disposed of in a safe manner. They shall never be thrown into ponds, lakes, or streams.

n) Where applicable, all employees who apply pesticides or herbicides shall be licensed or work under the direct supervision of a licensed operator.

o) Spray wastes shall be disposed of in a safe manner and in accordance with federal, state, and local regulations.

p) Equipment upon which employees stand while the vehicle is in motion shall be equipped with guardrails around the working area.

SECTION 4 PERSONAL PROTECTIVE EQUIPMENT

401 Personal Protective Equipment (PPE)

a) All employees shall be equipped with the appropriate PPE necessary to safely perform their jobs. The employer shall ensure that a preliminary assessment of work operations is performed to adequately evaluate the hazards and select suitable PPE for the employees. Any time PPE is worn, a job hazards analysis (JHA) should be completed prior to starting work.

b) Before any employee is assigned a new article of PPE to use during the course of their job, training should be conducted to instruct the employee on the use, care, inspection, and maintenance of the PPE.

c) When working on or near live electricity, the employer shall consider an arc hazard assessment of the electrical system. The arc hazard assessment would provide the qualified electrical workers with the flash protection boundary based upon the incident energy produced. See tables 4.1 and 4.2.

402 Eye and Face Protection

Appropriate and approved eye and/or face protection shall be worn when an employee is engaged in the following work activities or when required by Utility policy:

a) Drilling or chipping stone, brick, concrete, paint, pipe coatings, or metal.

b) Power grinding, buffing, or wire brushing.

c) Flame welding, cutting, or burning (approved colored lenses shall be used).

d) Hand drilling or sawing of overhead objects.

e) Use of powered tools such as drills, saws, or sanders.

f) Dust or flying particles (compressed air used for cleaning purposes must be less than 30 psi, and then effective chip-guarding and personal protection must be used).

g) Gunniting, pouring hot lead or hot compounds, or using other hot or injurious substances.

h) Handling acids, caustics, chlorines, ammonia, or other similar liquids or gases, except when approved complete head coverings are worn (chemical goggles are necessary).
i) Brush chippers.
j) Thermite (cadweld) type welders.
k) Flying particles caused by other workers, if employee is within the range of such particles (a suitable screen around the work may be used instead).
l) Any other danger of injury to the eyes, or at the direction of a supervisor.
m) Any time there is a possibility of electrical flash, or work activities (as determined by JHA) generate airborne particulates, appropriate protective shield or safety glasses shall be worn. If a worker may be exposed to an electrical hazard, all protective headwear, including prescription eyewear, must have an appropriate non-conductive rating. Refer to ANSI Z89.1-2003 for prescription eyewear purchased after July 5, 1994. The employer shall ensure employees are equipped with non-metallic prescriptive eyewear.
n) While using powder-actuated tools.
o) Protective eyewear appropriate for the lighting condition shall be worn. Glasses with dark lenses shall not be worn in poor lighting conditions, before sunrise or after sunset.

For additional information concerning eye and face protection requirements, refer to OSHA Standard 29 CFR 1910.133.

403 Head Protection

a) Approved safety head gear shall be worn by all employees in areas where falling objects, electrical contact, or other hazards may cause a head injury, and when required by Utility policy.
b) Safety head gear or head band assembly shall not be defaced or altered in any manner without approval.
c) Approved head shields or hoods shall be worn when welding with hydrogen, heliarc, or electric arc.
d) All employees whose hair length (facial hair included) may cause a hazard when working around moving machinery or an external

heat source sufficient to cause a fire, shall keep the hair to a safe length or wear a hair net or other device to keep the hair from causing hazards.

e) For additional information concerning head protection requirements, refer to OSHA Standard 29 CFR 1910.135, ANSI Z89.1 for industrial workers, and ANSI Z89.2 for electrical workers.

404 Wearing Apparel

Each employee shall wear gloves and other clothing suitable for the work performed. Rubber glove protectors shall not be used as work gloves.

Appropriate footwear required for special work shall be worn as directed by the employee in charge. All employees must wear appropriate footwear for assigned jobs that will ensure minimum protection. When protective footwear is required, it shall meet the requirements of OSHA Standard 29 CFR 1910.136. (Other protective devices are to be used in specific types of work to provide adequate personal protection.)

Also refer to clothing restrictions in Paragraph 405.

405 Clothing

a) All employees shall always wear clothing and shoes that are suitable for the particular type of work which they are doing, and that are in compliance with Utility policy. The employer shall ensure that each employee who is exposed to the hazards of flames or electric arcs does not wear clothing that, when exposed to flames or electric arcs, could increase the extent of injury that would be sustained by the employee.

As per National Electrical Safety Code (NESC)requirements, wearing appropriate clothing has been shown to limit the lasting effects of being caught in a flashover. The level of injury sustained by a worker involved in a flashover can be substantially reduced by careful selection of the clothing materials to be worn (to avoid fusing melted plastic to the skin, skin damage due to burning clothing, and unnecessary exposure of the skin to heat during a flashover.) Long sleeves are recommended and shall be worn with sleeves rolled down in order to help reduce the amount of exposure to heat on the arms.

Tables 4.1 and 4.2 are given as a guideline for evaluation of flame resistant and flame retardant clothing. A calculation should be completed by each utility to estimate arc exposure values based on their own fault current and work practice separation distance from the arc to the employee.

Table 4.1
Clothing and clothing systems – voltage, fault current, and maximum clearing time for voltages 1 to 46kV (See Rule 410A3)

Voltage (kV)	Fault Current (kA)	4 cal system	8 cal system	12 cal system
		Maximum Clearing Time (Cycles)	Maximum Clearing Time (Cycles)	Maximum Clearing Time (Cycles)
1 to 15	5	46.5	93.0	139.5
	10	18.0	36.1	54.1
	15	10.0	20.1	30.1
	20	6.5	13.0	19.5
15.1 to 25	5	27.6	55.2	82.8
	10	11.4	22.7	34.1
	15	6.6	13.2	19.8
	20	4.4	8.8	13.2
25.1 to 36	5	20.9	41.7	62.6
	10	8.8	17.6	26.5
	15	5.2	10.4	15.7
	20	3.5	7.1	10.6

Courtesy of National Electrical Safety Code Table 410-1

Table 4.2
Clothing and clothing systems – voltage, fault current, and maximum clearing time for voltages 46.1 to 800kV (See Rule 410A3)

Voltage (kV)	Fault Current (kA)	4 cal system		8 cal system		12 cal system	
		Maximum Clearing Time (Cycles)		Maximum Clearing Time (Cycles)		Maximum Clearing Time (Cycles)	
46.1 to 72.5	20	8.5	18.2	17.0	36.4	25.5	54.5
	30	5.3	10.2	10.5	20.4	15.8	30.6
	40	3.7	6.6	7.3	13.2	11.0	19.7
	50	2.8	4.6	5.5	9.2	8.3	13.9
72.6 to 121	20	8.2	9.9	16.5	19.8	24.7	29.8
	30	4.7	5.7	9.4	11.4	14.1	17.1
	40	3.1	3.8	6.2	7.5	9.3	11.3
	50	2.2	2.7	4.4	5.4	6.6	8.1
138 to 145	20	9.8	12.1	19.5	24.1	29.3	36.2
	30	5.6	7.4	11.2	14.9	16.8	22.3
	40	3.7	5.2	7.4	10.4	11.1	15.6
	50	2.6	3.9	5.3	7.8	7.9	11.7
161 to 169	20	9.3	11.9	18.6	23.9	27.9	35.8
	30	5.7	7.4	11.5	14.8	17.2	22.2
	40	4.0	5.2	8.0	10.3	12.0	15.5
	50	3.0	3.9	6.0	7.8	9.0	11.6
230 to 242	20	10.4	13.6	20.9	27.3	31.3	40.9
	30	6.4	8.4	12.9	16.8	19.3	25.2
	40	4.5	5.9	9.0	11.7	13.5	17.6
	50	3.4	4.4	6.8	8.8	10.1	13.2
345 to 362	20	22.6	26.4	45.3	52.7	67.9	79.1
	30	14.0	16.2	28.1	32.4	42.1	48.6
	40	9.8	11.3	19.6	22.6	29.4	34.0
	50	7.4	8.5	14.7	17.0	22.1	25.5
500 to 550	20	18.9	23.1	37.8	46.2	56.7	69.2
	30	11.7	14.2	23.3	28.4	35.0	42.6
	40	8.1	10.0	16.3	19.9	24.4	29.9
	50	6.1	7.5	12.2	15.0	18.3	22.4
765 to 800	20	43.6	25.3	87.3	50.5	130.9	75.8
	30	27.0	15.6	53.9	31.2	80.9	46.8
	40	18.9	10.9	37.8	21.7	56.7	32.6
	50	14.2	8.2	28.4	16.3	42.6	24.5

Courtesy of National Electrical Safety Code Table 410-2

b) Appropriate flame retardant clothing is acceptable under conditions defined by an arc hazard assessment. Clothing made of acetate, polyester, nylon or rayon (either alone or in blends) may not be worn unless it has been adequately treated or is worn in such a manner as to eliminate the ignition and melting hazards. An electrical safety hat with appropriate protective shield or safety glasses (see Eye and Face Protection, paragraph 402 and Head Protection, paragraph 403) shall be worn when working on or near live parts where the possibility of an electric arc exists. The wearing of short pants when performing any type of electrical line work shall be prohibited.

c) When work is performed in the vicinity of exposed energized parts of equipment, employees shall remove all exposed conductive articles such as key or watch chains, rings, or wrist watches or bands, if such articles increase the hazards associated with inadvertent contact with the energized parts, moving equipment, and to avoid pinching, crush hazards, and being caught on or in something such as with loose clothing. Loose clothing can also catch on exposed hardware or extend into energized areas.

d) Finger rings or unnecessary jewelry shall not be worn while climbing on or off structures or vehicles or while performing any task where the ring might be caught under or snagged by a projecting item. Rings and wrist watches with metal case and watch bands shall not be worn while working on or near energized equipment or lines. Medical alert bracelets may be worn with transparent bands that hold the bracelets snugly to the skin.

e) Each employee shall wear gloves suitable for the work. Rubber glove protectors shall not be used as work gloves. Metal articles worn under rubber gloves may provide a pressure point or chafe glove, thus increasing the opportunity for failure at that point.

f) Due to the potential for heat-related illness when wearing protective clothing in ambient temperatures greater than 78 degrees F, employers shall provide employees additional awareness training regarding the recognition and prevention of signs and symptoms of heat-related illness. (Refer to the American Conference of Governmental Industrial Hygienists 2007 Threshold Limit Value’s and Biological Exposure Indices Manual)

g) Employees shall refer to Utility policies for additional clothing requirements.

406 Use and Care of Rubber Gloves

Note: Supervision or Utility rules may require the use of rubber sleeves in addition to rubber gloves.

a) The use of rubber gloves shall be in accordance with the following table:

Table 4.3
Maximum-Use Voltage for Rubber Gloves

Class of Glove	Voltage, V (RMS) Phase-Phase
00	500
0	1,000
1	7,500
2	17,000
3	26,500
4	36,000

The maximum use voltage is the ac voltage (rms) rating of the protective equipment that designates the maximum nominal design voltage of the energized system that may be safely worked. The nominal design voltage is equal to the phase-to-phase voltage on multiphase circuits.

Exception 1: If there is no multiphase exposure in a system area (at the worksite) and the voltage exposure is limited to the phase (polarity on dc systems) to ground potential, the phase (polarity on dc systems) to ground potential shall be considered to be the nominal design voltage.

Exception 2: If electric equipment and devices are insulated, isolated, or both, such that the multiphase exposure on a grounded wye circuit is removed and if supplemental insulation (e.g., insulated aerial device or structure-mounted insulating work platform) is used to insulate the employee from ground, then the nominal design voltage may be considered as the phase-to-ground voltage on that circuit.

Courtesy of National Electrical Safety Code 2007, Table 441-6

b) Voltage shall be considered to be phase-to-phase voltage unless all conductors except the one being worked are insulated (with

protective devices) or isolated so that physical contact cannot be made with any energized part. In that case, phase-to-ground voltage will determine maximum-use voltage.

c) Rubber gloves are recommended to be worn while working on any pole or other structure on which energized lines or equipment are located, on which lines and equipment that could be energized are located, or that are located close to energized lines or equipment where an employee could make contact (see paragraph 507.1 for limits on voltages 5kV or more). The rubber gloves should be put on before the employee ascends a pole or structure or raises an aerial device off the ground or device's cradle. Furthermore, employees should not remove the gloves until they have descended the pole or structure or returned the aerial device to the ground or cradle. As a minimum requirement, gloves shall be put on before the employee comes within falling or reaching distance (based on the AC Live-Line Work Minimum Approach Distance as indicated in Table 5.2) of unprotected energized circuits or apparatus or those that may become energized, and they shall not be removed until the employee is entirely out of falling or reaching distance of such circuits or apparatus. Employees shall refer to Utility policy regarding additional rubber glove requirements.

d) In addition, rubber gloves shall be worn during the following conditions:

(1) Working on or within falling or reaching distance of conductors, electrical equipment, or metal surface (crossarms, crossarm braces, or transformer cases), which are not effectively grounded and which may be or may become energized.

(2) During wet or stormy weather, working on or within falling or reaching distance of any conductor or equipment that may be or may become energized at any voltage.

(3) Required by supervision.

(4) Removing lead sheath and sleeves from cables and joints and opening or cutting cables (until they have been proven to be de-energized at the work location by positive tests).

(5) Performing tests on cables using approved testing devices.

(6) Operating manually controlled air-break switches.

(7) Opening and closing manually operated oil circuit breakers.

(8) Using approved switch sticks or live-line tools for opening, closing, removing, or replacing hot clamps, fuses, or fuse doors on cutouts or when making or breaking any circuit and during inclement weather. (Exception: gloves may not be worn when using an extendo stick from the ground at a minimum of 20 feet.)

(9) Using approved switch sticks or live-line tools for making tests to determine if lines are de-energized, in applying and removing grounding devices, and during inclement weather.

(10) Working on or near series street lighting circuits even though they are disconnected from the source of power.

(11) Repairing series fixtures or attachments, the circuit of which is exposed to energized conductors, except where the fixtures are disconnected from the line.

(12) Pulling in wires or handling other conducting materials near circuits, apparatus, or equipment that is or may become energized.

(13) Working on or near telephone or other circuits that are subject to induced voltages from energized high voltage circuits, unless such circuits to be worked are adequately grounded.

(14) Making physical contact with protective devices installed on energized conductors. While setting or removing poles between or near conductors energized above 600 volts, observe the following:

(i) If safe clearance cannot be maintained, the conductors shall be de-energized or covered with protective devices and spread, or pole guards shall be used to minimize accidental contact.

(ii) Workers handling the butt of the pole shall wear rubber gloves whether or not cant hooks, peaveys, or slings are used.

(iii) Until a pole is positively secured from moving against an energized conductor, no one shall step on or off the truck or touch any part of it without using rubber gloves, if the employee is standing on the ground.

(15) Also refer to Paragraphs 509.9.

Note: "Reaching distance" includes the employee's reach as extended by handling conductive material and/or work equipment.

e) Rubber gloves shall never be worn inside out. They shall be exchanged any time they become damaged or the employee to whom they are assigned becomes suspicious of their condition. Leather protection should be worn over insulating gloves except as follows:

(1) Protector gloves need not be used with Class 0 gloves under limited use conditions, where small equipment and part manipulation require unusually high finger dexterity. In this case, extra care will be needed in the visual examination of the glove and in the avoidance of handling sharp objects.

(2) Any other class of glove may be used for similar work without protector gloves if the possibility of physical damage is small and if the class of glove is one class higher than that required for the voltage involved. Insulator gloves used without proper protector gloves may not be used at a higher voltage until tested.

f) Leather protectors or overgloves shall not be worn except over rubber gloves. Their use shall conform to the following table:

Table 4.4 Minimum Distance Between Protector Gauntlet and Cuff or Rubber Glove	
Class of Rubber Glove	Minimum Distance (inches)
0	1
1	1
2	2
3	3
4	4

g) Rubber gloves shall be inspected and given an air test before each day's use and immediately following any incident that could reasonably be suspected of having caused damage.

h) Gloves, when not in use, shall be kept in canvas bags or other approved containers and stored where they will not become damaged from sharp objects or be exposed to direct sunlight. They shall never be folded while stored nor shall other objects be placed upon them.

i) Rubber gloves shall be stored in the glove bag with the cuffs down to permit drainage and better ventilation and to reduce the possibility of damage.

j) Rubber gloves shall be produced by a seamless process and will be marked with the appropriate class and type. The marking shall be nonconductive.

k) In addition to the requirements outlined in g) above, rubber gloves shall be periodically tested according to Table 5.8.

l) Refer to Paragraph 509.9 and OSHA Standard 29 CFR 1910.137 for additional rubber glove requirements.

407 Supplemental Breathing Equipment

a) Approved breathing apparatus shall be used for the following:

(1) Entering or working in any confined or enclosed space or in any environment where an adequate supply of fresh air cannot be assured.

(2) Sandblasting.

(3) Exposure to any environmental condition that would be unhealthy.

b) Supplemental breathing equipment shall not be used unless the employee has been trained in its use, and it has been determined that the employee is physically able to perform the work and use the equipment.

c) For additional information concerning supplemental breathing equipment, refer to the Utility's respiratory protection program and OSHA Standards 29 CFR 1910.94 and 29 CFR 1910.134.

408 Life Jackets

When working where there is a danger of drowning, employees shall wear an approved personal flotation device or be protected by a safety belt and lanyard or by a safety net.

409 Respirators

Note: In the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors, the primary objective shall be to prevent atmospheric contamination. This shall be accomplished as far as feasible by accepted engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation, and substitution of less toxic materials). When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators shall be used in accordance with the Utility's Respiratory Protection Program.

a) A sufficient number of respirator models and sizes shall be available so that the respirator is acceptable to, and correctly fits, the user:

(1) Respirators for Immediately Dangerous to Life and Health (IDLH) Atmospheres: For IDLH atmospheres, one of

the following respirators must be provided and used in accordance with manufacturer's instructions:

(a) A full facepiece, pressure demand, self-contained breathing apparatus (SCBA) with a minimum service life of 30 minutes.

(b) A combination full facepiece, pressure demand, supplied-air respirator (SAR) with auxiliary self-contained air supply.

(c) Respirators provided only for escape from IDLH atmospheres shall be certified for escape from the atmosphere in which they will be used.

(d) All oxygen deficient atmospheres shall be considered IDLH.

(2) Respirators for Non-IDLH Atmospheres: Respirators shall be provided that are adequate to protect the health of the employee under routine and reasonably foreseeable emergency situations. The respirator selected shall be appropriate for the chemical state and physical form of the contaminant. For protection against gases and vapors, one of the following respirators shall be provided:

(a) Atmosphere-supplying respirator (ASR).

(b) Air-purifying respirator (APR).

(3) Air-purifying respirators against gases and vapors are permitted only when:

(a) The respirator is equipped with an end-of-service-life indicator (ESLI) certified for the contaminant, or

(b) If there is no appropriate ESLI, a change schedule for canisters and cartridges, based on objective information or data that will ensure that canisters and cartridges are changed before the end of their service life, shall be implemented.

(4) For protection against particulates, one of the following respirators shall be provided:

(a) Atmosphere-supplying respirator.

(b) Air-purifying respirator equipped with a filter certified as a high efficiency particulate air

(HEPA) filter, or an air-purifying respirator equipped with a filter certified for particulates.

(c) For contaminants consisting primarily of particles with mass median aerodynamic diameter (MMAD) of at least 2 micrometers (approximately 8×10^{-6} inch or ASTM Standard Sieve No. 5000), an air-purifying respirator equipped with any filter certified for particulates by NIOSH.

b) Only employees who have been properly trained, fit tested, and determined physically able to perform the work and wear the respirator shall be assigned a task that requires the use of a respirator.

c) When respirators are provided for a particular work activity, they shall be used.

d) Use of a respirator shall follow the manufacturer's instructions, the specific instructions of supervision, and the Utility's Respirator Protection Program.

e) Persons using air line respirators, self-contained breathing apparatus, or similar respirator devices in immediately dangerous to life and health (IDLH) environments shall be equipped with a safety harness and lifeline or other equivalent means of rescue. At least one person with suitable self-contained breathing apparatus shall be at the nearest fresh-air base for emergency rescue.

f) Approved respirators shall be worn when:

(1) Applying paint or toxic liquids with pressure spray equipment inside buildings, except in shops where special approved rooms or booths are provided for this purpose.

(2) Buffing which creates an abnormal amount of dust.

(3) Welding or cutting involving hazardous materials without adequate ventilation.

(4) Handling lime or other toxic or caustic powdered chemicals.

(5) Exposed to abnormal amounts of coal dust.

(6) Sandblasting.

(7) Handling acids or caustics.

(8) Handling asbestos.

(9) Exposed to nuisance dusts.

(10) Handling fly or bottom ash.

(11) Exposed to known radiation hazards.

(12) Entering or working in areas of unknown air quality.

(13) Required by the Utility's Respiratory Protection Program or supervision.

g) All respirators shall be cleaned after use and stored in sanitary containers. Records of a Respirator Maintenance Program shall be kept.

h) The employer shall not permit respirators with tight-fitting facepieces to be worn by employees who have:

(1) Facial hair that comes between the sealing surface of the facepiece and the face or that interferes with valve function or

(2) Any condition that interferes with the face-to-facepiece seal or valve function.

If an employee wears corrective glasses or goggles or other personal protective equipment, the employer shall ensure that such equipment is worn in a manner that does not interfere with the seal of the facepiece of the user.

i) For additional information concerning respirator requirements, refer to OSHA Standard 1910.134.

Section 5 Electric Utility Operations

501 Office Safety

501.1 Office Safety

a) Employees shall report all injuries, regardless of severity, to the person in charge.

b) Employees shall walk cautiously up and down stairs. The handrail shall be used whenever possible.

c) Caution shall be exercised when walking around blind corners.

d) Drawers of desks and file cabinets shall be kept closed when not in use.

e) Only one drawer of a file cabinet shall be pulled out at a time in order to avoid tipping, unless the cabinet is securely fastened to the wall or to other cabinets.

f) Do not sit on the edge of a chair. Do not tilt back when sitting in a straight chair.

g) Boxes, chairs, etc., shall not be used in place of ladders.

h) The floor shall be kept free of tripping hazards such as telephone cords, electric extension cords, and paper cartons.

i) Employees mopping or waxing floors shall place warning signs to alert co-workers of the potential for slippery floors. All liquid spills shall be immediately cleaned up.

j) Material shall be stored on shelves in a manner to prevent falling; heavy objects shall be placed on lower shelves.

k) Hallways and aisles shall be kept clear of all obstructions.

l) All emergency exits and emergency equipment such as fire extinguishers and fire hose racks shall be kept clear of all obstructions.

m) Employees shall not use ventilation fans unless they are guarded or securely placed at least 7 feet above the floor.

n) Solvents and other volatile or toxic substances shall be used only with adequate personal protection or in well-ventilated areas. Refer to Paragraph 304, Hazardous Materials.

o) Employees shall not attempt to clean, oil, or adjust any machine that is running. If the machine is not equipped with a starting switch that can be locked in the “off” position, it shall be disconnected from its power source.

p) Unsafe electrical cords, faulty electrical or other equipment, or any other hazardous condition shall be reported.

q) Safety shall be considered in what employees wear on the job. Loose-fitting clothing, dangling bracelets, rings, and ties may cause serious injury to employees operating or working around power-driven machines and shall not be worn.

r) Broken glass and other sharp objects shall not be placed in wastepaper containers unless properly protected and/or sealed.

s) Cigarettes, cigars, and other burning materials shall not be placed in wastepaper containers.

t) Common or sharp-pointed pins shall not be used for fastening paper together. Staples, paper clips, or other approved fasteners shall be used.

501.2 Video Display Terminals

a) Employees using video display terminals for extended periods of time shall consider the following:

(1) Keep back straight with feet resting firmly on the ground.

(2) Use a back-support cushion for lower back.

(3) Position video display terminal so the operator's eyes are level with the top of the screen.

(4) Position the video display terminal directly in front of the user and adjust to avoid glare.

(5) Adjust the height of the chair or keyboard so that shoulder-elbow-arm angle is 90 degrees.

(6) Use a cushioned wrist rest to keep user's hands and fingers in the same plane as the forearm.

b) Video display terminal users shall adjust position frequently to avoid muscle stiffness.

502 Warehouse Operations

502.1 General

a) Warehouse materials shall be stored in a manner that will prevent shifting or falling.

b) Unstable materials must be secured to prevent shifting, falling, or rolling.
c) Stored materials shall not be allowed to protrude in or obstruct aisles.
d) When stacking materials, consideration shall be given to the size of the material for stability of the stack.
e) Materials shall not be stored too close to overhead or wall mounted appliances such as lights, heaters, fire protection equipment, electrical panels, and similar devices.
f) Do not carry loads on hand trucks, carts, fork trucks or alone with load blocking a clear view of the pathway unless a signal person is used.
g) Forklifts operated in a warehouse shall have rotating beacon on and warning (horn) sounded when proceeding around blind corners or through wall openings.
h) For additional information, refer to Paragraph 110 Housekeeping, Paragraph 301 Material Handling and Storage, Section 503 Vehicle Operations, and Paragraph 503.9 Industrial Trucks--Fork Lifts.

502.2 Shipping and Receiving

a) When loading hazardous materials, all regulations pertaining to containers, container labels and shipping papers shall be followed.
b) Shipping containers shall be appropriate for the product being contained and prior labels shall be removed or eliminated. Example: Do not ship a nonhazardous product in a previously labeled “aerosol container.”
c) When offloading large trucks using a forklift, the wheels of the truck being unloaded must be chocked.
d) When receiving any product or materials, the packages shall be checked thoroughly to prevent a possible release or spill.
e) Use the Utility emergency response procedures for reporting accidental spills or releases.
f) Upon receiving chemical products, storage compatibilities must be considered to prevent reactions that may cause fire or produce dangerous toxic gases or vapors, should the materials accidentally combine.

g) When receiving radiation source containers, the Radiation Safety Officer must be notified.
h) For additional information, refer to Paragraph 304 Hazardous Materials.

503 Vehicle Operations

503.1 General

a) Only specifically authorized employees who possess a valid license or permit for the equipment being used shall operate Utility-owned motor vehicles or personally owned vehicles on Utility business. All vehicle loading and operation shall be done according to applicable state and federal Department of Transportation rules and regulations.
b) Drivers shall know and obey all state and local motor vehicle laws applicable to the operation of their vehicle.
c) The driver shall drive at safe speeds no greater than that permitted by law. Traffic, road, and weather conditions shall be given consideration in determining the safe speed within the legal limit at which the vehicle shall be operated.
d) A driver shall not permit unauthorized persons to drive or operate a Utility vehicle.
e) Passengers in Utility vehicles will only be allowed as specified by the Utility.
f) If seat belts are provided, they shall be used by all occupants.
g) Employees shall not permit anyone to ride on the running boards, fenders, or any part of the vehicle except on the seats or inside the body walls. Passengers shall not stand in moving vehicles.
h) Employees shall not ride on trailers.
i) Employees shall not jump on or off vehicles in motion.
j) All vehicles shall be equipped with the appropriate safety and emergency equipment, such as fire extinguisher, first aid kit, traffic cones, signs, flares, and reflectors.
k) Refer to paragraph 504 for vehicle maintenance operations.
l) Employees shall refer to Utility policies for additional requirements.

503.2 Inspection of Equipment

a) The driver shall determine that brakes are in a safe operating condition before operating equipment. If brakes are not working properly, they must be corrected before vehicle is used.

b) The driver shall inspect windshield wipers frequently and see that they are in good operating condition and that the windows and windshield give sufficient visibility for safe operation of vehicle.

c) All vehicle lights and reflectors shall be inspected by the employee; if found defective, they shall be repaired immediately.

d) The driver shall report any defects that may have developed during the day. If the brakes are not working properly, they shall be adjusted or repaired before the vehicle is put into operation. Other items that affect safety shall be repaired prior to continued vehicle operation.

503.3 Exhaust Gas

The driver shall not operate the engine in any garage except when driving in or out, and then the engine shall be operated as little as practicable. The engine shall not be warmed up inside a garage nor shall the driver test the engine operation in a garage unless the exhaust gas is carried directly to outside atmosphere, or doors and windows are open so that adequate ventilation exists.

503.4 Operation

a) The operator of a motor vehicle shall clearly signal intention of turning, passing, or stopping.

b) Upon a signal from a vehicle approaching from the rear, the driver of a Utility vehicle shall yield the right-of-way.

c) Drivers shall be prepared to stop and yield the right-of-way in all instances when necessary to avoid an accident.

d) The driver of a vehicle shall be courteous toward other operators and pedestrians. The vehicle shall be operated in a safe manner, and the driver shall yield the right-of-way to pedestrians and other vehicles when failure to do so might endanger any person or another vehicle.

e) The driver shall maintain sufficient distance behind another vehicle to safely stop the vehicle in the clear distance ahead.

f) Drivers shall exercise added caution when driving through residential and school zones.

g) When entering or leaving any building, enclosure, alley, or street where vision is obstructed, a complete stop shall be made and the driver shall proceed with caution.

h) Trucks on which derricks or booms are erected above traveling height shall not be moved except under the immediate direction of a designated employee, who shall give his undivided attention to the movement.

i) Before a vehicle is driven under or adjacent to energized equipment, especially in substation areas, the clearance shall be checked, especially that of the radio antenna, in order to ensure that proper clearances will be maintained between the vehicle and energized equipment.

j) All ignition systems shall be turned off and no smoking permitted while refueling.

k) When proceeding down grade, the clutch shall not be disengaged. Trucks, particularly if heavily loaded, shall be in a lower gear on steep grades.

503.5 Parking

a) When vehicles must be parked on the roadway, they shall be parked on the right-hand side facing in the direction of traffic flow, whenever possible.

b) When parking on a roadway, vehicles shall park off the traveled road surface, whenever possible. When vehicles must park closer than 10 feet to the traveled road surface, appropriate warning devices shall be used.

c) Trucks or trailers stopped on any public roadway shall be protected by proper warning lights, reflectors, or red flags in accordance with state or local requirements.

d) Vehicles shall not be parked on bridges or over culverts except when necessary for work.

e) When it is necessary to park on an incline, the driver shall make sure the vehicle is left in a safe position. The engine shall be turned off, the vehicle placed in the lowest gear or “park” position, and

the parking brake set. The front wheels shall be cut into the curb, or if a curb is not present, the rear wheels shall be chocked.

f) Any DOT commercial motor vehicle shall be chocked while parked.

503.6 Backing

a) Whenever possible, the vehicle shall be positioned to avoid the necessity of backing.

b) Extreme caution shall be exercised when backing a vehicle, to avoid injury to persons and to prevent property damage. Another employee, if present, shall be stationed at the rear of the vehicle to assist the driver in backing the vehicle safely.

c) When backing a vehicle which has an obstructed view to the rear, take the following precautions:

(1) A reverse signal (backup alarm) audible above the surrounding noise level shall be used, or

(2) An observer shall signal that it is safe to back.

(3) Back slowly.

(4) Watch both sides but do not depend entirely on mirrors.

(5) In any difficult backing situation, enlist the help of another person on the ground as a guide, when such help is available.

503.7 Stopping on the Highway

a) Stopping on the highway shall be avoided.

b) When it is absolutely necessary to stop on the highway, use extreme caution. Warning signals and lights shall be used:

(1) Rotating beacon shall be used, if vehicle is so equipped.

(2) Tail lights/emergency flashers shall be used.

(3) Flares or reflectors shall be placed to give adequate advance warning.

(4) If work is in progress, traffic control devices (together with flagmen, where necessary) shall be used in accordance with the manual on uniform traffic control.

503.8 Hauling Poles or Ladders

a) Poles, ladders, pipe, etc., shall be loaded parallel with the truck length. Such material shall not extend beyond the normal sides of the vehicle.

b) Materials shall be securely fastened to prevent a hazard due to shifting.

c) Material that extends more than 4 feet beyond the front or back of the truck or trailer shall have warning devices attached. During the day, red flags shall be used; at night and during periods of poor visibility, red lights or an escort vehicle with strobe lights shall be used. An employee shall be used for flagging when necessary.

d) When a vehicle hauling long poles must enter congested areas or heavy traffic, escort vehicles displaying suitable warning signs should be used.

e) Refer to Paragraphs 507.15 and 507.16 for additional pole handling requirements.

503.9 Industrial Trucks--Fork Lifts

a) Industrial trucks shall be operated only by authorized persons who are qualified and trained in their use.

b) Brakes and controls shall be tested before use. Equipment with faulty brakes or mechanical or electrical defects shall not be operated. Needed repairs shall be completed or reported immediately.

c) Equipment shall always be operated at a safe speed for existing conditions.

d) Before moving the equipment, the operator shall make sure that no person or objects are in the path of the vehicle. Clearances in all directions shall always be checked, particularly overhead clearances.

e) Industrial trucks shall not be fueled with the engine running.

f) When picking up a load, forks shall be set squarely and as far as possible under the load. Loads should not be raised or lowered while traveling. Loaded or empty, forks should be carried as low as possible, but high enough to clear uneven surfaces.

g) Loads shall not be suspended or swung over other persons. No one should be allowed to stand, walk or work under elevated forks.

h) The operator shall always face in the direction of travel.

i) On inclines, all types of loaded lift trucks shall be driven with the load on the upgrade side of the driver, whether ascending or descending.

j) Sudden stops, which might spill the load, shall be avoided.

k) All loads shall be securely fastened or safely positioned to prevent tipping or falling.

l) Lift bars on fork lift trucks that are movable or replaceable shall be held firmly in place by a proper securing pin. Jury-rigged devices, such as using a threaded bolt, shall not be permitted.

m) Only attachments provided by or approved by the manufacturer may be used. Such attachments shall be properly secured. Improvised methods shall not be used.

n) No one shall be allowed to ride the truck, fork lift, or other equipment other than the operator, except when seats are provided for this purpose.

o) When an industrial truck is left unattended (operator is 25 feet away or the vehicle is not in his view), the load engaging means shall be fully lowered, controls shall be neutralized, power shall be shut off, and brakes set. Wheels shall be chocked when the truck is parked on an incline.

p) Equipment with internal combustion engines shall not be operated in enclosed areas for prolonged periods of time so as not to exceed the allowable levels of carbon monoxide.

q) When loading or unloading trucks or railroad cars, approved dockboards that are properly secured shall be used. The wheels of the truck or railroad car shall be blocked.

r) For additional information concerning industrial trucks, refer to OSHA Standard 29 CFR 1910.178.

503.10 Cranes, Derricks, Hoisting Equipment

a) Only authorized persons shall be permitted in the cab or on the equipment. Only those designated persons who are trained and qualified shall operate the hoisting equipment.

b) No person shall be permitted to ride the hook, sling, or load of any hoisting equipment.

c) Load limits as specified by the manufacturer shall not be exceeded under any circumstances.

d) Operating and maintenance procedures as specified by the manufacturer shall be followed.

e) The following are the minimum checks which shall be made daily before use:

(1) All control mechanisms for maladjustment interfering with proper operation.

(2) All safety devices for malfunction.

(3) Deterioration or leakage in air or hydraulic systems.

(4) Hooks, hoist lines, slings, and load attachment devices.

(5) Fire extinguisher available (5 BC or larger).

f) Before a lift is attempted, the lifting mechanism shall be level and firmly supported with the hoist line centered over the center of gravity of the load to be lifted.

g) No load shall be lifted until its weight has been determined.

h) For the first lift of each day, the load shall be test lifted and the brakes checked (load lifted several inches, then tested).

i) With every load, the slings and bindings shall be checked and shall be readjusted as necessary to ensure safety and stability.

j) Signals to the equipment operator shall be given by one person designated to perform this task. The operator shall, however, obey a "Stop" signal given by anyone. Refer to Figure 5.1 for standard crane hoist hand signals.

k) When mobile hoists, cranes, or other similar lifting devices are used near energized lines or equipment, the lifting device shall be:

(1) Properly grounded,

(2) Insulated,

(3) Isolated, or

(4) Considered as energized.

l) No employee shall be under a suspended load or inside the angle of a winch line. No employee shall stand or work near a cable, chain, or rope under tension unless the nature of their work requires it.

m) Winch lines, ropes, or wire cables shall not be guided by hand when standing within reach of the drum or sheave.

n) Wire rope loops shall be made by proper slicing or mechanical clamping of the tail section. Wire rope clips shall not be used to form eyes in wire rope bridles or slings.

o) When U-bolt wire rope clips are used to form eyes in winch lines, the number used and the spacing provided shall be in accordance with Figure 5.2. The U-bolt shall be applied so that the U section is in contact with the dead end of the rope.

Figure 5.1 Crane Hoist Hand Signals

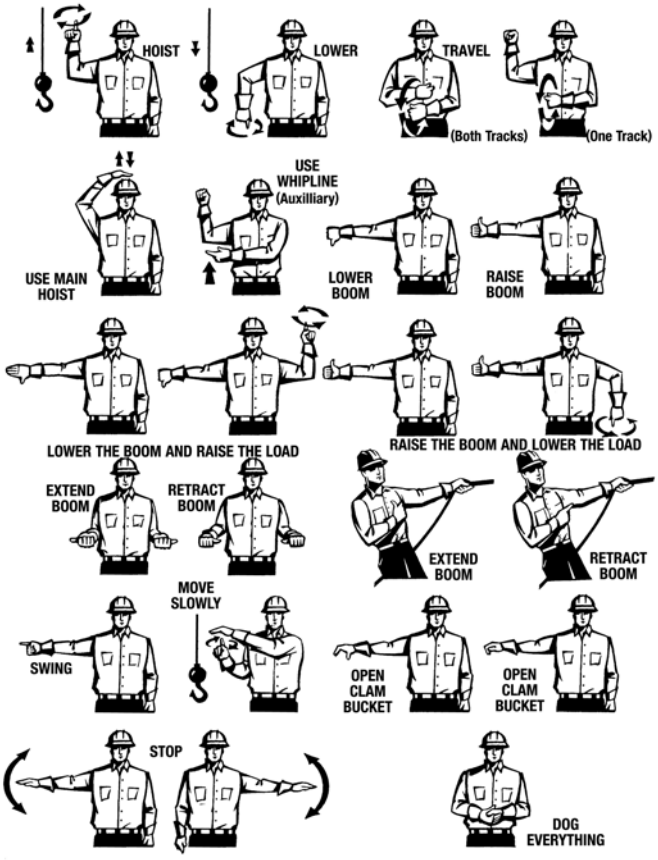
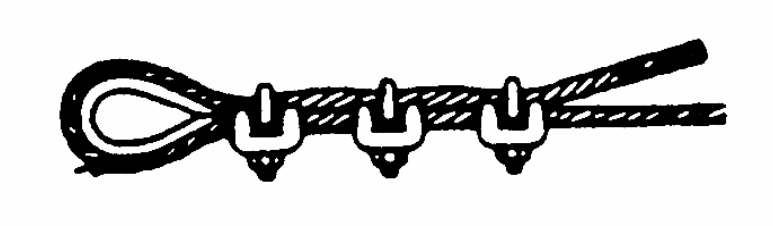
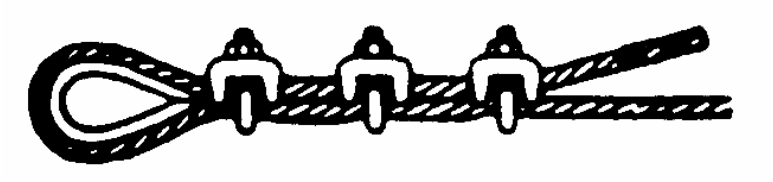


Figure 5.2 U-Bolt Wire Rope Clips



CORRECT METHOD = U-bolts of clips on short end of rope. (Live end not distorted.)



WRONG METHOD = U-bolts on live end of rope. (This will kink strands on live end.)



WRONG METHOD = Staggered clips; two correct and one wrong.

Table 5.1
Wire Ropes--Safe Loads

Size inch	Stranding	Improved Plow		Plow	
		Breaking Strength, tons	Permissible Working Loads, pounds	Breaking Strength, tons	Permissible Working Loads,* pounds
7/16	6x19	8.27	3,308	7.19	2,876
	8x19	7.09	2,836	6.17	2,468
	6x37	7.82	3,128	6.80	2,720
1/2	6X19	10.70	4,280	9.35	3,740
	8x19	9.23	3,692	9.02	3,208
	6x37	10.20	4,080	8.85	3,540
9/16	6x19	13.50	5,400	11.80	4,720
	8x19	11.60	4,640	10.10	4,040
	6x37	12.90	5,160	11.20	4,480
5/8	6x19	16.70	6,680	14.50	5,800
	8x19	14.30	5,720	12.40	4,960
	6x37	15.80	6,320	13.70	5,480

* All permissible working loads are based on a safety factor of 5.

p) Operators shall not leave their position at the controls of cranes, hoists, derricks, or other lifting devices while the load is suspended.

q) Operators of cranes, derrick, hoists, and other hoisting equipment shall exercise extreme caution when in close proximity to energized lines or equipment:

(1) When performing power transmission or distribution construction, refer to paragraph 507, Overhead Distribution and Transmission for applicable clearance requirements.

(2) When work does not involve power transmission or distribution construction and maintenance, minimum clearance distances shall be the following (numbers are expressed as phase-to-ground voltages):

(a) Up to 50 kV: 10 feet.

(b) Over 50 kV: 10 feet plus 0.4 inch for each 1 kV over 50 kV.

r) Trucks on which derricks or booms are erected above traveling height shall not be moved except under the immediate direction of a designated employee, who shall give his undivided attention to the movement.

s) For additional information concerning cranes, derricks, and hoisting equipment, refer to OSHA Standards 29 CFR 1910.180 and 29 CFR 1910.181.

503.11 Rigging Equipment

a) All rigging equipment shall be of sufficient strength, proper type, and safe for its intended use.

b) Rigging equipment shall not be loaded beyond its rated capacity.

c) Before each use, all slings, fastenings, and attachments shall be inspected for damage or defects by a qualified person. Damaged or defective equipment shall be immediately removed from service.

d) Makeshift lifting devices formed from bolts, rods, or reinforcing steel shall not be used.

e) Slings shall not be shortened with knots, bolts, or other makeshift devices.

f) Slings used in a basket hitch shall have the load balanced to prevent slippage.

g) Unless used in a basket configuration, slings shall be securely attached to the load by the use of hooks with retaining devices or the use of shackles or other positive latching device.

h) Slings shall be padded or protected from the sharp edges of their loads.

i) A sling shall not be pulled from under a load when the load is resting on the sling.

j) Slings shall be long enough to provide the maximum practical angle between the sling leg and the horizontal plane of the load.

k) Shackle pins shall never be replaced with bolts or other non-approved devices.

l) Only hooks with approved retaining devices shall be used. Hooks shall never be rigged so that they are point loaded at the tip of the hook. The load shall be securely seated in the saddle of the hook.

m) When eye bolts are used, care shall be taken to ensure the bolt is not side loaded.

n) For additional information concerning rigging equipment, refer to OSHA Standard 29 CFR 1910.184.

503.12 Aerial Devices

a) Only authorized persons who are properly trained and qualified shall use or operate aerial devices.

b) The operating and maintenance instruction manuals issued by the manufacturer shall be followed.

c) Load limits of the boom and basket shall not be exceeded. Shock loading (sudden stops or starts) of the equipment shall be avoided.

d) Aerial devices shall not be "field modified" unless such modification is certified by the manufacturer. The insulated portion shall not be altered in any manner that might reduce its insulating value.

e) Prior to use, the equipment shall be given a warm-up period. The hydraulic system and the lift controls shall be checked and tested daily before use to determine if such features are in safe working condition. Malfunctions or unsafe operational conditions shall be

reported. Equipment that is not in proper operational condition shall not be used.

f) Articulating boom and extensible boom platforms, primarily designed as personnel carriers, shall have both platform (upper) and lower controls. Lower level controls shall not be operated unless permission has been obtained from the employee in the lift, except in case of emergency.

g) The truck shall not be moved unless the boom is lowered, the basket cradled and secured, and the outriggers retracted.

h) Employees shall not ride in the bucket while the truck is traveling. (Exceptions: Employees may ride in the basket for short moves at the work location if the basket is returned to the cradled position for each move and the employees face the direction of travel.)

i) When employees are in the bucket of an aerial lift, the emergency brake of the vehicle shall be set. Wheel chocks or outriggers shall be used to provide added protection. When the vehicle is on an incline, wheel chocks shall be used regardless of whether outriggers are used. The truck should be approximately level when viewed from the rear.

j) When outriggers are used, they shall be set on pads or on a solid surface. Outriggers shall not be extended or retracted outside of clear view of the operator unless all persons are outside the range of possible equipment motion.

k) Employees shall not belt to an adjacent pole or structure. When working from an aerial lift, a body belt or harness shall be worn and a lanyard attached to the boom, basket or other acceptable attachment point.

l) Safety rules governing the use of hot-line tools, rubber goods, personal protective equipment, and general safe practices shall also apply to work done from aerial baskets. (Exception: Different rules apply when performing “live-line bare-hand” work.)

m) When a boom must be maneuvered over a street or highway, necessary precautions shall be taken to avoid accidents with traffic and pedestrians.

n) The operator shall always face in the direction in which the basket is moving and shall see that the path of the boom or basket is clear when it is being moved.

o) Employees shall not stand or sit on top or edge of the basket or on ladders placed in the basket. Employees' feet shall be on the floor of the basket the entire time they are in it.

p) Climbers shall not be worn by employees while in the basket.

q) When two employees are in the basket or baskets, one of them shall be designated to operate the controls. One employee shall give all signals, which shall be thoroughly understood by all persons concerned.

r) When two employees are working from the basket, extreme care shall be taken to avoid one employee contacting poles, crossarms, or other grounded or live equipment while the second employee is working on equipment at a different potential.

s) In no case shall more than one energized conductor or phase be worked at one time.

t) Clearances: The aerial lift, together with the employee in the basket and all tools and equipment, shall maintain proper clearances from unprotected energized conductors. If it is difficult for the operator to determine the distance between the equipment and the energized parts accurately, another person shall observe the clearance and give timely warnings when minimum clearance distance is approached. (Exception: Direct contact may be made when performing "live-line bare-hand" work.) Refer to Tables 5.2 and 5.3 for clearance requirements.

u) When using pneumatic or hydraulic tools in a bucket, the operator shall be sure that hoses or lines do not become entangled in the operational controls.

v) Aerial basket vehicles working adjacent to energized conductors or equipment shall be properly grounded or barricaded and treated as energized.

w) For additional information concerning aerial lifts, refer to OSHA Standards 29 CFR 1910.67 and 29 CFR 1910.269.

503.13 Reporting Utility Vehicle Accidents

a) The driver shall report accurately and immediately every accident involving a vehicle in their possession, according to Utility policy. Additional reports shall be made to the police or state authority as required.

b) The driver shall not discuss or argue the causes or results of an accident with other parties but shall secure all pertinent facts and information. Questions asked by proper authority shall be answered, but under no circumstances shall fault or negligence be admitted or any statement signed for anyone except proper representatives of the Utility.

c) Should the other driver demand immediate action, referral shall be made to the employee's supervisor.

d) The driver, when involved in an accident, shall stop and give his name and address, and the employer's name and address. The driver shall also secure the name and address of others involved in the accident and of witnesses to the accident (this is very important). The driver shall also note position of the vehicle(s) after the collision in reference to edge of road, sidewalk line, center of intersection, etc.

e) If any person is injured as the result of the vehicle accident, employees shall see that necessary emergency aid is provided.

f) Near misses as well as actual accidents should be reported, according to Utility policy.

503.14 Portable and Vehicle Mounted Generators

a) The generator may only supply equipment located on the generator or the vehicle and cord- and plug-connected equipment through receptacles mounted on the generator or the vehicle.

b) The noncurrent-carrying metal parts of the equipment and the equipment grounding conductor terminals of the receptacles shall be bonded to the generator frame.

c) In the case of vehicle mounted generators, the frame of the generator shall be bonded to the vehicle frame.

d) Any neutral conductor shall be bonded to the generator frame.

504 Vehicle Maintenance

504.1 General

a) Stationary jack stands or supports must be used when working under vehicles and equipment.

b) Vehicle lift devices (grease rack) are to be operated by authorized personnel only.

c) Dump boxes, booms, and other hydraulic lifting or loading units shall be securely blocked when servicing.

d) Wheels shall be chocked as appropriate on vehicles and equipment during servicing.

504.2 Batteries

a) Batteries in storage must be maintained in a well-ventilated area and secured to prevent spillage of acid contents.

b) Battery charging and jump starting shall be done in accordance with industry practice by connecting and disconnecting the positive and negative terminals in a manner that will prevent sparking.

504.3 Hydraulic Systems

a) Hydraulic fluids shall be contained in proper containers when draining these systems.

b) Checking for hydraulic leaks requires the use of proper tools and procedures. No employee shall use their hands to check for hydraulic leaks.

504.4 Spray Painting

a) Supplied air respiratory protective equipment must be used during spray painting operations using Urethane paints.

b) Spray painting areas must be secured, properly ventilated and warning signs posted to prevent unauthorized persons from entering the area.

c) Appropriate air purifying respiratory protection with appropriate cartridges and prefilters must be worn during all spray painting operations using lacquers and enamels.

d) Air purifying respiratory protection with appropriate filters or cartridges and prefilters should be used during sanding of materials, vehicles, and equipment being prepared for painting.

e) Only authorized persons shall operate paint booths.

f) Refer to Paragraph 409 for additional information on the use of respiratory protection.

504.5 Servicing Multipiece and Single Piece Wheel Rims

For information concerning the servicing of multipiece and single piece wheel rims, refer to OSHA Standard 29 CFR 1910.177.

504.6 Maintenance and Inspection of Fleet Utility Vehicles

a) Unit operator is responsible for inspection checks and lubrication in accordance with the manufacturer's operation and maintenance manual (for the truck as well as the mounted equipment.)

b) Proper maintenance of fiberglass components is essential for the components to maintain their dielectric properties and appearance. The exterior surface of fiberglass components, including upper control tubes, lower boom inserts, etc., should be cleaned and inspected pursuant to manufacturer's recommendations. This fiberglass maintenance should be performed as indicated in the manufacturer's operation and maintenance manual.

c) In cases where there is a question about the condition of equipment, a competent person should be consulted and necessary inspection and repairs completed promptly.

d) Repairs to the fuel and ignition systems of industrial trucks which involve fire hazards shall be conducted only in locations designated for such repairs.

e) Trucks in need of repairs to the electrical system shall have the battery disconnected prior to such repairs.

f) All parts of any industrial truck requiring replacement shall be replaced by only parts equivalent as to safety with those used in the original design.

g) When the temperature of any part of any truck is found to be in excess of its normal operating temperature, thus creating a hazardous condition, the vehicle shall not be returned to service until the cause for such overheating has been eliminated.

h) Industrial trucks shall be kept in a clean condition, free of lint, excess oil, and grease. Noncombustible agents should be used for cleaning trucks. Low flash point (below 100*F) shall not be used. High flash point (at or above 100* F) solvents may be used. Precautions regarding toxicity, ventilation, and fire hazard shall be consonant with the agent or solvent used.

i) For more information on the maintenance of industrial trucks, refer to OSHA 20 CFR 1910.178(q).

504.7 Defective Vehicle Tag Out

a) A defective equipment tag is to be used when vehicles or equipment are deemed unsafe to operate. The defective equipment tag indicates a unit shall not be operated for any reason.

b) Vehicles and equipment may be tagged out during servicing at the discretion of the Fleet Technician.

c) A unit with two systems, i.e., Cab and Chassis and separate Aerial Device, may be tagged independently of each other with the approval of the Vehicle Maintenance Supervisor.

d) Tags shall be signed and dated by the Fleet Technician performing the work.

e) Restricted Use Tags are intended to restrict operation of vehicles or equipment to the Servicing Fleet Technician(s). The restricted use tag allows only the Servicing Fleet Technician to operate vehicles or equipment while repairs are being made.

f) Refer to Utility specific fleet lockout-tagout procedures for additional requirements.

505 Work Zone Safety (Traffic Control)

505.1 General

a) Work area protection is the adequate safeguarding or protecting of pedestrians, motorists, Utility workers, and equipment by the use of adequate barriers, warning signs, lights, flags, traffic cones, high level standards, barricade rope, flagmen, etc., on approaches to work areas, excavations, open manholes, parked equipment, etc.

b) Work area protection is accomplished by the use of good informative and protective devices, keeping in mind that a safe installation requires the use of these devices in relation to the location of the workers and the equipment involved. The use of these devices must be coupled with proper planning, design, installation, inspection, maintenance, and the use of good common sense. It is of the utmost importance that the work area be properly identified and that warning

devices clearly convey the message to the traveling public well in advance of arrival at the work area.

c) The public must be warned in advance, then regulated and guided safely through or around the work area. Proper work area protection shall be planned to ensure the safety and protection of the public, the worker, and the equipment.

d) The possibility of accidents occurring is greatly minimized by proper planning, design, installation, operation, and maintenance, coupled with the use of common sense.

e) Refer to the "Manual on Uniform Traffic Control Devices."

f) For additional information concerning work area protection, refer to OSHA Standard 29 CFR 1910.269.

505.2 Equipment

a) Only those signs, standards, barricades, flags, and cones that conform to state or local codes shall be used.

b) All state and local traffic codes shall be followed when providing work area protection.

c) During night operations or in periods of reduced visibility, special precautions shall be taken. Adequate warning equipment, which may include flashing lights, flares, or area illumination, shall be used.

d) Warning devices and equipment shall be removed as soon as the hazard is eliminated.

e) Warning devices and equipment not in use shall be stored in a proper manner or shall be removed from the work area.

505.3 Flagmen

a) Flagmen or other appropriate traffic controls shall be used to supplement protection provided by signs, signals, and barricades whenever necessary.

b) Flagmen shall wear a red or orange warning vest or other garment. Warning garments worn at night shall be of a reflectorized material.

c) Flagmen using hand-signaling equipment shall ensure signals provide sufficient warning to protect themselves and the worksite. The

use of sign paddles is preferred and the following should be used if available:

(1) Signal flags shall be red and at least 24 inches square.

(2) Sign paddles (Stop and Slow) shall be on a 6 foot staff, and of the appropriate size and shape.

(3) In periods of darkness or reduced visibility, red lights shall be used.

d) Flagmen shall place themselves in a protected position to reduce possibility of injury from traffic.

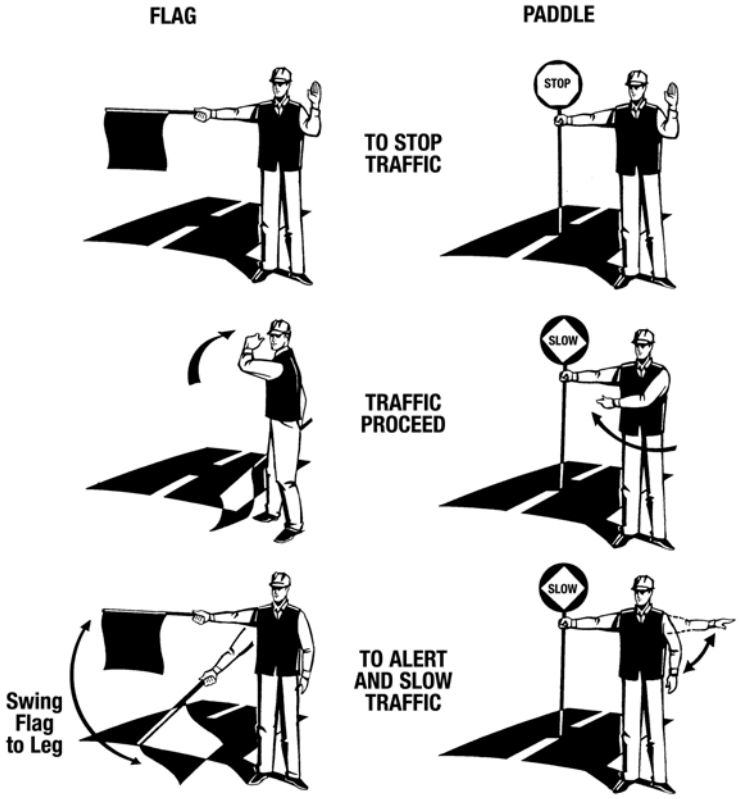
e) Flagmen shall ensure they can fully observe the operation and shall guide vehicular traffic in such a manner as to minimize the possibility of accidents or injury.

f) When flagmen are used at both ends of a jobsite, reliable communications or prearranged signals shall be used to ensure proper traffic flow.

g) Flagmen shall face traffic when giving signals.

h) Flagmen shall give positive, direct signals that leave no doubt as to their meaning.

Figure 5.3 Use of Hand-Signaling Devices by Flaggers



506 Tools and Equipment

506.1 Hand Tools

a) All tools, regardless of ownership, shall be of an approved type and maintained in good condition. (Tools are subject to inspection at any time. Supervisors have the authority and responsibility to condemn unserviceable tools, regardless of ownership.)

b) Defective tools shall be tagged to prevent their use, or they shall be removed from the jobsite.

c) Employees shall always use the proper tool for the job performed. Makeshift and substitute tools shall only be used with proper authorization and under supervision.

d) Hammers with metal handles, screwdrivers or knives with metal continuing through the handle, and metallic measuring tapes shall not be used on or near energized electrical circuits or equipment.

e) Tools shall not be thrown from place to place or from person to person; tools that must be raised or lowered from one elevation to another shall be placed in tool buckets or firmly attached to hand lines.

f) Tools shall never be placed unsecured on elevated places.

g) As impact tools such as chisels, punches, drift pins, etc., become mushroomed or cracked, they shall be dressed, repaired, or replaced before further use.

h) Chisels, drills, punches, ground rods, and pipes shall be held with suitable holders or tongs (not with the hands) while being struck by another employee.

i) Shims shall not be used to make a wrench fit.

j) Wrenches with sprung or damaged jaws shall not be used.

k) Pipe shall not be used to extend a wrench handle for added leverage unless the wrench was designed for such use.

l) Tools shall be used only for the purposes for which they have been approved.

m) Tools with sharp edges shall be stored and handled so that they will not cause injury or damage. They shall not be carried in pockets.

n) Wooden handles that are loose, cracked, or splintered shall be replaced. The handle shall not be taped or lashed with wire.

o) All cutting tools such as saws, wood chisels, drawknives, or axes shall be kept in suitable guards or in special compartments.

p) Tools shall not be left lying around where they may cause a person to trip or stumble.

q) When working on or above open grating, a canvas or other suitable covering shall be used to cover the grating to prevent tools or parts from dropping to a lower level where others are present, or the danger area shall be barricaded or guarded.

r) The insulation on hand tools shall not be depended upon to protect users from electric shock.

s) When using such tools as screwdrivers and wrenches, employees should avoid using their wrists in a bent (flexed), extended, or twisted position for long periods of time. Employees should maintain their wrists in a neutral (straight) position.

t) For additional information concerning hand tools, refer to OSHA Standard 29 CFR 1910.242.

506.2 Portable Electric Tools

a) The noncurrent-carrying metal parts of portable electric tools such as drills, saws, and grinders shall be effectively grounded when connected to a power source unless:

(1) The tool is an approved double-insulated type, or

(2) The tool is connected to the power supply by means of an isolating transformer or other isolated power supply, such as a 24V dc system.

b) All powered tools shall be examined before use to ensure general serviceability and the presence of all applicable safety devices. The electric cord and electric components shall be given an especially thorough examination.

c) Powered tools shall be used only within their capability and shall be operated in accordance with the instructions of the manufacturer.

d) All tools shall be kept in good repair and shall be disconnected from the power source while repairs are being made.

e) Electrical tools shall not be used where there is a hazard of flammable vapors, gases, or dusts.

f) Tools connected to a central power supply, including portable and vehicle mounted generators (not isolated and not double-insulated), shall be protected by a Ground Fault Interrupter (GFI) or by an "assured grounding system."

g) For additional information concerning portable electric tools, refer to OSHA Standards 29 CFR 1910, Subpart P and 29 CFR 1910.269.

h) Any cord and plug connected equipment supplied by other than premises wiring shall comply with one of the following:

(1) Equipped with a cord containing an equipment grounding conductor connected to the tool frame.
(2) Double insulated.
(3) Connected to the power supply through an isolating transformer with an ungrounded secondary.

506.3 Pneumatic Tools

a) Compressed air and compressed air tools shall be used with caution.

b) Pneumatic tools shall never be pointed at another person.

c) Pneumatic power tools shall be secured to the hose or whip by some positive means to prevent the tool from becoming accidentally disconnected.

d) Safety clips or retainers shall be securely installed and maintained on pneumatic impact (percussion) tools to prevent attachments from being accidentally expelled.

e) Compressed air shall not be used for cleaning purposes except when reduced to less than 30 psi, and then only with effective chip guarding and personal protective equipment.

f) Compressed air shall not be used to blow dust or dirt from clothing.

g) The manufacturer's safe operating pressure for hoses, pipes, valves, filters, and other fittings shall not be exceeded.

h) The use of hoses for hoisting or lowering tools shall not be permitted.

i) All hoses exceeding 1/2 inch inside diameter shall have a safety device at the source of supply or branch line to reduce pressure in case of hose failure or disengagement of a connection.

j) Before making adjustments or changing air tools, unless equipped with quick-change connectors, the air shall be shut off at the air supply valve ahead of the hose. The hose shall be bled at the tool before breaking the connection.

k) Eye protection, foot protection, and other protective devices shall be worn when their use could reduce the possibility of injury.

l) Pneumatic tools shall be operated only by competent persons who have been trained in their use.

m) A pneumatic tool used where it may contact exposed live electrical parts shall have a nonconductive hose and an accumulator to collect moisture.

n) Employees shall not use any part of their bodies to locate or attempt to stop an air leak.

o) For additional information concerning pneumatic tools, refer to OSHA Standards 29 CFR 1910, Subpart P and 29 CFR 1910.269.

506.4 Hydraulic Tools

a) Manufacturers' safe operating pressures for hydraulic tools, hoses, valves, pipes, filters, and fittings shall not be exceeded.

b) Pressure shall be released before connections are broken unless quick-acting, self-closing connectors are used.

c) Employees shall wear appropriate personal protective equipment and shall not use any part of their bodies to locate and attempt to stop a hydraulic leak.

d) The fluid used in hydraulic powered tools shall be fire resistant and shall retain its operating characteristics at the most extreme temperatures to which it will be exposed.

e) All hydraulic lines longer than 35 feet should have check valves or provide for loss of insulating value due to partial vacuum, when used where they may come into contact with exposed live parts.

506.5 Power Lawn Mowers, Edgers, etc.

a) Employees shall ensure that all applicable guards are in place prior to using power lawn mowers.

b) All power lawn mowers shall be equipped with adequate guards, which shall remain in place while the mower is in use.

c) Prior to making adjustments, inspections, or repairs, the employee shall turn off the mower and permit it to come to a complete stop.

d) When operating a power mower, the employee shall perform the following:

(1) Remove any rocks, pieces of wire, or other foreign objects from the area to be mowed.

(2) Avoid placing the body in front of the discharge opening.

(3) Mow across the face of a slope or incline.

(4) Wear proper protective equipment including, as a minimum, safety glasses or safety goggles, appropriate hearing protection, and proper footwear.

e) For additional information concerning power lawn mowers, edgers, etc., refer to OSHA Standard 29 CFR 1910.243.

506.6 Powder-Actuated Tools

a) Only those employees who are trained and qualified in their operation shall use powder-actuated tools.

b) Explosive charges shall be carried and transported in approved containers.

c) Operators and assistants using these tools shall be safe-guarded by means of eye protection (safety eye goggles or face shields), a safety hat, and appropriate hearing protection.

d) Tools shall be maintained in good condition and serviced regularly by qualified persons. The material upon which these tools are to be used shall be examined before work is started for the purpose of determining its suitability and eliminating the possibility of hazard to the operator and others.

e) Prior to use, the operator shall ensure that the protective shield is properly attached to the tool.

f) Prior to use, the operator shall inspect the tool to determine if it is clean, if moving parts operate freely, and if the barrel is free from obstructions.

g) A defective tool shall be tagged and immediately removed from service.

h) Powder-actuated tools shall not be used in an explosive or flammable atmosphere.

i) Tools shall not be loaded until just prior to the intended firing.

j) Only cartridges with an explosive charge adequate for the job and with proper penetration shall be used.

k) Tools and cartridges shall never be left unattended.

l) Tools shall never be pointed at any person.

m) In case of a misfire, the operator shall hold the tool in place for 30 seconds. He shall then try to operate the tool a second time and

then wait another 30 seconds. Misfired cartridges shall be disposed of properly (place in metal container and return to supervisor).

n) Only powder charges, studs, or fasteners specified by the manufacturer for the specific tool shall be used.

o) For additional information concerning powder-actuated tools, refer to OSHA Standard 29 CFR 1910.243.

506.7 Safe Supports and Scaffolds

a) No employee, or any material or equipment, shall be supported or permitted to be supported on any portion of a tree, pole structure, scaffold, ladder, walkway, or other elevated structure, crane or derrick, etc., without first determining that such support is adequately strong and properly secured in place.

b) Employees shall check all scaffolding before use to ensure it is of sufficient strength and rigidity to safely support the weight of the persons and material to which it will be subjected.

c) Employees shall not use a scaffold from 4 to 10 feet in height having a minimum horizontal dimension of less than 45 inches unless proper guardrails are present to provide adequate employee protection.

d) Employees shall not use a scaffold over 10 feet in height unless a standard guardrail, with midrail and toeboard, is present to provide adequate employee protection.

e) Scaffold planks shall extend over their end supports by not less than 6 inches (unless cleated) nor more than 12 inches.

f) Scaffolds shall not be moved without first removing all loose tools, materials, and equipment resting on the scaffold deck.

g) All scaffolds shall be sufficiently secured and braced.

h) The footing and anchorage points for scaffolds shall 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 shall not be used to support scaffolds or planks.

i) Scaffolds shall not be altered or moved horizontally while being used or occupied except when specifically designed for such use. Movable scaffolds shall have the casters or wheels locked to prevent movement.

j) The width of all scaffolds, ramps, and platforms shall be sufficient to prevent congestion of persons, materials, or equipment, and in no case shall they be less than 18 inches wide.

k) Synthetic or natural fiber rope shall not be used as guardrails.

l) Employees working on suspended scaffolds shall be protected by an independent lifeline, body harness, and a lanyard.

m) Safe access shall be provided for all scaffolds. Structural members should not be used as a means of access.

n) For additional information concerning safe supports and scaffolds, refer to OSHA Standards 29 CFR 1910.28 and 29 CFR 1910.29.

506.8 Ladders--General

a) Wooden ladders shall not be painted so as to obscure a defect in the wood; only a clear, nonconductive finish shall be used.

b) All ladders shall be inspected frequently and regularly. Ladders with weakened, broken, or missing steps, broken side rails, or other defects shall be tagged and removed from service.

c) Ladders shall be sufficiently strong for their intended use.

d) Portable metal ladders and other portable conductive ladders shall not be used in the vicinity of exposed energized lines and equipment. (Exception: Such ladders may be used in specialized work, such as high voltage substations, where nonconductive ladders might present a greater hazard. These ladders shall be properly marked.)

e) Ladders shall not be placed in front of doors opening toward the ladder unless the door is open, locked, or guarded.

f) When ascending or descending ladders, employees shall have both hands free and shall face the ladder.

g) Only one employee shall work from a ladder at one time (except for hook type ladders). If two employees are required, a second ladder shall be used.

h) Only Utility-owned ladders shall be used by employees.

i) Ladders shall not be used as scaffold platforms unless specifically designed for that purpose.

j) Boxes, chairs, etc., shall not be used as ladders.

k) All ladders shall be capable of supporting at least 2.5 times the maximum intended load without failure.

l) When working from a portable ladder, the ladder must be securely placed, held, tied, or otherwise made secure to prevent slipping or falling.

m) The use of step ladders above 20 feet is prohibited and the use of extension ladders above 24 feet is strongly discouraged. Refer to your Utility's ladder policy.

n) Ladders of all types should never be left in place when employees leave the worksite for an extended period of time. They shall be laid on the ground or floor in a safe location or returned to the truck (storage position).

o) For additional information concerning ladder requirements, refer to OSHA Standards 29 CFR 1910.25, 29 CFR 1910.26, and 29 CFR 1910.27.

506.9 Straight Ladders

a) Portable straight ladders shall not be used without nonskid bases.

b) The ladder shall be placed so that the distance between the bottom of the ladder and the supporting point is approximately one-fourth of the ladder length between supports.

c) Straight ladders shall not be climbed beyond the third step from the top.

d) When dismounting from a ladder at an elevated position (such as a roof), the employee shall ensure that the ladder side rails extend at least 3 feet above the dismount position, or that grab bars are present.

e) Employees shall belt off to a ladder whenever both hands must be used for the job or a possibility of the employee falling from an elevated position exists.

f) Ladders shall not be spliced together to form a longer ladder, unless specifically designed to be used as a section ladder.

g) A ladder shall not be placed against an unsafe support.

506.10 Step Ladders

a) The top step shall not be used, except for platform ladders.

b) Step ladder legs shall be fully spread and the spreading bars locked in place.

c) Step ladders shall not be used as straight ladders.

d) When an employee is working on a step ladder more than 10 feet high (except a platform ladder), the ladder shall be held by another person.

507 Overhead Distribution and Transmission

507.1 Working On or Near Exposed Energized Lines and Equipment

a) Only qualified employees and trainees working under their direct supervision may work on or with exposed energized lines or parts of equipment. Only qualified employees and trainees working under their direct supervision may work in areas containing unguarded, uninsulated energized lines or parts of equipment operating at 50 volts or more. When employees are performing work on or associated with exposed lines or equipment energized at 50 volts or more, persons trained in first aid and cardiopulmonary resuscitation (CPR) shall be available as follows:

(1) For field work involving two or more employees at a work location, at least two trained persons shall be available. Only one trained person needs to be available if all new employees are trained in first aid and CPR within 3 months of their hiring dates.

(2) For fixed work locations such as generating stations, the number of trained persons available shall be sufficient to ensure that each employee exposed to electric shock can be reached in 4 minutes by a trained person. Where the existing number of employees is not sufficient to meet this requirement (at a remote substation, for example), all employees at the work location shall be trained.

b) When working on energized circuits or equipment where the voltage between any two conductors is more than 5 kV (nominal), the following minimum conditions shall be met in addition to all rules governing the use of protective equipment.

(1) Employees shall be isolated from all grounds (wooden poles shall be considered as grounds in this case) and conductors by using approved supplementary insulation such

as aerial baskets, a linesman's platform, or other approved insulated devices.

c) At least two qualified employees will be present while the following types of work are being performed (except as noted in (c) below):

(1) Installation, repair or removal of de-energized lines if an employee is exposed to contact with other parts energized at more than 600 volts.

(2) Installation, repair or removal of lines energized at more than 600 volts.

(3) Installation, repair or removal of equipment such as transformers, capacitors and regulators, if an employee is exposed to contact with parts energized at more than 600 volts.

(4) Work involving the use of mechanical equipment, other than insulated aerial lifts, near parts energized at more than 600 volts.

(5) Any other work that exposes an employee to electrical hazards greater than or equal to those listed above.

d) Two employees do not need to be present in the following operations:

(1) Routine switching of circuits (if it can be done safely).

(2) Work performed with live-line tools if the employee is positioned so that they are not within reach of or otherwise exposed to energized parts.

(3) Emergency repairs necessary to safeguard the general public.

e) 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 volts or more. When two or more employees are working on the same line section, they shall only work on or contact the same conductor at one time.

Note: An employee undergoing on-the-job training who has demonstrated the ability to perform duties safely at his level of training and who is under the direct supervision of a qualified

person is considered to be a qualified person for the performance of those duties.

f) No employee may approach or take any conductive object without an insulating handle closer to exposed energized parts than the minimum approach distances set forth in Tables 5.2 through 5.6 unless the employee is insulated from the energized part or the energized part is insulated from the employee and any other conductive object at a different potential, or the employee is insulated from any other conductive object, as during live-line bare-hand work. Refer to Paragraphs 507.2, 507.5, 507.8, and 509.5 for related information. Refer to OSHA Standard 29 CFR 1910.137.

Table 5.2
AC Live-Line Work Minimum Approach Distance [4]
(NESC 2007 Table 441-1)

Nominal Voltage in Kilovolts Phase-to-Phase [1] [2]	Distance			
	Phase-to-Ground Exposure		Phase-to-Phase Exposure	
	(ft-in)	(m)	(ft-in)	(m)
0 to 0.300	Avoid Contact		Avoid Contact	
0.301 to 0.750 [1]	1-0	0.31	1-0	0.31
0.751 to 15 [1]	2-2	0.65	2-3	0.67
15.1 to 36.0	2-7	0.77	2-10	0.86
36.1 to 46.0	2-9	0.84	3-2	0.96
46.1 to 72.5	3-3 [3]	1.00 [3]	3-11	1.20
72.6 to 800	For nominal voltage phase to phase above 72.6kV, an engineering analysis must be conducted to determine the maximum anticipated per unit over voltage factor to calculate minimum approach distance. See table 5.3 & 5.4			

Note 1: These distances take into consideration the highest switching surge an employee will be exposed to on any system with air as the insulating medium and the maximum voltages shown.

Note 2: The clear live-line tool distance shall equal or exceed the values for the indicated voltage ranges.

[1] For single-phase systems, use the highest voltage available.

[2] For single-phase lines off three phase systems, use the phase-to-phase voltage of the system.

[3] The 46.1 to 72.5kV phase-to-ground 3-3 distance contains a 1-3 electrical component and a 2-0 inadvertent movement component.

[4] Distances listed are for standard atmospheric conditions. The data used to formulate this table was obtained from test data taken with standard atmospheric conditions. Standard atmospheric conditions are defined as temperatures above freezing, wind less than 12 mi per hr or 24 km per hr, unsaturated air, normal barometer, uncontaminated air, and clean and dry insulators. If standard atmospheric conditions do not exist, extra care must be taken.

Courtesy of National Electrical Safety Code 2007 Table 441-1

Table 5.3
AC Live-Line Work Minimum Approach Distance for altitudes less than 3000ft
With Overvoltage Factor Phase-to-Ground Exposure [1]

Maximum anticipated per unit overvoltage factor T	Maximum phase-to-phase voltage in kV													
	72.5 to 121.0		121.1 to 145.0		145.1 to 169.0		169.1 to 242.0		242.1 to 362.0		362.1 to 550.0		550.1 to 800.0	
	ft	in	ft	in	Ft	in	ft	in	ft	in	ft	in	ft	in
1.5	2	2	2	5	2	8	3	4	4	6	6	6	10	5
1.6	2	3	2	6	2	9	3	6	4	9	7	0	11	5
1.7	2	4	2	7	2	10	3	8	4	11	7	6	12	5
1.8	2	5	2	8	3	0	3	10	5	2	8	1	13	6
1.9	2	6	2	9	3	1	4	0	5	5	8	8	14	8
2.0	2	7	2	11	3	2	4	1	5	8	9	4	**15**	**11**[2]
2.1	2	8	3	0	3	4	4	3	5	10	9	11	17	2
2.2	2	9	3	1	3	5	4	5	6	2	10	7	18	5
2.3	2	10	3	2	3	6	4	7	6	6	11	2	19	9
2.4	2	11	3	3	3	7	4	9	6	10	**11**	**10**[2]	21	3
2.5	3	0	3	4	3	9	4	11	7	3	12	8	22	8
2.6	3	0	3	5	3	10	5	0	7	7	13	4		
2.7	3	1	3	6	3	11	5	2	7	11	14	2		
2.8	3	2	3	7	4	1	5	4	8	4	14	12		
2.9	3	3	3	9	4	2	5	6	8	9	15	9		
3.0[2]	**3**	**4**	**3**	**10**	**4**	**3**	**5**	**8**	**9**	**2**	16	8		
3.1	3	5	3	11	4	4	5	10	9	6				
3.2	3	6	4	0	4	6	6	0	9	11				
3.3	3	7	4	1	4	7	6	3	10	4				
3.4	3	8	4	2	4	8	6	5	10	9				
3.5	3	9	4	3	4	10	6	8	11	3				

Note 1: The distance specified in this table may be applied only where the maximum anticipated per-unit transient overvoltage has been determined by engineering analysis and has been supplied by the employer. Table 5.2 applies otherwise.

Note 2: The distances specified in this table are the air, bare-hand, and live-line tool distances.

[1] Distances listed are for standard atmospheric conditions. The data used to formulate this table was obtained from test data taken with standard atmospheric conditions. Standard atmospheric conditions are defined as temperatures above freezing, wind less than 15 mi per hr, unsaturated air, normal barometer, uncontaminated air, and clean and dry insulators. If standard atmospheric conditions do not exist, extra care must be taken.

[2] See Rule 441A4a in NESC

Courtesy of National Electrical Safety Code 2007 Table 441-2.

Table 5.4
AC Live-Line Work Minimum Approach Distance
With Overvoltage Factor Phase-to-Phase Exposure
(NESC 2002 Table 441-3)

Maximum anticipated per unit overvoltage factor T	Distance to employee – phase-to-phase work, in air, barehand, and clear live-line tool													
	Maximum phase-to-phase voltage in kV													
	72.5 to 121.0		121.1 to 145.0		145.1 to 169.0		169.1 to 242.0		242.1 to 362.0		362.1 to 550.0		550.1 to 800.0	
	ft	in	ft	in	ft	in	ft	in	ft	in	ft	in	ft	in
1.5	2	6	2	10	3	1	4	0	5	6	8	0	13	0
1.6	2	9	3	2	3	6	4	6	6	3	9	5	15	8
1.7	3	1	3	5	3	10	5	1	7	0	11	0	18	6
1.8	3	4	3	9	4	3	5	7	7	9	12	6	21	5
1.9	3	7	4	1	4	7	6	1	8	7	14	3	24	7
2.0	3	10	4	4	4	11	6	7	9	4	15	11	**27**	**10**[2]
2.1	3	11	4	6	5	1	6	9	9	7	16	9	29	7
2.2	4	0	4	7	5	2	6	11	10	0	17	6	31	1
2.3	4	1	4	8	5	3	7	1	10	5	18	4	32	10
2.4	4	2	4	9	5	4	7	3	10	9	**19**	**2**[2]	34	9
2.5	4	3	4	10	5	6	7	4	11	2	20	1	36	6
2.6	4	3	4	11	5	7	7	6	11	7	21	0		
2.7	4	4	5	0	5	8	7	8	12	1	22	0		
2.8	4	6	5	1	5	10	7	10	12	7	23	1		
2.9	4	6	5	3	5	11	8	0	13	1	24	0		
3.0[2]	**4**	**7**	**5**	**4**	**6**	**0**	**8**	**2**	**13**	**6**	25	1		
3.1	4	8	5	5	6	1	8	4	13	11				
3.2	4	9	5	6	6	2	8	6	14	5				
3.3	4	10	5	7	6	4	8	9	14	11				
3.4	4	11	5	8	6	5	8	11	15	4				
3.5	5	0	5	9	6	6	9	3	15	9				

Note 1: The distance specified in this table may be applied only where the maximum anticipated per-unit transient overvoltage has been determined by engineering analysis and has been supplied by the employer. Table 5.2 applies otherwise.

Note 2: The distances specified in this table are the air, bare-hand, and live-line tool distances.

[1] Distances listed are for standard atmospheric conditions. The data used to formulate this table was obtained from test data taken with standard atmospheric conditions. Standard atmospheric conditions are defined as temperatures above freezing, wind less than 15 mi per hr, unsaturated air, normal barometer, uncontaminated air, and clean and dry insulators. If standard atmospheric conditions do not exist, extra care must be taken.

[2] See Rule 441A4a in NESC

Courtesy of National Electrical Safety Code 2007 Table 441-3.

Table 5.5
DC Live-Line Work Minimum Approach Distance, for altitudes less than 3000ft
With Overvoltage Factor

Maximum Anticipated Per-Unit Transient Overvoltage	Distance in Feet-Inches				
	Maximum Line-to-Ground Voltage in Kilovolts				
	250	400	500	600	750
1.5 or lower	3-8	5-3	6-9	8-7	11-10
1.6	3-10	5-7	7-4	9-5	13-1
1.7	4-1	6-0	7-11	10-3	14-4
1.8	4-3	6-5	8-7	11-2	15-9

Note 1: The distance specified in this table may be applied only where the maximum anticipated per-unit transient overvoltage has been determined by engineering analysis and has been supplied by the employer. However, if the transient overvoltage factor is not known, a factor of 1.8 shall be assumed.

Note 2: The distances specified in this table are the pole to ground, air, bare-hand, and live-line tool distances.

Courtesy of National Electrical Safety Code 2007 Table 441-4.

Table 5.6 Altitude Correction Factor		
Altitude		Correction Factor
ft	m	
3,000	900	1.00
4,000	1,200	1.02
5,000	1,500	1.05
6,000	1,800	1.08
7,000	2,100	1.11
8,000	2,400	1.14
9,000	2,700	1.17
10,000	3,000	1.20
12,000	3,600	1.25
14,000	4,200	1.30

Note: If the work is performed at elevations greater than 3,000 ft (900 m) above mean sea level, the minimum approach distance shall be determined by multiplying the distances in Table 5.2 through Table 5.5 by the correction factor corresponding to the altitude at which work is performed.

Courtesy of National Electrical Safety Code 2007 Table 441-5.

g) Employees may not work on equipment or lines in any position from which a shock or slip will tend to bring the body toward exposed parts that are at a potential different from the employee's body.

h) In connecting de-energized equipment or lines to an energized circuit by means of a conducting wire or device, employees shall first

attach the wire to the de-energized part. When disconnecting, employees shall remove the source end first. Loose conductors shall be kept away from exposed energized parts.

i) When work is performed in the vicinity of exposed energized parts of equipment, employees shall remove or render nonconductive all exposed conductive articles, such as key or watch chains, rings, or wrist watches or bands.

j) Employees shall immediately report to the nearest supervisor any defective line, apparatus or tool, or other condition, which in their judgment may be dangerous either to persons or property or likely to interrupt or delay service.

k) Electrical equipment and lines shall always be considered "live" unless they are positively known to be dead by testing and grounding. Before starting to work, preliminary inspection or test shall be made to determine what conditions exist. Care shall be exercised to handle neutral wires with the same caution that is used with energized wires.

l) Secondary windings of current or series transformers shall be short-circuited before any instrument, or other device connected in the circuit, is removed or disconnected.

m) Employees must evaluate existing conditions that relate to the safety of the work to be performed before work is started.

n) When two or more employees are working on the same structure, they shall only work on or contact the same conductor.

o) The automatic reclosing feature of circuit interrupting devices shall be placed in non-automatic reclose mode before work begins, if moving, cutting, repairing or performing hands-on rubber glove methods.

p) For additional information concerning overhead distribution and transmission requirements, refer to OSHA Standard 29 CFR 1910.269.

Exclusions

- In the event that the site supervisor assures that work is performed behind sufficient protective devices, they may determine that one of such interrupting devices is not required.

- When performing hands on energized live work, steps shall be taken to assure that circuits cannot become re-energized in the event of a fault.

507.2 Flexible Protective Equipment

a) Flexible protective equipment should be considered as only partial protection and in no case should it be depended on as giving complete protection.

b) Employees shall not touch or work on any exposed energized lines or apparatus except when wearing protective equipment approved for the voltage to be contacted. Insulating sleeves shall be worn with insulating gloves. Insulating sleeves need not be worn under the following conditions:

(1) If exposed energized parts not being worked on are insulated from the employee, and

(2) The insulation is placed from a position not exposing the employee's upper arm to contact with other energized parts.

c) When work is to be done on or near energized lines, all energized and grounded conductors or guy wires within reach of any part of the body shall be covered with rubber protective equipment, except that part of the conductor on which the employee is to work.

d) When working on energized lines or apparatus, work should be done from below, if possible.

e) In applying flexible protective equipment, an employee shall always protect the nearest and lowest wires first, protecting themselves as they progress. The protective equipment shall extend beyond the reach of the employee's anticipated work position or extended reach distance. In removing rubber protective equipment, the reverse order shall be maintained.

f) Flexible blankets shall not be used on the ground without protecting them from physical damage and moisture by means of a tarpaulin, canvas, or protective mat.

g) Protective equipment shall be put on before entering the work area within which energized lines or apparatus may be reached and shall not be removed until the employee is completely out of reach of this area.

h) To avoid corona and ozone damage, rubber protective equipment shall not be allowed to remain in place on energized lines or apparatus overnight or for more than one 8 hour period, unless approved by the supervisor in charge.

i) Flexible protective equipment shall be stored in special compartments on trucks and containers provided so that they will not be damaged by tools, chemicals or other equipment.

j) Bare communications conductors shall be treated as energized lines and shall be protected accordingly.

k) Blankets, gloves and sleeves shall be produced by a seamless process and will be marked with the appropriate class and type. The markings shall be nonconductive.

l) Electrical protective equipment shall be given periodic testing as shown in Table 5.8.

m) Equipment shall be free from harmful physical irregularities that can be detected by the tests or inspections required under this section.

n) Flexible protective equipment shall be inspected for damage before each use and immediately following any incident that can reasonably be suspected of having caused damage.

o) For additional information concerning flexible protective equipment, refer to Paragraph 406, Paragraph 509.9, and OSHA Standards 29 CFR 1910.137 and 29 CFR 1910.269. Refer to Table 5.7 for rubber insulating equipment voltage requirements.

Table 5.7
Rubber Insulating Equipment
Voltage Requirements

Class of Equipment	Maximum Use Voltage* (ac rms)	Retest Voltage** (ac rms)	Retest Voltage** (dc avg)
0	1,000	5,000	20,000
1	7,500	10,000	40,000
2	17,000	20,000	50,000
3	26,500	30,000	60,000
4	36,000	40,000	70,000

*The maximum use voltage is the ac voltage (rms) classification of the protective equipment that designates the maximum nominal design voltage of the energized system that may be safely worked. The nominal design voltage is equal to the phase-to-phase voltage on multiphase circuits. However, the phase-to-ground potential is considered to be the nominal design voltage:

(1) If there is no multiphase exposure in a system area and if the voltage exposure is limited to the phase-to-ground potential, or

(2) If the electrical equipment and devices are insulated or isolated or both so that the multiphase exposure on a grounded wye circuit is removed.

**The proof-test voltage shall be applied continuously for at least 1 minute, but no more than 3 minutes.

507.3 Climbing and Working on Poles

a) All poles and structures shall be carefully inspected before climbing to assure that they are in a safe condition for the work to be performed and that they are capable of sustaining the additional or unbalanced stresses to which they will be subjected. The types of abnormalities that should be checked are general condition, cracks, holes, shell rot and decay, knots, depth of setting, soil conditions and burn marks. Acceptable tests for poles are hammer tests and rocking tests.

Table 5.8
Rubber Insulating Equipment
Test Intervals

Type of Equipment	When to Test
Rubber insulating line hose	Upon indication that insulating value is suspect
Rubber insulating covers	Upon indication that insulating value is suspect
Rubber insulating blankets	Before first issue and every 12 months thereafter*
Rubber insulating gloves	Before first issue and every 6 months thereafter*
Rubber insulating sleeves	Before first issue and every 12 months thereafter*

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

b) If poles or structures may be unsafe for climbing, they shall not be climbed until made safe by guying, bracing, or other adequate means.

c) Wires shall not be attached to or removed from a pole or structure until it is certain the pole or structure will withstand the altered strain.

d) When poles are encountered such that free climb is not appropriate (ice, badly chewed, wide cracks, shell rot, etc.), an alternate means of climbing should be considered (considerations may include belt around pole, fall arrest equipment and fall prevention systems) or the use of an aerial basket shall be considered

e) Workers shall not wear their climbers while driving or riding in vehicles or when working on the ground, on ladders (except hook ladders), or on platforms in which the wearing of the climbers creates a hazard. Climbers shall be put on at the base of the pole and removed at the base of the pole unless gaffs are covered.

f) Gaffs on climbers shall be kept within safe length limits (1-1/4 inches minimum), properly shaped, and sharp.

g) Employees shall not work on an elevated pole or structure without first securing themselves with a safety strap.

h) Only approved body belts, body harnesses, and straps shall be used. Employees shall adhere to the fall protection requirements outlined in Paragraph 203.

i) Metal hooks, chains, etc., for holding tools or tape shall not be attached to body belt or harness. Leather or other nonconducting material shall be used for this purpose.

j) The safety strap shall not be put around a pole above the uppermost pole attachment position, except where pole top or attachment is above eye level. The safety strap shall not be used on pole steps, crossarm braces, insulators, insulator pins, conductors, rotten or otherwise weak crossarms, or on attachments that are being moved. When a safety strap must be attached to a crossarm, it shall never be placed beyond the outside crossarm attachment. It shall be so placed that it will not be cut by line equipment or twisted or fouled by material that may give way under strain.

k) Employees shall not trust their weight to guy wires, pins, braces, conductors, or other such equipment that might prove unstable.

l) When two or more employees are to work on the same pole at the same time, each shall reach the working position before the next leaves the ground. They shall descend the pole one at a time.

m) When climbers are stored in the truck or tool room, the gaffs shall be covered.

n) Handline shall be hung in secure location when working on a pole or in a bucket.

507.4 Working on Energized Lines with Live-Line Tools

a) Refer to Paragraph 406-c and Utility policy concerning the use of rubber gloves with live-line tools. As a minimum requirement, rubber gloves shall be worn when making or breaking a circuit (such as switching and grounding procedures), when proper clearances cannot be maintained from underbuilt circuits, and during inclement weather.

b) Lines of No. 6 copper, No. 6 ACSR, and No. 8A Copperweld or smaller shall not be worked on with live-line tools except when installing or removing a tap.

c) Planned work with live-line tools shall not be started during unfavorable weather.

d) Before work with live-line maintenance tools is begun, the dispatcher or person having jurisdiction shall be notified. If during live-line tool work, an interruption to service occurs, the dispatcher or other person having jurisdiction shall be notified immediately.

e) Only tools approved by the Utility shall be used in live-line maintenance work.

f) A careful check shall be made to see that the condition of the structure and lines at the point of the work is such that the job may be performed safely. In addition, the adjacent spans and structures shall be carefully checked for defects in conductors, tie wires, insulators, and other equipment.

g) Under no circumstances shall a lineman depend on another worker to hold a live conductor clear of him.

h) When moving heavy conductors, blocks shall be used on the live-line tool so that they may be moved slowly and carefully.

i) While live-line work is in progress, no other work of any nature shall be performed on the same pole or structure.

j) All live-line tools, when not in use, shall be kept in proper storage containers or bags provided for that purpose and such containers or bags shall be stored in a dry and, if possible, warm place.

k) Live-line tools shall never be laid directly on the ground or against sharp objects such as barbed wire fences. Special tool holders or tarpaulins shall be used for this purpose.

l) All live-line tools shall be visually inspected before use each day. Tools to be used shall be wiped clean, and if any hazardous defects are indicated, such tools shall be removed from service.

m) Live-line tools used for primary employee protection shall be removed from service every 2 years for examination, cleaning, repair and service.

n) The automatic reclosing feature of circuit interrupting devices shall be made inoperative before work begins.

507.5 Working on Energized Lines Barehanded

a) Only employees who have been instructed and trained in live-line bare-hand work shall use the technique on energized circuits.

b) Live-line bare-hand work shall not be performed on voltages less than 69 kV.

c) Before using the live-line bare-hand technique on energized high voltage conductors or parts, a check shall be made of the following:

(1) The voltage rating of the circuit on which the work is to be performed.

(2) The clearance to ground of lines and other energized parts on which work is to be performed.

(3) The voltage limitations of the aerial lift equipment intended to be used.

d) Only equipment designed, tested, and intended for live-line bare-hand work shall be used.

e) The automatic reclosing feature of circuit-interrupting devices shall be made inoperative before working on any energized line or equipment.

f) Work shall not be performed during the progress of an electrical storm in the immediate vicinity.

g) A conductive bucket liner or other suitable conductive device shall be provided for bonding the insulated aerial device to the energized line or equipment.

(1) The employee shall be connected to the bucket liner by use of conductive shoes, leg clips, or other suitable means.

(2) Where necessary, adequate electrostatic shielding for the voltage being worked or conductive clothing shall be worn.

h) Only tools and equipment intended for live-line bare-hand work shall be used and such tools and equipment shall be kept clean and dry.

i) Before the boom is elevated, the outriggers on the aerial truck shall be extended and adjusted to stabilize the truck, and the body of the truck shall be bonded to an effective ground or barricaded and considered as energized equipment.

j) Before moving the aerial lift into the work position, all controls (ground level and bucket) shall be checked and tested to determine that they are in proper working condition.

k) Arm current tests shall be made before starting work each day, each time during the day higher voltage is going to be worked, and when changed conditions indicate a need for additional tests.

This test shall consist of placing the bucket in contact with an energized source equal to the voltage to be worked upon for a minimum of 3 minutes. The leakage current shall not exceed 1 microampere per kilovolt of nominal line-to-line voltage. Work operations shall be suspended immediately upon any indication of a malfunction in the equipment.

l) All aerial lifts to be used for live-line bare-hand work shall have dual controls (lower and upper) as required by the following:

(1) The upper controls shall be within easy reach of the employee in the basket. If a two-basket type lift is used, access to the controls shall be within easy reach from either basket.

(2) The lower set of controls shall be located near the base of the boom to permit override operation of equipment at any time.

m) Before the employee contacts the energized parts to be worked, the conductive bucket liner shall be bonded to the energized conductor by means of a positive connection that shall remain attached to the energized conductor until the work on the energized circuit is

completed. The bond should be designed to break away in the event an emergency requires the bucket to be lowered to the ground.

n) The minimum clearance distances for live-line bare-hand work shall be as specified in Tables 5.2 through 5.5. These minimum clearance distances shall be maintained from all grounded objects and from lines and equipment at a different potential than that to which the insulated aerial device is bonded unless such grounded objects or other lines and equipment are covered by insulated guards. These distances shall be maintained when approaching and leaving and when bonded to the energized circuit.

o) The use of handlines between buckets, booms, and the ground is prohibited.

p) No conductive materials more than 36 inches long shall be placed in the bucket, except for appropriate length jumpers, armor rods, and tools.

q) Uninsulated equipment or material shall not be passed between a pole or structure and an aerial lift while an employee working from the bucket is bonded to an energized part.

r) Nonconductive type handlines may be used from line to ground when not supported from the bucket.

s) A minimum clearance table (as shown in Table 5.2) shall be printed on a plate of durable nonconductive material and mounted in the bucket or its vicinity so as to be visible to the operator of the boom.

t) Insulated measuring sticks shall be used to verify clearance distances.

507.6 Working on De-Energized Lines and Equipment

a) General: All conductors and equipment shall be treated as energized until tested and grounded.

b) New Construction: New lines or equipment may be considered de-energized and worked as such under the following conditions:

(1) The lines or equipment are grounded, or

(2) The hazard of induced voltages is not present, and adequate clearances or other means are implemented to prevent contact with energized lines or equipment and the new lines or equipment.

c) Communication Conductors: Bare-wire communication conductors on power poles or structures shall be treated as energized lines unless protected by insulating materials.

d) Refer to Paragraphs 507.13 and 507.14 for grounding procedures and requirements.

507.7 Series Street Lighting Circuits

a) Before a series street lighting circuit is opened and work is performed thereon, one of the following procedures shall be performed:

(1) Circuit shall be disconnected from the source of supply by opening and physically rendering inoperative disconnecting switches or other absolute cutouts, to which Hold Cards shall be attached. Dependence shall not be placed on time switches or other automatic devices.

(2) Circuit shall be properly jumpered to avoid an open circuit condition.

b) All series street lighting circuits shall be considered as energized and worked on in accordance with Paragraphs 507.1, 406, and 507.4.

507.8 Working on Transformers

a) The primary leads of a distribution transformer shall be considered energized at full voltage until both the primary and secondary leads have been disconnected or it has been definitely determined that the secondary circuit to which it is attached is grounded.

b) The cases of all transformers connected to a source of supply shall be considered as being energized at the full primary voltage unless they are adequately grounded.

c) Employees shall not stand on or otherwise contact transformer cases while working on or near energized circuits.

d) Employees shall refer to Utility policy for procedures on grounding substation transformers.

507.9 Hoisting Cables--Conductive Material

a) Wire rope or other conductive material shall not be used to raise transformers, poles, or any other material near high voltage lines, except when the wire rope and any conductive material being raised are

adequately protected by insulating covering, and such energized wires are properly covered.

b) Use of wire rope as a hoist line shall be discontinued when it becomes worn, deteriorated, or damaged to a degree that is unsafe.

c) Metallic slings (chain or cable) shall not be used near energized equipment.

d) Positive control of wire rope shall be maintained at all times.

e) Synthetic hoisting and pulling lines and ropes shall not be considered as nonconductive.

507.10 Working on Capacitors

a) Line capacitors shall be considered at full voltage until they have been removed from the line and the terminals short-circuited and discharged to ground by an approved method. The terminals shall not be short-circuited until the capacitors have been de-energized for at least 5 minutes.

b) Employees shall wear rubber gloves and use an approved hot stick while shorting and grounding terminals and during inclement weather.

c) Employees shall not come in contact with an ungrounded capacitor case until the capacitor has been disconnected from the circuit and the terminals shorted.

d) The terminals of all capacitors in storage shall be shorted.

507.11 Stringing or Removing De-Energized Conductors

a) Prior to stringing operations, a 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.

b) If the conductor could accidentally contact an energized circuit or receive a dangerous induced voltage buildup, the conductor being installed or removed shall be grounded or provisions made to insulate or isolate the employee in order to further protect the employee from the hazard of the conductor.

c) If the existing line is de-energized, proper clearance authorization shall be secured and the line grounded on both sides of the

crossover, or the line being strung or removed shall be considered and worked as energized.

d) 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 worker or the energized conductor. The automatic reclosing feature of the circuit interrupting device shall be made inoperative. In addition, a running ground shall be used on the line being strung or the line considered and worked as energized.

e) Conductors being strung in or removed shall be kept under positive control by the use of adequate tension reels, guard structures, tielines, or other means to prevent accidental contact with energized circuits.

f) A transmission clipping crew shall have a minimum of two structures clipped in between the crew and the conductor being sagged. When working on bare conductors, clipping and tying crews shall work between grounds at all times. The grounds shall remain intact until the conductors are clipped in, except on dead-end structures.

g) Adequate grounds shall be placed on all dead-end structures and shall remain intact until jumpers are installed to complete the circuit, or shall be removed as the last phase of aerial cleanup.

507.12 Stringing Adjacent to Energized Lines

a) Prior to stringing parallel to an existing energized transmission line, a competent determination shall be made to ascertain whether dangerous induced voltage buildups will occur, particularly during switching and ground fault conditions. If such dangerous induced voltage may exist, the provisions of Paragraphs 507.13-b through 507.13-j shall be followed.

b) When stringing adjacent to energized lines, the tension stringing method or other methods that preclude unintentional contact between the lines being pulled and any employee shall be used.

c) All pulling and tensioning equipment shall be effectively grounded.

d) A ground shall be installed between the tensioning reel setup and the first structure in order to ground each bare conductor,

subconductor, and overhead ground conductor during stringing operations.

e) During stringing operations, each bare conductor, subconductor, 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.

f) The ground shall be left in place until conductor installation is completed.

g) Such grounds shall be removed as the last phase of aerial cleanup.

h) Except for moving type grounds, the grounds shall be placed and removed with a hot stick.

i) Conductors, subconductors, and overhead ground conductors shall be grounded at all dead-end or catch-off points.

j) A ground shall be located at each side and within 10 feet of the working area where conductors, subconductors, or overhead ground conductors are being spliced at ground level. The two ends to be spliced shall be bonded to each other.

k) All conductors, subconductors, and overhead ground conductors shall be bonded to the tower at any isolated tower where it may be necessary to complete work on the transmission line.

l) Work on dead-end towers shall require grounding on all de-energized lines.

m) Grounds may be removed as soon as the work is completed, provided that the line is not left open-circuited at the isolated tower at which work is being completed.

n) When performing work from the structures, clipping crews and all others working on conductors, subconductors, or overhead ground conductors shall be protected by individual grounds installed at every work location.

o) Where applicable, source side automatic reclosing devices shall be disabled before tension stringing begins.

p) The tension stringing method requires the use of protective covering or other approved measures designed to minimize the possibility that the conductors being installed or removed, will come in contact with energized lines or equipment.

q) One of the following methods shall be used to protect against accidental contact of moving conductors being installed during tension stringing activities:

(1) The conductor being installed, and the equipment used to install it, are positioned in such a manner as to not infringe on the minimum approach distance for the voltage of the energized system. All energized lines and equipment are positioned in such a manner as to prevent contact should the tensioning or pulling equipment fail.

(2) Energized lines exposed to accidental contact shall be covered with insulating protective material that will withstand the type of contact that might be made during the installation process.

r) Measures shall be taken to eliminate exposure to differences in potential in the event accidental contact occurs during tension stringing operations. Recommended measures for protection are listed below:

(1) Use best available ground source to help assure quick clearing of fuses or breakers in the event of accidental contact.

(2) Use traveling grounds on conductors and wire ropes during the conductor installation process.

(3) Bond equipment together to minimize potential differences.

(4) Provide grounding mats to extend area if equipotential.

(5) Employ insulating protective equipment or barricades as appropriate, to guard against hazardous potential differences.

s) Traveling grounds shall be left in place until the conductor installation is completed between the deadend structures.

t) Grounds should be removed as soon as practical when the installed conductor is being dead-ended.

u) Ungrounded conductors must be worked by using the appropriate hotline method.

v) Reliable two way communications, through two-way radio or other equivalent means, shall be maintained during the entire pulling process. The tugger operator, reel tension operator and the person

following the conductor as it is moving, shall be in contact with each other at all times.

w) If two conductors are to be spliced, the conductor ends shall be bonded to each other and grounded before being spliced.

x) While the conductor or pull line is being pulled into position, employees are not permitted directly under operations.

507.13 Grounding--General

a) All previously energized conductors shall be considered energized until tested and properly grounded.

b) New Construction: New lines or equipment may be considered de-energized and worked as such where:

(1) The lines or equipment are grounded, or

(2) The hazard of induced voltage is not present and adequate clearances or other means are implemented to prevent contact with energized lines or equipment and the new lines or equipment.

c) Communication Conductors: Bare-wire communication conductors on power poles or structures shall be treated as energized lines unless protected by insulating materials.

d) Voltage Testing: De-energized conductors and equipment, which are to be grounded, shall first be tested for the presence of voltage.

e) Attaching and removing grounds:

(1) When attaching grounds, the ground end shall be attached first, and the other end shall be attached and removed by means of insulating tools.

(2) When removing grounds, the grounding device shall first be removed from the line or equipment using insulating tools.

f) Grounding - Equal potential grounding is required whenever possible. When equal potential grounding is not possible, dual point grounding (bracket grounding) is acceptable.

(1) Equal potential grounding is required when workers are working on or in close proximity to a structure, whether working from the structure (climbing) or from an aerial device.

(2) If the line conductor is down on the ground or work is being performed from an aerial device in mid-span where no structure is in the immediate work area, dual point grounding (bracket grounding) may be utilized. When using dual point grounding, grounds shall be installed as close as practical to the work location and no further away than one span.

g) Testing Without Grounds: Grounds may be temporarily removed during tests. During the test procedure, each employee will use insulating equipment and shall be isolated from any hazards involved.

h) Grounding Electrode: When grounding electrodes are used, such electrodes shall have a resistance to ground low enough to remove the danger of harm to personnel or permit prompt operation of protective devices.

i) Grounding Tower: Grounding to tower shall be made with a tower clamp capable of conducting the anticipated fault current.

j) Ground Lead: A ground lead, to be attached to either a tower ground or driven ground, shall be capable of conducting the anticipated fault current and shall have minimum conductance of No. 2 AWG copper.

k) Lifting equipment, bucket and material handling trucks, digger/derricks line trucks, shall be bonded to an effective ground or considered energized and barricaded when used near energized equipment or lines. Employers may elect to barricade lifting equipment, bucket and material handling trucks, digger/derricks line trucks, instead of bonding to the best available ground. In either case a physical barricade must be in place to keep employees or the general public from coming in contact with the equipment. When installing truck grounds, the employee installing the ground must use a hand line to raise and lower the ground.

l) When a ground is to be attached to a line or to equipment, the ground-end connection shall be attached first, and then the other end shall be attached by means of a live-line tool.

m) When a ground is to be removed, the grounding device shall be removed from the line or equipment using a live-line tool before the ground-end connection is removed.

n) When work is performed on cable at a location remote from the cable terminal, the cable may not be grounded at the cable terminal if there is a possibility of hazardous transfer of potential should a fault occur.

507.14 Equal Potential Grounding

a) A chain binder, with provisions for attaching a personal protective ground, shall be tightened around the pole at a position below where the lineman will place his feet.

b) A personal protective ground shall be attached to the chain binder and extended to the system neutral. If the neutral is not present or cannot be approached safely, refer to Paragraphs 507.13-h and 507.13-i for alternate grounding.

c) Personal protective grounds shall be extended from the chain binder to a single phase, and from that phase to the other phases in a short circuit fashion.

d) When work is completed, the personal protective grounds shall be removed in reverse order of installation.

e) When a circuit is to be opened (e.g., opening jumpers at a junction pole or cutting slack), a temporary personal protective ground shall be installed across the open point.

f) When it is not practical to use single-point grounding at the pole where work is to be performed, such as when wires are down, grounds shall be installed on both sides of the work location but not further than adjacent structures.

507.15 Pole Temporary Storage

a) If it becomes necessary to store poles at the location where they are to be set, they shall be so placed that they will not interfere with traffic.

b) If poles left on or near streets, highways, or walkways overnight create a hazard, they shall be safeguarded by red lights or well-lighted warning signs.

c) Poles shall be so placed or blocked that they will not roll.

d) Employees shall not remain on a pole pile while poles are being hoisted.

e) Poles, loaded on a truck or trailer, shall be securely fastened every 10 feet to the truck or trailer.

f) When a load of poles is within working distance of the ground, load binders shall be so installed that they can and will be operated by employees while standing on the ground.

g) Employees shall not ride pole dollies or trailers.

h) The wheels of the transporting vehicle shall be chocked and securely braked prior to loading or unloading.

i) Refer to Paragraph 503.8 for additional requirements on hauling poles and ladders.

j) Poles--Average Weights (When furnished to A.S.A. specifications): Poles, even within the same class, vary in diameter and, hence, weight. Also, the moisture content of a pole changes under various conditions. Therefore, while weights given in the following tables should be taken as average values only, they should prove sufficiently reliable. Refer to Tables 5.9, 5.10, and 5.11.

507.16 Setting and Removing Poles

a) If any holes are left unfilled at the end of the work period, they shall be protected with substantial coverings.

b) All persons not engaged in pole-setting operations shall keep out of the work area.

c) No one shall be on a gin pole when it is being used to raise another pole.

d) While setting or removing poles between or near conductors energized above 600 volts, observe the following:

(1) Ground wires should not be attached on the pole being set or removed from an energized line higher than ten feet from the ground.

(2) If safe clearance cannot be maintained, the conductors shall be de-energized or covered with protective devices and spread, or pole guards shall be used to minimize accidental contact.

(3) Workers handling the butt of the pole shall wear rubber gloves whether or not cant hooks, peaveys, or slings are used.

(4) Until a pole is positively secured from moving against an energized conductor, no one shall step on or off the

Table 5.9
Western Red Cedar Total CCA Treatment
Poles--Average Weights
(When furnished to A.S.A. Specifications)
(Furnished by ANSI 05.1-2002)

Length (ft)	Class											
	H6	H5	H4	H3	H2	H1	1	2	3	4	5	6
30							762	666	581	501	442	383
35							970	828	739	640	564	495
40			1,993	1,822	1,702	1,544	1,191	1,049	904	789	703	627
45			2,393	2,185	1,990	1,871	1,426	1,250	1,092	950	851	
50		2,986	2,539	2,508	2,145	2,145	1,686	1,478	1,284	1,119	987	
55		3,484	3,214	2,940	2,686	2,451	1,954	1,709	1,485	1,313		
60	4,237	3,920	3,604	3,306	3,029	2,752	2,231	1,944	1,693	1,518		
65	4,847	4,484	4,142	3,818	3,389	3,089	2,511	2,195	1,912	1,709		
70	5,359	4,966	4,597	4,227	3,880	3,557	2,828	2,455	2,152	1,934		
75	5,890	5,471	5,075	4,679	4,283	3,937	3,099	2,742	2,742			
80	6,626	5,993	5,544	5,121	4,726	4,198	3,785	3,194	2,742			
85	7,210	6,706	6,058	5,610	5,161	4,600	4,023	3,524	3,033			
90	7,840	7,306	6,593	6,118	5,643	5,019	4,419	3,880	3,349			
95	8,560	7,995	7,432	6,709	6,207	5,488	4,967	4,310	3,726			
100	9,141	8,547	7,722	7,194	6,435	6,105	4,940	5,214	4,577			
105	9,840	9,184	8,349	7,762	6,963	6,782	6,600	5,669	5,029			
110	10,563	9,874	8,966	8,349	7,514	7,343	7,184	6,174	5,481			
115	11,309	10,599	9,639	8,956	8,072	7,953	7,844	6,679	5,933			
120	12,078	11,326	10,296	9,346	8,672	8,547	8,164	7,227				
	Pounds											

Table 5.10
Creosoted Yellow Pine
Poles--Average Weights
(When furnished to A.S.A. Specifications)
(Furnished by ANSI 05.1-2002)

Length (ft)	Class											
	H6	H5	H4	H3	H2	H1	1	2	3	4	5	6
30												
35					2,222	1,884						
40					2,585	2,222						
45					2,976	2,585						
50					3,454	2,976						
55					4,015	3,454						
60					4,620	4,015						
65					5,198	4,620						
70					5,863	5,198						
75					6,590	6,130						
80					7,458	6,600	5,863	4,730	3,883			
85					8,019	7,458	6,600	5,264	4,296			
90					8,762	8,019	7,458	5,869	4,730			
	Pounds											

Table 5.11
Douglas Fir Penta Treated
Poles--Average Weights
(When furnished to A.S.A. Specifications)
(Furnished by ANSI 05.1-2002)

Length (ft)	Class											
	H6	H5	H4	H3	H2	H1	1	2	3	4	5	6
30							1,065	890	765	635	520	410
35							1,210	1,065	920	805	695	605
40							1,545	1,310	1,165	1,025	895	770
45				3,034	2,635	2,280	1,930	1,560	1,410	1,225	1,075	930
50	4,397	3,998	3,825	3,490	3,000	2,573	2,225	1,870	1,625	1,420	1,245	
55	4,270	4,872	4,354	3,998	3,514	2,995	2,480	2,130	1,845	1,600		
60	6,130	5,577	5,021	4,584	4,109	3,605	2,845	2,480	2,155	1,845		
65	6,888	6,274	5,659	5,136	4,608	4,075	3,330	2,810	2,380			
70	7,728	7,056	6,374	5,765	5,136	4,574	3,860	3,145	2,635			
75	8,568	7,905	7,046	6,322	5,650	5,006	4,320	3,515	3,015			
80	9,398	8,659	7,785	6,955	6,230	5,530	4,985	4,045	3,575			
85	10,325	9,465	8,520	7,622	6,840	6,082	5,480	4,385	3,640			
90	11,395	10,498	9,394	8,486	7,478	6,658	6,035	4,945	4,080			
95	12,345	11,362	10,214	9,115	8,136	7,272	6,600	5,985				
100	13,325	12,254	11,069	9,821	8,789	7,853	7,205	6,545				
105	14,352	13,214	11,875	10,680	9,518	8,520	7,900	7,070				
110	15,418	14,433	12,974	11,669	10,320	9,173	8,555	7,670				
115	16,526	15,149	13,589	12,341	11,069	9,821	9,180	8,438				
120	17,563	16,109	14,568	13,147	11,731	10,493	9,990	9,032				
125		17,045	15,509	13,910	12,614	11,218	10,746					
	Pounds											

truck or touch any part of it without using rubber gloves, if the employee is standing on the ground.

e) When pikes are used to hold poles in place while holes are being backfilled, the pikes shall be firmly grounded in all directions and shall not be removed until the backfill is sufficient to hold the pole. When a pole is being "canted" or "hooked," the pikes shall be held.

f) Employees shall not stand or pass under a suspended load or adjacent to, over, or under a loaded winch line.

g) Employees engaged in handling or working on poles shall wear suitable gloves and shall wear a shirt or jacket with the sleeves rolled down if needed.

h) Only those employees who are trained and qualified shall operate the hoisting equipment.

i) The hoist equipment load limits as specified by the manufacturer shall not be exceeded under any circumstance.

j) Hoisting equipment shall have a load-capacity chart and boom-angle indicator in view of the operator.

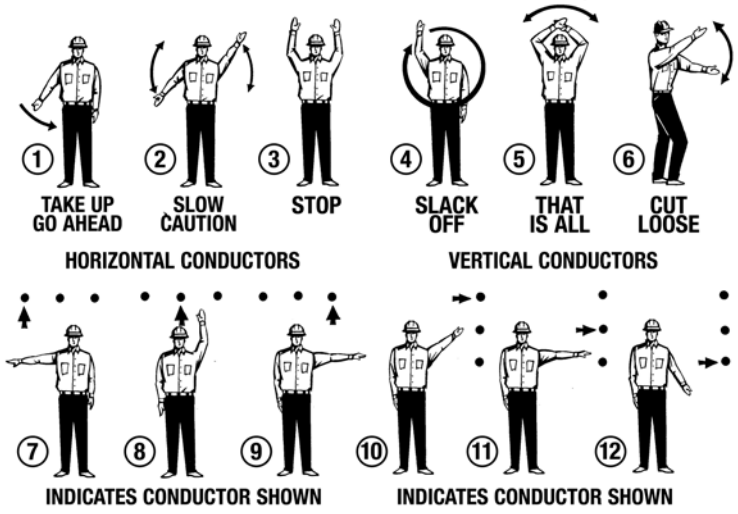
k) When removing set poles, extreme caution shall be exercised to assure the hoisting equipment is not overloaded due to the weight of the pole and its adhesion to the ground. The use of sufficient lifting capacity, and/or loosing the earth around the pole along its entire depth, shall be considered.

l) Hoisting equipment operators shall accept signals only from the employee specifically designated. The operator shall obey the stop signal given by anyone.

m) When poles are set, moved or removed near exposed energized overhead conductors, the pole shall not contact the conductors.

n) Exposure to pole coatings, pesticides, and preservers during touching, removing, and breaking poles may increase the risk of developing dermal abrasion and irritation to the skin from chemicals. Common chemicals used include pentachlorophenol, creosote, copper naphthenate or arsenicals. Direct contact with the poles shall be minimized or eliminated by use of gloves at all times. Long sleeve shirts are recommended during the setting and removing of poles to minimize the amount of exposure through skin contact.

Figure 5.4 Suggested Standard Signals for Line Work



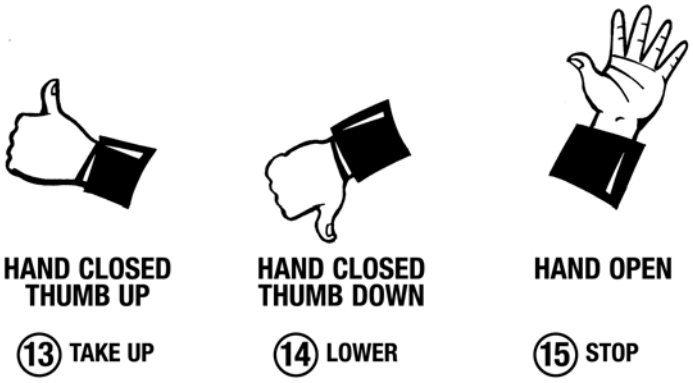
Signal 1 is used to indicate the direction of pull. Faster or slower motions of this signal are used to indicate speeds other than caution or slow speeds. Where there is a choice of conductors to be pulled, this signal is given with one of the indicating Signals 7-12, inclusive.

Signal 2 always follows either Signal 1 or Signal 4 and is an indication of slow speed for caution. This signal must be given continuously while the pull is being made at slow speed and is to be terminated by either giving Signal 1, Signal 4 (depending on direction), or Signal 3.

Signal 4 is used to indicate the direction of pull and is used in slacking or lowering as Signal 1 is used for taking up.

Signals 7-12 are always used in connection with either Signal 1 or 4 and are given at the same time either Signal 1 or 4 is given. In using Signals 10, 11, and 12, the person's arm on the wire side to be pulled is used for the indicating signal.

Figure 5.5 Truck Hoist Signals



Signals 13-15 are to be used only when the person signaling is within 50 feet of the truck operator.

507.17 Derrick Trucks, Cranes, etc.

With exception of equipment certified for work on the proper voltage, mechanical equipment shall not be operated closer to any energized line or equipment than the clearances set forth in Tables 5.2 through 5.5 unless:

(1) An insulated barrier is installed between the energized part and the mechanical equipment, and

(2) The mechanical equipment is grounded, or

(3) The mechanical equipment is insulated, or

(4) The mechanical equipment is considered as energized.

507.18 Fuses

When fuses must be installed or removed with one or both terminals energized at more than 300 volts, or with exposed parts energized at more than 50 volts, tools or gloves rated for the voltage shall be used. When installing expulsion type fuses, employees shall wear safety

glasses or safety goggles and shall stand clear of the exhaust path of the fuse barrel.

507.19 Rope

a) A rope shall not be overloaded or dragged over rough or sharp objects.

b) Short bends over sharp edged surfaces should be avoided.

c) Kinks shall be removed before any strain is put on a rope.

d) When not in use, rope shall be dried, stored properly, and kept free from mechanical damage and excessive heat and dryness.

e) Rope shall be examined regularly for cuts, worn spots, burns, and rot. The rope shall be untwisted at various places and inspected for poor fiber and dry rot.

f) The outward appearance of rope shall not be accepted as proof of quality or strength.

g) The safe loads shall not be exceeded.

h) Hand lines shall be a minimum of 1/2 inch diameter line or have a minimum diameter of breaking strength 2650 lbs.

507.20 Substations

a) Only those authorized to enter a substation shall be permitted to do so.

b) New employees and those not familiar with the hazardous conditions inherent in a substation shall be given special instructions (job briefing) before they are permitted to enter.

c) Movement of vehicles, gin poles, cranes, and other hoisting or mechanized equipment shall be controlled by signalmen or flagmen.

d) Mobile equipment with booms or extensions above the cab level shall be equipped with a minimum 1/0 AWG extra flexible copper or equivalent ground lead. The equipment shall be bonded to the station ground mat when being operated in a stationary position.

e) No parking shall be allowed within the substation unless required for work purposes.

f) Before driving a car or truck into a substation, the driver shall check the overhead clearance of the vehicle (e.g., radio antenna, boom, basket) to prevent contact with low lines or other structures.

g) Except for fuse replacement or other necessary access by qualified persons, the guarding of energized parts within a compartment shall be maintained during operation and maintenance functions to prevent accidental contact with energized parts and to prevent tools or other equipment from being dropped on energized parts.

h) When drawout type circuit breakers are removed or inserted, the breaker shall be in the open position and the control circuit shall also be rendered inoperative, if the design of the equipment permits.

i) When substation fences are expanded or a section is removed, grounding continuity shall be maintained and bonding shall be used to prevent electrical discontinuity.

j) When guards are removed from energized equipment, barriers shall be installed around the work area to prevent employees, who are not working on the equipment but are in the area, from contacting the exposed live parts.

k) Extreme caution shall be exercised in the handling of bus or tower steel, or other materials of a length that could contact energized equipment. Such material shall not be carried on the shoulder.

l) No material or equipment shall be stored under an energized bus or line or near energized equipment.

m) When a substation fence must be extended or removed for construction purposes, a temporary fence affording comparable protection shall be erected. Such temporary fencing, when constructed of metal, shall be bonded to the existing fence. All substation gates shall be kept closed and locked except when work is in progress and access can be controlled.

n) Sufficient access and working space shall be provided and maintained around electric equipment to permit ready and safe operation and maintenance of such equipment.

o) For additional information concerning substations, refer to OSHA Standard 29 CFR 1910.269.

p) For more specific information on guarding of rooms containing electrical supply equipment and guarding of energized parts, refer to OSHA Standard 29 CFR 1910.269 (u) (4) and (5).

507.21 Metering

a) Rubber gloves, hard hat, approved long sleeved shirt and eye protection shall be worn when installing or removing meters from energized meter sockets and meter sockets equipped with bypass capabilities. Leather gloves shall be worn if the socket is de-energized.

b) Meter sockets shall be inspected before the meter is installed and/or the service is energized. Checks shall be made to ensure there is no socket damage, loose connections, or foreign objects present that could cause a short circuit or flashover.

c) Voltage readings between the source, load, and ground shall be made to prevent cross-phasing, feedback, or phase-to-ground fault through the meter or meter socket.

d) Single-phase and three-phase meters installed in meter bases with bypass capabilities shall be disconnected or connected using one of the following methods:

(1) By using the facility main switch or disconnect;

(2) By using the portable service disconnect device; or

(3) By disconnecting the service or de-energizing the transformed station.

e) Before removing a meter, a visual inspection shall be made to determine if the meter or meter socket is damaged. If damage is indicated, the meter shall be de-energized before removal.

f) When setting socket type meters, the load side terminal shall be entered first, followed by the source side. The removal of the meter shall take place in the reverse order. Care shall be taken to prevent the meter ring from coming into contact with the socket terminals.

g) A meter shall not be disconnected by rotating the meter in the meter socket.

h) During testing, the energized socket or test equipment shall not be left unguarded. If a socket is to be left energized, a meter or approved socket cover shall be in place before leaving the work area.

i) Installation, removal, and maintenance of transformer rated meters shall only be performed by properly trained employees.

j) Under no circumstances shall the secondary terminals of a current transformer be opened. The transformer shall be shunted before the secondary metering circuit is opened.

k) A check shall be made to ensure that all instrument transformer cases and associated enclosures are properly grounded.

l) When approaching or working on customer property, employees shall watch for tripping hazards; defective stairs; and the presence of dogs, cats, or other potentially dangerous animals.

m) Before entering customer property, employees shall announce their presence and state their business if practical. Employees shall also notify the customer when leaving the property if practical.

n) If possible, employees shall turn off customer main switch prior to installing and removing socket type meters.

o) Employees shall push socket type meters into their socket. Employees shall never hit the meter with their hand or any other device.

507.22 Testing and Test Facilities

This section applies to testing involving interim measurements utilizing high voltage (1000 volts or more), high power or combinations of both, not to testing involving continuous measurements as in routine metering, relaying or normal line work.

a) Employees shall be trained in safe work practices upon their initial assignment to the test area.

b) Permanent test areas shall be guarded by walls, fences or barriers designed to keep employees out of the test areas.

c) In field testing, or at a temporary site where permanent fences or gates are not provided, one of the following means shall be used to prevent unauthorized employees from entering:

(1) The test area shall be guarded by the use of distinctively colored safety tape that is supported waist high and to which safety signs are attached.

(2) The test area shall be guarded by a barrier or barricade that limits access to the area, or

(3) The test area shall be guarded by one or more test observers stationed so that the entire area can be monitored.

d) Barriers shall be removed when the protection they provide is no longer needed.

e) Guarding shall be provided within the test areas to control access to test equipment or to apparatus under test that may become energized as part of the testing.

f) All conductive parts accessible to the test operator during the time the equipment is operating at high voltage shall be maintained at ground potential except for portions of the equipment that are isolated from the test operator by guarding.

g) When ungrounded terminals of test equipment or apparatus under test may be present, they shall be treated as energized until determined by tests to be de-energized.

h) Visible grounds shall be applied, either automatically or manually with proper insulating tools, to the high voltage circuits after they are de-energized and before work is performed on the circuit or item or apparatus under test. Common ground connections shall be solidly connected to the test equipment and the apparatus under test.

i) In high power testing, an isolating ground-return conductor system shall be provided so that no intentional passage of current, with its attendant voltage rise, can occur in the ground grid or in the earth. An isolated ground-return conductor need not be provided if the following conditions are met:

(1) If an isolated ground-return conductor cannot be provided due to the distance of the test site from the electric energy source, and

(2) If employees are protected from any hazardous step and touch potentials that may develop during the test.

j) In tests in which grounding of test equipment by means of the equipment grounding conductor located in the equipment power cord cannot be used due to increased hazards to test personnel or the prevention of satisfactory measurements, a ground that affords equivalent safety shall be provided and the safety ground shall be clearly indicated in the test setup.

k) When the test area is entered after equipment is de-energized, a ground shall be placed on the high voltage terminal and any other exposed terminals.

l) High capacitance equipment or apparatus shall be discharged through a resistor rated for the available energy.

m) A direct ground shall be applied to the exposed terminals when the stored energy drops to a level at which it is safe to do so.

n) If a test trailer or test vehicle is used in field testing, its chassis shall be grounded. Protection against hazardous touch potentials with respect to the vehicle, instrument panels and other conductive parts accessible to employees shall be provided by bonding, insulation or isolation.

o) Control wiring, meter connections, test leads, and cables may not be run from a test area unless they are contained in a grounded metallic sheath and terminated in a grounded metallic enclosure, or unless other precautions are taken that demonstrate equivalent safety.

p) Meters and other instruments with accessible terminals or parts shall be isolated from test personnel. If this isolation is provided by locating test equipment in metal compartments with viewing windows, interlocks shall be provided to interrupt the power supply if the compartment cover is opened.

q) Safety practices governing employee work at temporary or field test areas shall provide for a routine check of the test areas for safety at the beginning of each series of tests.

r) The test operator in charge shall conduct these routine safety checks before each series of tests and shall verify at least the following conditions:

(1) Barriers and guards are in workable condition and are properly placed to isolate hazards.

(2) System test status signals, if used, are operable.

(3) Test power disconnects are clearly marked and readily available in an emergency.

(4) Ground connections are clearly identifiable.

(5) Personal protective equipment is provided and used as required.

(6) Signal, ground, and power cables are properly separated.

507.23 Hazardous Energy Control

Note: Refer to Utility-specific hazardous energy control and switching procedures.

a) If a system operator is in charge of the lines or equipment and their means of disconnection, the following steps shall be taken:

(1) A designated employee requests that the system operator de-energize the equipment. This designated employee becomes the employee in charge and is responsible for the clearance.

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

(3) Automatic and remotely controlled switches that could cause opened disconnecting means to close shall be tagged at the point of control.

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

(5) After the above steps have been taken, the equipment to be worked shall be tested to ensure it is de-energized.

(6) Protective grounds shall be installed (refer to OSHA Standard 29 CFR 1910.269(n)).

(7) The equipment may now be worked as de-energized.

(8) If two or more independent crews will be working on the same lines or equipment, each crew shall independently comply with the above steps.

(9) Transfer of clearance shall be communicated to the system operator and the employees in the crew. The new employee in charge shall now be responsible for the clearance.

(10) Clearance release requires the employee in charge to notify the employees under his direction that the clearance is to be released, determine that employees in the crew are clear of overhead lines and equipment, determine that protective grounds have been removed, report this information to the system operator, and release the clearance.

(11) The person releasing the clearance shall be the same person who requested it, unless the responsibility has been properly transferred.

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

(13) Only after all the above have been successfully accomplished, may the lines and equipment be re-energized.

b) If no system operator is in charge of the lines or equipment and their means of disconnection, one employee in the crew shall be designated as being in charge of the clearance. The employee in charge shall then take the place of the system operator and complete steps (2) through (13) above.

c) If only one crew will be working on the lines or equipment and if the means of disconnection is accessible and visible to and under the sole control of the employee in charge, then steps (1), (3), (4), (8), and (12) under a) in this section need not be taken.

d) For more information, refer to OSHA Standards 29 CFR 1910.269 and 29 CFR 1910.147.

508 Tree Trimming

508.1 General

a) The qualified utility arborist in charge before the start of each job shall perform a job briefing. The briefing shall be communicated to all affected workers. An employee working alone does not need to conduct a job briefing. However, the employer shall ensure that the tasks are being performed as if a briefing were required. (ANSI-4.1.3)

b) Chain saw-resistant foot / leg protection shall be worn by employees while operating a chain saw during ground operations. (See ANSI-133 4.2.8)

c) Workers engaged in tree trimming operations shall wear head protection that conforms to ANSI Z89.1. Class E helmets shall be worn when working in proximity to electrical conductors, in accordance with ANSI Z89.1. Workers shall not place reliance on the dielectric capabilities of such helmets.

d) 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, “People Working” signs, cones, red flags or flares, barricades, and other warning devices (or combinations thereof) shall be used to protect vehicular and pedestrian traffic.

e) Climbers with pole gaffs shall not be used in trees.

f) Dead or rotted limbs, regardless of size, shall not be used by employees for support.

g) No work shall be done in a tree until the employee is securely tied in or belted to the tree.

h) The climbing rope shall be crotched in such a manner as to prevent its "working out" on a lateral limb.

i) When working in a multiple trunk tree, the climbing rope shall preferably be crotched around a main trunk other than the one on which the employee is working.

j) Employee shall crotch their climbing rope in two places if a single crotch does not adequately protect them from falling into energized lines or falling back into trunk of tree.

k) The climbing rope shall not be used as a pull rope or as a hand line to lower limbs or branches.

l) The ground end of a climbing rope shall not be allowed to dangle over roadways and shall be kept free from obstructions, passing vehicles, etc.

m) The taut-line hitch, Blake's hitch, Prusik knot, or comparable knot used for tying in or descending shall not be released until the climber is on the ground.

n) Branches or other material shall not be dropped unless the immediate area has been cleared so that there is no possibility of injury to persons or damage to property. If such a possibility exists, a rope shall be used to lower branches or other materials.

o) When lowering heavy tree members, employees shall not tie fall lines around hands or bodies.

p) Employees shall not attempt to clear limbs or brush from under that side of tree where the climber is working.

q) Employees shall obtain assistance or use power equipment, if available, when lifting logs or other heavy loads.

r) When loading brush on a truck, employees shall not stand on or straddle the loaded brush.

s) Brush shall be hauled away promptly or otherwise disposed of to avoid presenting "an attractive nuisance" to children and to prevent injury to persons or damage to passing vehicles.

t) When hauling brush, care shall be taken that it does not extend over the sides of the truck.

u) When it is necessary to work in the vicinity of poison ivy, poison oak, or poison sumac, employees shall keep sleeves rolled down and wear gloves.

508.2 Working Near Energized Conductors

(The instructions below do not apply to electric power generation, transmission, and distribution qualified employees).

a) Before any employee climbs, enters, or works around any tree, a close inspection shall be made to determine whether an electric conductor passes within 10 feet of the tree.

b) Wires in proximity to tree trimming shall be considered as energized, unless proven to be dead and grounded.

c) All employees involved with tree trimming, other than line clearance tree trimmers, shall maintain the following minimum clearances from energized conductors and equipment (numbers expressed are phase-to-ground):

(1) For lines and equipment energized at 50 kV or less, the minimum clearance distance is 10 feet.

(2) For lines and equipment energized at more than 50 kV, the minimum clearance distance is 10 feet plus 4 inches for every 10 kV over 50 kV.

d) Only line clearance tree trimmers shall perform tree trimming if an electrical hazard exists or if parts of the trees are within 10 feet of exposed energized overhead conductors or equipment.

e) A second line clearance tree trimmer shall be within normal voice communication and have climbing gear within 50 feet of the work area if any of the following conditions exist:

(1) If a line clearance tree trimmer is to approach closer than 10 feet to any conductor or electrical apparatus energized at more than 750 volts.

(2) If branches or limbs being removed are closer to lines energized at more than 750 volts or are within the distances listed in Tables 5.2 and 5.3 (excluding the notes to those tables).

(3) If roping is necessary to remove branches or limbs from energized conductors or apparatus at more than 750 volts.

f) Line clearance tree trimmers shall maintain clearances from energized conductors as shown in Tables 5.2 and 5.3 (excluding the notes to those tables).

g) Line clearance tree trimmers shall use insulating equipment and rubber gloves when removing branches that are contacting exposed energized conductors or equipment or that are within the distances (or have the potential to become within the distances) specified in Tables 5.2 and 5.3 (excluding the notes to those tables). Limbs being removed from contact with wires are to be handled with the same precautions as the wires themselves. Care shall be taken to prevent limbs being removed from coming in contact with tree trimmer's body.

h) Ladders, platforms, aerial lifts, tools, and equipment shall not be brought closer to an energized conductor or apparatus than the distances listed in Tables 5.2 and 5.3 (excluding notes to those tables).

i) Tree trimming and tree felling work should terminate and employees should move to a place of safety during electrical storms and periods of high winds or other unusual weather conditions that are dangerous to employees.

j) Employees shall not remove tree limbs or branches from above energized conductors while other employees are working in trees below the conductors in the same span.

k) Broken or fallen wires shall not be handled except by persons experienced in such work.

l) When working near wires, the employee shall have their climbing rope so secured that, in the event they slip or a limb breaks, they will swing free and clear of the wires.

m) Tree limbs shall not be dropped on conductors.

n) Ropes shall not be thrown over conductors or crossarms for the purpose of using the conductor or crossarm as a support or hitch.

o) Dry ropes shall be used in trees through which energized conductors pass.

p) For additional information concerning working near energized conductors, refer to OSHA Standard 29 CFR 1910.269.

508.3 Tree Felling

a) The employee felling the tree shall plan a clear retreat path before a cut is started.

b) The feller shall 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 cut is started.

c) When felling a tree, an undercut shall be made about 1/3 the diameter of the tree to guide the tree in the direction to fall and reduce the possibility of splitting. A back or felling cut shall be made parallel to the inner edge of the undercut and approximately 2 inches higher than the undercut.

d) The feller shall shut off his saw before he starts his retreat.

e) On terrain where trees are likely to slide or roll, fellers shall fell trees from the uphill side.

f) No one shall be allowed to work in a tree located near a tree that is being felled if there is any danger of its being struck by any part of the falling tree. The recommended distance between workers is twice the height of the trees being felled.

g) All persons not engaged in the felling operation shall be kept clear of guide ropes and other rigging.

h) Clear warning shall be given to all employees in the area when trees are to be felled or heavy tree members are to be dropped.

i) Once the felling of a tree has been started, it shall be completed before leaving the job.

j) For additional information concerning tree felling, refer to OSHA Standard 29 CFR 1910.266.

508.4 Care and Use of Tools and Rope

a) Ropes shall be inspected at least daily and before each use. Damaged sections shall be cut out and destroyed or the rope replaced.

b) Ropes shall be kept away from fire, acids, oil, chemicals, and all sources of excessive heat.

c) Dragging ropes over rough surfaces and sharp objects, such as rocks, shall be avoided. Ropes shall be stored separately from sharp-edged cutting tools.

d) The cutting edge of tools shall be suitably sheathed or guarded except while in actual use. Cutting tools shall be kept sharp and properly shaped.

e) When not in actual use, the trimmer's saw shall be returned to the scabbard.

f) Axes shall not be used in trees or carried on the shoulder.

g) Tools shall not be thrown into or dropped from a tree; they shall be raised or lowered by a suitable rope line.

h) A pruner shall not be laid on a limb or in a crotch, or hooked on a wire or rope. It shall be hooked over a limb strong enough to hold its weight.

i) Ladders shall be removed from the base of the tree when not in use.

j) Climbing ropes shall have a minimum diameter of 0.5 inch (1.2 cm) with a minimum breaking strength of 2,300 pounds (10.2 kN). Synthetic rope shall have an elasticity of not more than 7 percent.

k) Ropes shall be coiled and piled, or suspended so that air can circulate through the coils.

l) Rope ends shall be secured to prevent unraveling.

m) Climbing rope may not be spliced.

n) A rope that has compromised insulation (for instance, wet or contaminated) may not be used near exposed energized lines.

508.5 Powered Trimming Equipment

a) Employees operating powered trimming equipment shall wear suitable eye and face protection.

b) For hearing protection requirements, refer to Paragraph 306.

c) Chainsaw operators shall inspect the saw before each use to assure that all handles and guards are in place and tight, that all controls function properly, and that the muffler is operational.

d) Chainsaw operators shall follow manufacturer's instructions on operation and maintenance.

e) Power saws weighing more than 15 pounds that are used in trees shall be supported by a separate line, unless the work is performed from an aerial lift or no supporting limbs are available.

f) When starting a chainsaw, it shall be placed on or against a solid support and the area cleared of all co-workers.

g) The operator shall grip the chainsaw with both hands during the entire cutting operation.

h) The saw bumper shall be against tree or limb before starting a cut.

i) Chainsaw operators shall, when necessary, clear the immediate area around their work to make certain that brush will not interfere with either the chainsaw or operator.

j) All chainsaws shall be equipped with “deadman” controls, so the control cannot lock in “on” position.

k) The chainsaw engine or motor shall be stopped for the following:

(1) When working on any part of the chain or cutting bar.

(2) While the saw is being moved from one location to another, including being carried up into the tree.

(3) While unit is unattended.

l) A gasoline driven chainsaw engine shall be stopped when being refueled. If gas is spilled on the chainsaw during refueling, it shall be wiped off before the engine is started. Chainsaws shall not be started within 10 feet of a fueling area.

m) A gasoline driven chainsaw shall not be used above shoulder level or at a distance that would require the operator to relinquish a safe grip on the saw.

n) Employees shall not approach a chainsaw operator within the reach of the saw while the saw is in operation.

o) An employee shall never hand a pneumatic or hydraulic pruner or saw to another employee unless it is disconnected.

p) Powered tools shall not be left unattended if connected to a power source.

q) Powered tools shall not be adjusted or repaired while connected to power source.

r) For additional information concerning power trimming equipment, refer to OSHA Standard 29 CFR 1910.266.

s) Stump cutters shall be equipped with enclosures or guards to protect employees. Each employee in the immediate area of stump grinding operations shall wear personal protective equipment.

t) When backpack power units are used, the following precautions shall apply:

(1) No one except the operator shall be within 10 feet of the cutting head of a brush saw.

(2) The backpack power unit shall be equipped with a quick shutoff switch readily accessible to the operator.

(3) Backpack power unit engines shall be stopped for all cleaning, refueling, adjustments and repairs to the saw or

motor except when the manufacturer's service procedure requires otherwise.

508.6 Chippers

a) Access panels for maintenance and adjustment of the chipper blades and associated drive train shall be in place and secure during operation.

b) Chippers shall never be parked directly under a tree being trimmed.

c) Employees shall not permit spectators to stand near the machine while feeding brush into chipper.

d) Full cover goggles or face shield shall be worn by an employee when feeding brush into chipper.

e) An employee shall never place hands or another part of their body into brush hopper while chipper is in operation.

f) Tools or other metallic objects shall not be used to push brush into chipper. Sweepings, which may contain foreign objects such as stones and nails, shall be loaded on truck and not fed into the chipper.

g) The ignition key shall be removed when chipper is left unattended.

h) For hearing protection requirements, refer to Paragraph 306.

i) Only wrist-length (nongauntlet) gloves shall be used by employees feeding a chipper.

j) Trailer chippers detached from trucks shall have their wheels chocked.

k) Brush chippers shall be equipped with a locking device in the ignition system.

l) For additional information on chippers, refer to OSHA Standard 29 CFR 1910.269.

508.7 Right-of-Way Clearing and Maintenance

a) When two or more employees are cutting brush, they shall be separated by at least 10 feet.

b) Under no circumstances shall anyone except the operator ride on a bulldozer, or any other heavy equipment used in land clearing.

c) Bulldozer operators shall wear seat belts, if the bulldozer is equipped with rollover protection.

d) Employees shall not anchor equipment to railroad tracks, fences, or structures belonging to others.

e) When emerging from right-of-way, prior to road travel, employees shall test brakes.

509 Underground Lines and Equipment

509.1 Opening and Guarding Holes

Whenever a cover is to be removed from a manhole or a vault, or any other obstruction to traffic exists, the following precautions shall be taken:

(1) All obstructions to traffic shall be guarded by adequate signs, barricades, lights, flags, etc. Traffic shall be warned in sufficient time that an obstruction exists through the use of signs, high level standards, flashing lights, traffic cones, flagmen, etc., as may be needed.

(2) Where permissible and practicable, the truck shall also be placed to guard the work area against oncoming traffic.

(3) A blow torch or other open flame shall never be used to melt ice around a manhole or vault cover.

(4) Manhole, vault, and service box covers shall always be removed and replaced by means of approved hooks or hoists.

509.2 Entering Underground Structures

A confined space is large enough for an employee to enter and perform assigned work and has a limited or restricted means for entry or exit and is not designed for continuous employee occupancy. A permit-required confined space has one or more of the following characteristics:

(1) contains or has a potential to contain a hazardous atmosphere(s);

(2) contains a material that has the potential for engulfing an entrant;

(3) has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls

or by a floor which slopes downward and tapers to a smaller cross section; or

(4) contains any other recognized serious safety or health hazard.

Determine if the space to be entered is a permit-required confined space and enter accordingly.

a) Before an employee enters a street opening, such as a manhole or an unvented vault, it shall be promptly protected with a barrier, temporary cover, or other suitable guard.

b) When work is to be performed in a manhole or unvented vault, observe the following:

(1) 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 toxic, explosive gases or fumes.

(2) When unsafe conditions are detected by testing or other means, the work area shall be ventilated and otherwise made safe before entry.

(3) Provisions shall be made for an adequate continuous supply of clean air.

c) If in an emergency it becomes necessary for an employee to enter a manhole or vault with a hazardous atmosphere, the employee shall use an approved airline respirator or self-contained breathing apparatus and a body harness attached to a lifeline monitored by an attendant stationed at the manhole or vault opening. Refer to Paragraph 201 for additional confined or enclosed space requirements.

d) A ladder shall always be used in entering or leaving a manhole or vault. Climbing into or out of manholes or vaults by stepping on cables or hangers is forbidden.

e) While work is being performed in manholes (enclosed spaces), a qualified employee trained in first aid and CPR shall be available in the immediate vicinity to render emergency assistance if required. This requirement shall not preclude the employee in the immediate vicinity from occasionally entering a manhole to provide assistance other than emergency. 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.

f) Before any work is done on a cable, it shall be identified by an approved method. If there is any doubt as to the identification, work shall not be started until it is checked and identified by the proper authority.

g) Where cables in manholes appear defective by the presence of abnormalities that could lead to or be an indication of an impending fault (such as oil or compound leaking from cable or joints, broken cable sheaths or joint sleeves, hot localized surface temperatures of cables or joints, or swollen joints whose circumference exceeds 3.5 times the standard sleeve size diameter), no employee may work in the manhole while the defective cable is energized. However, if the defective cable or splice cannot be de-energized because of service load conditions, employees may enter the manhole provided they are protected from the possible effects of a failure by shields or other devices that are capable of containing the adverse effects of a fault in the joint.

h) For additional requirements concerning confined or enclosed spaces, refer to Paragraph 201.

509.3 Work on Energized Cables

a) At least two employees will be present while the following types of work are being performed (except as noted in c) below):

(1) Installation, repair or removal of de-energized lines if an employee is exposed to contact with other parts energized at more than 600 volts.

(2) Installation, repair or removal of lines energized at more than 600 volts.

(3) Installation, repair or removal of equipment such as transformers, capacitors, regulators, switchgear, and sectionalizing cabinets, if an employee is exposed to contact with parts energized at more than 600 volts.

(4) Work involving the use of mechanical equipment, other than insulated aerial lifts, near parts energized at more than 600 volts.

(5) Any other work that exposes an employee to electrical hazards greater than or equal to those listed above.

b) Two employees do not need to be present in the following conditions:

(1) Routine switching of circuits (if it can be done safely).

(2) Work performed with live-line tools if the employee is positioned so that they are not within reach of or otherwise exposed to energized parts.

(3) Emergency repairs necessary to safeguard the general public. 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 volts or more. When two or more employees are working on the same line section, they shall only work on or contact the same conductor at one time.

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

c) No employee may approach or take any conductive object without an insulating handle closer to exposed energized parts than the clearances set forth in Tables 5.2 through 5.6 unless the employee is insulated from the energized part or the energized part is insulated from the employee and any other conductive object at a different potential or the employee is insulated from any other conductive object, as during live-line bare-hand work. Refer to Paragraphs 507.2, 507.5, 507.8, and 509.5 for related information. Refer to OSHA Standard 29 CFR 1910.137.

d) Only qualified employees and trainees working under their direct supervision may work on or with exposed energized lines or parts of equipment or access enclosures. Only qualified employees and

trainees working under their direct supervision may work in areas containing unguarded, uninsulated energized lines or parts of equipment operating at 50 volts or more. When employees are performing work on or associated with exposed lines or equipment energized at 50 volts or more, persons trained in first aid and cardiopulmonary resuscitation (CPR) shall be available as follows:

(1) For field work involving two or more employees at a work location, at least two trained persons shall be available. Only one trained person needs to be available if all new employees are trained in first aid and CPR within 3 months of their hire dates.

(2) For fixed work locations, the number of trained persons available shall be sufficient to ensure that each employee exposed to electric shock can be reached in 4 minutes by a trained person. Where the existing number of employees is not sufficient to meet this requirement (at a remote location, for example), all employees at the work location shall be trained.

e) Employees shall not work on equipment or lines in any position from which a shock or slip will tend to bring the employee's body toward exposed parts that are at a potential different from the employee's body.

f) When work is performed in the vicinity of exposed energized parts of equipment or lines, employees shall remove all exposed conductive articles. Conductive articles include the following: dangling neckwear, bracelets, keys, wristwatches, rings or similar articles must not be worn, except for medical alert bracelets which may be worn with transparent bands that hold the bracelets snugly to the skin. Metal rim prescriptive eyewear should not be worn near exposed energized parts.

g) All underground cables and apparatus energized at voltages greater than 600 volts shall be de-energized before work is done on the conductor or before the cables are cut into or spliced.

h) Before any work is performed on an energized cable, other cables and all grounded equipment with which contact can be made while working on the energized cable shall be covered with rubber blankets or approved insulating shields. (Cables with nonmetallic

sheaths and those with an insulating jacket over the metallic sheath need not be covered.)

i) Because of the characteristics of a low voltage network system, when work is performed on cables or apparatus carrying less than 600 volts, employees shall take extra precautions in the use of necessary rubber protective equipment, in observing adequate clearances, and in using proper tools in order to prevent short circuits.

j) Employees shall wear rubber gloves with leather protectors and stand on rubber mats or insulated stools while cutting into and removing sheathing or sleeves and while testing an energized cable.

k) All employees working on or in the vicinity of lines or equipment exposed to voltages higher than those guarded against by the safety protective equipment provided shall assure themselves that the equipment or lines on which they are working are free from dangerous leakage or induction, or have been effectively grounded.

l) When a supply cable to be worked on as de-energized that cannot be positively identified or determined to be de-energized shall be pierced or severed at the work location with a tool designed for this purpose.

m) Before cutting into an energized supply cable, the operating voltage shall be determined and appropriate precautions taken for handling conductors at that voltage.

n) Repair to cables shall be in accordance with the cable manufacturer's specifications.

o) When removing a section of sheath or sleeve on an energized cable that contains lead, refer to paragraph 313 of this Manual. Air monitoring during the splicing of lead-jacketed electrical lines has shown the potential for exposures to lead at or above the action level. Any soldering or heating of lead jacketed materials should be conducted using proper engineering controls (i.e. ventilation), personal hygiene, PPE, and personal monitoring.

All Utility employees involved in the disturbance of lead-containing materials or lead based paint as part of regular work activities should have at least a lead awareness training class and have blood lead levels checked initially, then at least annually thereafter.

p) For more information regarding the OSHA lead standard, refer to 29 CFR 1910.1025 or IEEE's National Electric Safety Code C2-2002, Section 443.

509.4 Work on Energized Equipment

a) When work is performed on cables or apparatus carrying less than 600 volts, employees shall take extra precautions in the use of necessary rubber protective equipment, in observing adequate clearances, and in using proper tools in order to prevent short circuits.

b) When energized enclosures are unlocked and opened, they shall be directly attended by a worker. They shall be kept closed and locked at all other times.

c) A primary or secondary system neutral on any energized circuit shall not be opened under any circumstances.

d) Elbow connectors provide a great deal of flexibility in switching and system sectionalizing. However, only those connectors designed and approved for load break use shall be used to connect or disconnect an energized circuit.

e) Only tools with insulated handles shall be used for making energized secondary connections or when work is performed within energized service pedestals, pad-mounted compartments, or submersible transformer enclosures.

f) Only one energized secondary or service conductor shall be worked on at any one time and protective devices shall be used to insulate or isolate it from all others.

g) Before any attempt is made to replace a damaged or blown cable limiter, the customer's service will be checked for faults by the use of either an ohmmeter or a voltmeter.

h) A shirt or jacket (nonsynthetic material), with full-length sleeves rolled down and buttoned, shall be worn when work is performed on any energized URD cable or apparatus. The employer shall ensure that each employee who is exposed to the hazards of flames or electric arcs does not wear clothing that, when exposed to flames or electric arcs, could increase the extent of injury that would be sustained by the employee.

Note: Clothing made from the following types of fabrics, either alone or in blends, is prohibited by this paragraph, unless the employer can

demonstrate that the fabric has been treated to withstand the conditions that may be encountered or that the clothing is worn in such a manner as to eliminate the hazard involved: acetate, nylon, polyester, rayon.

509.5 Work on De-Energized Cables

a) When cables and apparatus are taken out of service to be worked on, the procedure outlined in Paragraph 507.6 shall be followed.

b) Before making an opening in or removing a part of the sheath or sleeve of a cable, the line shall be grounded at the first possible grounding point on each side of the work location.

c) When a high voltage cable is to be cut, a short section of the shielding, if any, completely around the cable shall be removed and tests made with two 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.

d) When opening a joint or splice in a high voltage cable, the sleeve of the joint shall be cut completely around near the wipes and then cut lengthwise and removed from the joint. No effort shall be made to remove the compound. The employee shall then test over each conductor with two approved testing devices. If no indication of a live cable is obtained, the employee shall remove the compound. If shielding tape is then encountered, it shall be removed and another test made over each conductor with two approved testing devices. If no indication of a live cable is then obtained, the employee shall pierce through the joint with a tool designed for this purpose until the tool touches one of the conductors. Before proceeding further, a test shall be made on the approved testing device.

e) When cutting or opening joints on low voltage cables, the same procedure as outlined for high tension cables shall be followed, except in testing. To determine whether the conductor is energized, the insulation shall be cut away to the conductor and tests made with an approved tester. On multiple conductor cables, only one conductor shall be cut into at a time and tests shall be made on at least two conductors before proceeding with work.

f) Air monitoring during the splicing of lead-jacketed electrical lines has shown the potential for exposures to lead at or above the action level. Any soldering or heating of lead jacketed materials should be conducted using proper engineering controls (i.e. ventilation), personal hygiene, PPE, and personal monitoring.

All Utility employees involved in the disturbance of lead-containing materials or lead based paint as part of regular work activities should have at least a lead awareness training class and have blood lead levels checked initially, then at least annually thereafter.

For more information regarding the OSHA lead standard, refer to 29 CFR 1910.1025.

509.6 Opening and Closing Circuits

a) Utility switching procedures, including Hold Carding and tagging practices, shall be followed when sectionalizing URD systems.

b) When a URD circuit has opened, the route of the circuit shall be patrolled for obvious hazards before the circuit is reclosed.

c) Approved switching tools and rubber gloves shall both be used when switches (including secondary breakers and primary load-break elbows) in an energized circuit are opened or closed.

Note: Supervision may require the use of rubber sleeves in addition to rubber gloves.

d) Any URD primary circuit shall be de-energized by opening one or more load-break devices. De-energizing shall 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.

e) Eye or face protection shall be worn when primary switching operations are performed.

f) System neutral on any circuit shall only be opened under the direct supervision of an authorized person.

509.7 Grounding

Note: A capacitance charge can remain in a URD cable after it has been disconnected from the circuit and a static type arc can occur when grounds are applied to such cables.

a) All URD cables and equipment, including services that have been energized or could become energized from any source shall be considered as energized until the equipment is tested and has been grounded.

b) Before working on de-energized primary circuits or equipment:

(1) a visible open break shall be provided;

(2) a voltage test shall be made; and

(3) the equipment shall be grounded.

c) When work is to be done on equipment or cables of an underground system, precautions to prevent backfeed shall be taken, including grounding of secondary conductors.

d) De-energized cables to be worked on shall be grounded at a point as close to the work as possible.

e) All underground cables and apparatus carrying current at voltages greater than 600 volts shall be de-energized and grounded before cables are cut into or spliced.

f) All conductors of a circuit shall be de-energized when work is to be performed on any of them.

g) Ground lead shall be capable of conducting the anticipated fault current and shall have a minimum conductance of No. 2 AWG copper.

509.8 Heating Materials

a) Metals and insulating compounds shall be heated in such a manner as to prevent hazard to the employees working in manholes or vaults and to vehicular or pedestrian traffic.

b) Gloves, sleeves, and safety glasses shall be worn while heating or working with hot insulating compound or metals.

c) Furnaces and tanks containing liquefied petroleum gas such as butane or propane shall not be placed in a manhole or vault.

d) Cold solder scraps or dipper shall never be placed in a hot solder pot until the chill and any moisture have been removed from the scraps or dipper.

e) Heating pots for solder, oil, or compound shall be safely positioned so that the contents cannot enter the vault or manhole in the event of spillage.
f) Lighted furnaces or blow torches should not be left unattended.
g) Torches or furnaces must be kept at a safe distance from flammable materials.

509.9 Rubber Glove Use

a) Rubber gloves shall be put on before any energized 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, barricaded, and shielded.
b) Rubber gloves shall be worn when removing animals, vines, weeds, grass, or vegetation of any kind that has grown into an energized URD installation whether the equipment is opened or closed.
c) Rubber gloves shall be worn when energized primary cables are moved, handled, or protected.
d) Rubber gloves shall be worn when work is performed on energized secondaries and services.
e) Rubber gloves shall be worn when working on or contacting a neutral.
f) Rubber sleeves should be used with rubber gloves when working on URD.
g) Refer to Paragraph 406 for additional rubber glove requirements.

509.10 Excavations

Note: This paragraph applies to all excavation work, not just URD operations.

a) Before opening an excavation, all interferences such as trees, sidewalks, and foundations shall be removed or supported as necessary to protect employees and the public.
b) The estimated location of utility and other underground installations that may be encountered during excavation work shall be determined before opening the excavation.

c) When excavation operations approach the estimated location of underground installations, the exact location of the installations shall be determined by safe and acceptable means, usually by hand digging with an insulated shovel and the use of suitable gloves.

d) If electric cables are damaged, the following steps shall be taken:

(1) If the damaged cable belongs to a utility other than the one performing the work, this utility shall be notified at once.

(2) The area shall be barricaded and the public kept out until hazardous conditions can be eliminated.

e) If gas lines are damaged, the following steps shall be taken as soon as possible:

(1) The hole shall be left open to allow the gas to dissipate into the atmosphere. All possible sources of igniting the gas shall be removed or eliminated.

(2) Residents of the area shall be warned when necessary, and the public kept out of the area.

(3) The local fire department shall be notified immediately.

(4) The gas company shall be notified at once.

(5) The local police department shall be notified.

f) If communication cables are damaged, the communication company shall be notified at once.

g) While the excavation is open, underground installations shall be protected, supported, or removed to safeguard employees.

h) A stairway, ladder, ramp, or other safe means of egress shall be located in trench excavations that are 4 feet or more in depth so as to require no more than 25 feet of lateral travel for employees.

i) Employees exposed to vehicular traffic shall wear orange reflectorized vests or other suitable garments.

j) No employee shall be permitted underneath loads handled by lifting or digging equipment. Employees shall stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials.

k) 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, a warning system such as barricades, a spotter, or stop logs shall be utilized. If possible, the grade should be away from the excavation.

l) Employees shall not work in excavations in which there is accumulated water or in excavations in which water is accumulating unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. The precautions necessary to protect employees adequately vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a body harness and lifeline.

m) If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation.

n) Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning shall be provided.

o) Employees shall be protected from excavated material or equipment that could fall or roll into excavations. Protection shall be provided by placing and keeping such materials or equipment at least 2 feet from the edge of excavations or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into the excavation.

p) Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted before starting work and as needed throughout the shift. Inspections shall also be made after every rainstorm. Where the competent person finds evidence of a situation that could result in a possible cave-in, failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

q) Where employees or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails shall be provided.

r) When excavations are left open, warning, devices, barricades, or guardrails shall be placed to adequately protect the public and employees.

s) At the end of each workday, as much of the excavation as practical shall be closed. No more trench shall be open at one time than is necessary.

t) Mechanical excavating equipment that is parked or operating on streets or highways shall be protected by proper warning devices.

u) When it is necessary to leave excavating equipment unattended, the blade, bucket, or scoop shall be lowered to the ground and the ignition system locked.

v) Each employee in an excavation shall be protected from cave-ins by an adequate protective system, either sloping or benching, or by a shoring or shield system, unless excavations are made entirely in stable rock or are less than 5 feet in depth and examination of the ground by a competent person provides no indication of a potential cave-in.

w) When choosing a protective system, a competent person shall take into consideration soil type, vibration sources, previously disturbed soil, layered soil, presence of water, heavy equipment work adjacent to the excavation, limited work area, and other hazard-increasing conditions.

x) Shoring and shield systems shall be installed and removed in a manner that protects employees from cave-ins, structural collapses, or from being struck by members of the shoring or shield system.

y) Removal of shoring systems shall begin at and progress from the bottom of the excavation. Members shall be released slowly so as to note any indication of possible cave-ins of the side of the excavation or possible failure of the remaining members.

z) Shields shall be installed in a manner to restrict lateral or other hazardous movement of the shield in the event of the application of a sudden lateral load.

aa) Employees shall be protected from the hazards of cave-ins when entering or exiting the areas protected by shields.

bb) Employees shall not be allowed in shields when shields are being installed, removed, or moved vertically.

cc) Sloping or benching, shoring or shielding for excavations greater than 20 feet deep shall be designed by a registered professional engineer. Refer to Table 5.12 for soil type maximum slope requirements for excavations less than 20 feet.

dd) For additional information on excavation requirements, refer to OSHA Standard 29 CFR 1926, Subpart P, Excavations.

ee) "Competent person" as used in this section is a person who meets all the requirements as set forth in OSHA Standard 29 CFR 1926, Subpart P, Excavations.

Table 5.12
Maximum Allowable Slopes for Excavations
Less Than 20 Feet Deep*

Soil or Rock Type	Maximum Allowable Slopes (H:V)**
Stable Rock	Vertical (90°)
Type A***	3/4:1 (53°)
Type B	1:1 (45°)
Type C	1:1/2:1 (34°)

*Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.

**Numbers in parentheses are angles expressed in degrees from the horizontal. Angles have been rounded off.

***A short-term maximum allowable slope of 1/2H:1V (63°) is allowed in excavations in Type A soil that are 12 feet (3.67 m) or less in depth. Short-term maximum allowable slopes for excavations greater than 12 feet (3.67 m) in depth shall be 3/4H:1V (53°).

509.11 Directional Boring Operations

a) Employees shall read operators manual and comply with all manufacturer's requirements when using directional boring equipment.

b) Employees shall avoid all pinch points, rotating shafts and other moving parts that could cause injury.

c) Employees shall not wear loose-fitting clothing that may become entangled in the drill string and shall restrain long hair to keep it away from moving parts. Employees shall stay clear of drill rod and drill unit when drilling is in progress.

d) Proper care and maintenance of directional boring equipment shall be performed according to manufacturer's specifications.

e) Employees shall be properly trained in the safe use of directional boring equipment.

f) Employees shall follow all rules and regulations regarding open excavations as stated in Paragraph 509.10.

g) For appropriate work area protection, refer to Paragraph 505, Work Zone Safety (Traffic Control).

h) Location of Underground Facilities:

(1) The person in charge shall contact a one call service and request the location of underground utilities and other services prior to starting boring operations. If a one call service is not available, each individual utility shall be contacted.

(2) The person in charge shall conduct a visual inspection of the jobsite looking for conditions that indicate there may be buried utilities or other obstructions in the bore path. Conditions may include: buried utility notices, utility using facilities without overhead lines, gas or water meters, junction boxes, drop boxes, pad-mounted transformers, light poles, manhole covers, sunken ground, or any other irregularity that may indicate previous trenching.

(3) The person in charge shall check to see that all utilities marked by other organizations look reasonable and that none appear to be overlooked. If locating equipment is available, spot checks of the locations flagged by others shall be made. If there is a doubt as to the location of a buried utility, the utility should be hand excavated to determine the exact location.

(4) One or more of the following boring methods shall be used when operations are within 10 feet of a utility. When practicable, all three should be used:

(a) Expose the utility along the bore path by careful hand digging or soft excavating.

(b) Have the utility shut down during the boring operation, and upon completion, tested prior to

turning on the service to ensure the utility has not been damaged during the operation.

(c) Use a steerable, tracked boring system and electrical strike system.

i) During premobilization inspection, employees shall:

(1) Check electronics before leaving the facility and follow manufacturer's instructions regarding calibration.

(2) Replace missing or damaged safety shields and safety signs.

(3) Inspect boring machine and check all fluid levels before leaving the facility. Look for loose chains, hydraulic leaks, fuel leaks, trailer tires, etc. Make sure all safety equipment is tested and available for use.

(4) Check trailer connections--safety chains, electrical connections, electric breakaway, trailer hitch, trailer brakes, and chain binders on boring machine.

(5) Before transporting equipment to the jobsite, inspect the site and note the overall grade or slope, including hills, ditches, and trenches. Consider the size of the area needed to set up the directional boring equipment. Also note any obstacles such as buildings, railroad tracks, and bodies of water.

j) Transportation:

(1) Employees shall find a safe place to park the truck and trailer and shall observe all safety rules regarding traffic control and other warnings for motorists and pedestrians.

(2) If the bore is near a road or other traffic, the appropriate federal, state, and local government agencies shall be contacted to determine the safety precautions and regulations to be observed. Appropriate traffic control shall be maintained as required.

k) Setup:

(1) The directional boring machine shall be firmly anchored on a level boring surface. If a level boring surface is not practicable, the directional boring machine shall be set up with the rod stack on the uphill side.

(2) Consideration shall be given to existing underground utilities or other obstructions when stacking the boring machine.

(3) All boring equipment shall be properly barricaded, as required, to keep spectators away.

(4) Pressurizing the drill string shall be preceded by a check that all connections are tight and all hoses and pipes are in good condition.

(5) Employees shall know telephone numbers of and have means to communicate with local emergency medical facilities.

(6) Applicable personal protective equipment, including but not limited to, hardhats, safety glasses, dielectric boots and dielectric gloves rated for the voltages involved, shall be worn by employees.

l) Bore Operations:

(1) Supervisors shall review jobsite hazards, safety and emergency procedures, and individual responsibilities with all personnel before work begins.

(2) Employees shall know the right-of-way and depth tolerances and take into account the backreamer diameter when planning the bore path.

(3) Employees shall use appropriate manufacturer recommended tools to tighten drill housings, backreamers, etc. Pipe wrenches, which can slip and fly off the rod causing serious injury, shall not be used.

(4) The drill string shall never be rotated when a wrench is attached to the pipe. Automated wrenches shall be used when possible.

(5) When backreaming and pulling in product, employees shall use extreme caution to keep loose clothing from becoming entangled.

(6) Railroad track signals, traffic signal loops, high voltage power lines, and other sources can affect electronic locator operation. Employees shall identify and resolve interferences before starting boring operations.

(7) While drilling and backreaming, employees shall make sure good water flow exists. Fluid cools the head electronics and reduces the amount of force required to bore.

(8) Employees shall lubricate drill pipe threads and keep threads free of dirt and debris.

(9) Employees shall inspect drill pipe for signs of damage, wear, or fatigue, and replace damaged or worn pipe before a break occurs.

(10) Locating, removing head, installing backreamer, pullback process, and hooking up service all require good communication. Radios or other effective means of communication shall be used.

(11) Cold weather has an effect on boring machinery and electronics. Employees shall follow manufacturer's requirements when boring in cold conditions.

(12) Employees operating the boring machine shall stop and investigate any sudden change in boring rate or anything that "doesn't feel right."

m) Electrical Strike Protection:

(1) Dielectric hightop boots and gloves rated for the voltages involved shall be worn at all times by the boring crew and locator to reduce the probability of injury. Pantlegs shall be tucked on the inside of electrically insulated boots.

(2) Electrically insulated sleeves shall be used when energized parts are not insulated from the employee or when employee's upper arms are exposed.

(3) Employees shall never bore near any power source in excess of the rating of the dielectric boots and gloves they are wearing.

(4) Leather protectors shall always be worn over insulating gloves to provide protection.

(5) As an added precaution, the locator shall stand 10 feet to the side of the bore path while the bore is progressing.

(6) When the directional boring machine requires ground contact by employees to operate, a grid system of wire mesh mats that is electrically bonded to the drill unit, and

appropriately covers the working areas of the operator and assistants, shall be used in accordance with the manufacturer's specifications.

(7) Barriers should be placed at least 6 feet away from all equipment that is electrically bonded. This shall include directional boring equipment, truck, trailer, entrance trench, exit trench, and bore path.

(8) A ground rod shall be driven and securely connected to the boring machine by a heavy-duty cable. If feasible, the ground rod shall be driven at least 6 feet away from the boring machine.

(9) If the boring machine is equipped with a voltage limiter, the voltage stake shall be placed at least 6 feet away and must not touch any other part of the equipment.

(10) Dielectric hightop boots and gloves rated for the voltages involved shall be worn by employees while installing grounding rods and voltage stakes.

(11) Sledgehammers shall not be used to install ground rods or voltage stakes; approved rod drivers shall be used.

(12) Each directional boring machine should have a strike detection system that includes a voltage stake, voltage limiter, and an electrical strike indicator. The electrical strike indicator should consist of dual detection sensors, reset feature and self-test circuit.

(13) Electronic strike sensing systems shall be tested prior to each use.

(14) All portions of the boring system shall be electrically bonded to reduce the likelihood of their damage from high voltage differentials.

n) Procedure in Event of an Electrical Strike:

Note: The following are guidelines; the specific equipment manufacturer's instructions shall be followed.

(1) A strike sensing system has both test and reset capabilities. If the machine does not have both elements, the crew cannot be certain the boring machine is not still energized after an electrical strike. For directional boring machines without an adequate strike sensing system, the best

policy would be to stay on the machine or grid until the utility has shut down electricity to the area.

(2) The operator shall warn the locator and bystanders to stay away.

(3) For directional boring machines with both test and reset capabilities, the following procedures shall be used:

(a) Do not step off the machine or grid mats and do not allow anyone to approach the work area.

(b) Move the drill head or backreamer away from the contact in hopes of disengaging it from the power source.

(c) Do not attempt to add or remove joints from the drill string. Breaking off the drill string can result in a lethal touch potential between it and the rest of the drilling unit.

(d) Attempt to reset the strike sensing control box. If it resets, go through its operational test. This verifies the current and voltage sensing circuits were not damaged during the strike.

(e) If the alarms continue after resetting, the drill string probably remains in contact with the power cable.

(f) Wait 1 minute or more for the utility's automatic reset breakers to complete all attempts to clear the short circuit. If the strike sensing system is operational and alarms remain off, the crew may leave the work area to notify the proper utility company. Employees shall not resume work without the power company's permission.

(g) If one cannot be sure the boring unit is no longer energized, have a person outside of the work area contact the proper utility company to shut off the line before anyone moves from their position.

o) Procedure in the Event of a Gas Line Strike:

No warning system tells directional boring crews that a gas line has been struck. Usually, the only indicator is the odor or sound of

leaking gas. If a natural gas line is struck, use the following procedures:

(1) Stop the machine's engine immediately.

(2) Instruct the crew and others to leave the area immediately.

(3) Contact the gas utility.

(4) Call emergency personnel.

(5) Barricade the area off to keep spectators away.

(6) Do not let anyone return to the area until the utility company indicates that it is safe to return.

p) Procedure in the Event of a Fiber-Optic Strike:

(1) Warn people nearby that a strike has occurred.

(2) Contact emergency personnel.

(3) Contact utility company.

(4) Do not look into the ends of fiber-optic or unidentified cable. Vision damage can occur.

(5) Do not resume work until given permission by utility company.

509.12 Pulling Cables

a) Employees shall not handle pull wires or pulling lines within reaching distance of blocks, sheaves, winch drums, and takeup reels.

b) Pull wires, steel pulling lines, or metal rodding shall not be pushed through ducts where energized equipment is present unless another employee is stationed at the other end of the run.

c) Employees shall not remain in a manhole or vault during pulling operations involving heavy pulling strains unless they can take a position clear of the pulling line.

509.13 Moving Energized Cables

a) Special care shall be taken when moving cables operating at voltages greater than 600 volts and then only when all other methods of movement (such as de-energizing) have been eliminated. A careful inspection of the cable to be moved shall take place before movement occurs. If cracks, voids, insulation damage or leaking oils are detected during the inspection, the cable shall not be moved in an energized state. All portions of the cable that are subject to damage must be

clearly visible. Appropriate electrical protective equipment and live-line tools must be chosen and used during this operation.

b) All cables operating at voltages less than 600 volts may be moved at the discretion of the supervisor. They shall not, however, be moved if such movement require changing bends.

c) All energized cables shall be handled with rubber gloves except when applying fireproofing materials.

d) Energized cables that are moved shall be inspected for defects.

510 Generating Stations

510.1 General

a) Visitors or uninstructed workers shall be accompanied by a qualified employee in stations and around Utility properties when life, service, or property might be endangered.

b) All employees entering an attended station, except employees regularly working at such station, shall immediately report their presence or purpose according to plant procedures.

c) When working on or near exposed energized lines and equipment, employees shall adhere to requirements of Paragraph 507.1.

d) Employees shall not work on gauge glasses until pressure has been relieved. Gauge glasses shall be pressurized carefully with only authorized personnel present.

e) All control, annunciator, and indicating light circuits on the back of control gauge boards shall be considered as energized. Employees working in back of these boards shall use precautions to guard against contact with exposed energized parts. Caution shall be exercised when disconnecting, blowing down, or draining gauge lines to prevent contact with exposed electrical equipment.

f) Should the water in the boiler become so low that it is not visible in the water column, the furnace fire shall be extinguished and other procedures followed as recommended by the manufacturer.

g) When prolonged welding or burning is to be done in the boiler drum, auxiliary ventilation shall be used.

h) On all water tube boilers where drums are equipped with manheads at each end, both manheads shall be removed from each drum before workers enter the boiler. For inspection purposes, only

one manhead need be removed if a worker is stationed outside during periods of inspection. For drum entry, the requirements of Paragraph 201, Confined or Enclosed Spaces, shall be met.

i) Steam lines shall not be worked on while under pressure except for repacking valves or peening pinhole leaks.

j) The following rules shall apply to steam leaks:

(1) Leaky manhole covers, handhold plates, and bolted flanges shall not be worked on under pressure without specific approval.

(2) In the event there is a steam line rupture or leak, an employee should not move until the source and direction of the leak can be determined.

(3) All employees shall stay clear of steam leaks or ruptures. The area shall be adequately barricaded off until the system is isolated or repaired.

(4) An employee shall not in any instance use any part of his body to check for steam leaks.

(5) When it becomes necessary to check for steam leaks, a wooden dowel with a cloth attached, mirror or piece of metal shall be used.

k) Before entering the furnace or gas passes of a boiler, the following precautions shall be taken:

(1) All fuel shutoff valves shall be closed, physically rendered inoperative, and tagged with a Hold Card.

(2) Soot blower, steam, or air supply valves shall be closed, physically rendered inoperative, and a Hold Card placed on each valve.

(3) Hold Cards shall be placed on the controls, and the controls physically rendered inoperative on the mechanical firing equipment such as fuel oil pumps, air supply fans, gas lines, pulverizers, and dampers. Refer to Paragraph 202 and your utility clearance procedures.

(4) Hold Cards shall be placed and the controls physically rendered inoperative on all equipment that may cause motion within the furnace or gas passes, including rotating air heaters, retractable temperature probes, soot blowers, and bypass dampers.

(5) Thoroughly ventilate all areas in which work is to be performed. (It may be advisable to provide continuous forced ventilation during the progress of the work.)

l) When working inside the furnace or ash hopper, protection shall be provided against falling slag. Boilers should be satisfactorily cleaned when out of service for furnace work.

m) Refer to Hand Tools, Paragraph 506.1.

n) The number of CPR and first aid trained persons available shall be sufficient to ensure that each employee exposed to electric shock can be reached in 4 minutes by a trained person. Where the existing number of employees is not sufficient to meet this requirement (at a remote substation, for example), all employees at the work location shall be trained.

o) For additional information concerning the requirements for generating stations, refer to OSHA Standard 29 CFR 1910.269. For additional information on working near exposed energized lines and equipment, refer to Paragraph 507.1.

510.2 Entering Confined Spaces

a) Before employees enter a confined or enclosed space, they shall notify their supervisor and shall see that all valves, switches, control devices, and other operating mechanisms have been so positioned, physically rendered inoperative, and tagged with Hold Cards as to prevent closing the exit opening, energizing electrically, evacuating the air, or flooding the space with steam, gas, water, or anything else that may endanger their lives or health.

b) To prevent the latching of self-locking doors or hatches while employees are working inside confined spaces, the locking devices shall be made inoperative or the doors (hatches) shall be secured in the open position.

c) Only authorized employees shall be allowed to work inside a furnace, boiler drum, pressure vessel, tank, or similar structure.

d) Before anyone enters a boiler drum, all valves, including blowdown valves, feedwater valves, steam valves, and fuel valves, shall be closed tightly and approved Hold Cards displayed (one on each of the blowdown valves and one at each of the water inlet valves). These cards shall not be removed until all work on the boiler has been

completed; all men are out of the boiler; and all handhole, manhole, and heater plates have been replaced. Refer to Paragraph 202 and your utility clearance procedures.

e) Only circuits with approved low voltage (6-12 volts) or GFI (ground fault interrupter) power supplies for lighting shall be used in boiler drums, boilers, pressure vessels, and tanks. These circuits shall have extension cords of sufficient length so that the transformers and power supplies are located outside the wet areas at all time.

f) Before dismantling valves, flanges, and similar apparatus associated with boilers, pressure vessels, or pressure piping, the pressure shall be relieved and the equipment adequately drained.

g) Employees shall not smoke or use open flame in boiler while protective coating containing flammable liquids is being applied. Only explosion proof lamps shall be used.

h) Refer to Paragraph 201 for additional confined and enclosed space requirements.

510.3 Boiler Plant

a) Waterwall ring header and economizer blowdown valves shall not be operated while the boiler is under load or being fired with other than ignition or pilot torches.

b) Should a blowoff line break, a tube fail, or some similar serious leak develop, the fire shall be drawn or retarded immediately and other procedures followed as recommended by the manufacturer.

c) When the blowdown line of a boiler being worked on is connected to a common blowdown line with other boilers and it becomes necessary to open the blowdown valves of the boiler being worked on, a Hold Card shall be attached to the blowdown valves and the valves physically rendered inoperative from all boilers. These Hold Cards shall not be removed until the valves of the boiler being worked on have been reclosed. Refer to Paragraphs 202 and your utility safe clearance procedure.

d) Employees shall not work on safety valves while the boiler is under pressure except to make necessary adjustments, nor shall they work near unvented safety valves while the boiler is under pressure.

e) Leaky manheads, handhole plates, and bolted flanges on steam lines shall not be worked on under pressure without getting specific approval from the plant superintendent or authorized representative.

f) Before a boiler water column is repaired or adjusted, the upper and lower shutoff valves shall be closed and the drain opened to release the pressure. Before placing a boiler water column in service, all personnel shall place themselves so that if the gauge glass should rupture, no one would be in direct line of steam discharge.

g) While applying a hydrostatic test to a boiler, only those inspecting for leaks shall be inside the boiler. If safety valve gags are used, care shall be taken to see that they are removed before the boiler is fired.

h) All employees shall stay clear of pressurized oil or air escaping from a ruptured line or fitting. No attempt shall be made by an employee to stop or slow such a leak by using hands, feet, or other parts of the body. The pump, compressor, or engine shall be stopped as soon as the leak is detected.

i) Inlet and outlet circulating water valves shall be locked out or tagged out and physically rendered inoperative before employees enter the water box of a condenser. If these valves are electrically operated, their main breakers shall be opened, physically rendered inoperative, and locked out or tagged out. Refer to Paragraph 202 and your utility safe clearance procedure.

j) All boiler plant safety devices such as safety valves, relief valves, fuel tripping devices, auxiliary tripping relays, interlocks, and alarms shall be tested as set forth by plant management.

k) When lancing boilers, employees shall wear a long-sleeved shirt, buttoned at the collar (or slagging jacket), gloves, and a face shield.

l) The boiler operator shall be notified before any door on a boiler is opened, because the fire might flash out due to a positive pressure within.

m) Employees shall stand to one side when opening a boiler door.

n) Only authorized personnel shall be permitted to open boiler doors. When required, boiler doors shall be closed before leaving the area.

Note: In units that have both induced draft fans and forced draft fans, when practicable, the unit should be placed on a fixed load and the induced and forced draft fans placed on hand control to lessen the danger of a positive pressure.

o) Employees shall stand to one side when using plugs or brushes with an air gun to clean tubes. This procedure will guard against back pressure in a blocked tube that may drive the plug or brush back when the air gun is removed.

p) No one shall be at the opposite end of tubes being cleaned or plugged.

q) Before removing a valve bonnet or stuffing box gland, or breaking a flanged joint or other pressure connections, the pressure shall be relieved and the system drained, physically rendered inoperative, and Hold Cards attached.

r) Bolts, nuts, or other fasteners shall be loosened with special care until it is certain that pressure does not exist.

s) Employees shall use only hoses that are approved for the intended use.

t) Air and water hoses shall not be used for steam. Steam hoses shall be insulated sufficiently to avoid burns from accidental contact.

u) Sufficient access and working space shall be maintained around electric equipment.

v) When a work area is adjacent to, or partially or wholly surrounded by energized areas, the "safe" work area shall be clearly marked by the use of barricades, tape, rope, or other suitable means.

w) Areas are to be marked with barricades, tape or equivalent means, as above, without violating the minimum working clearance for the voltage involved.

x) While working or pounding on hopper to aid the removal of fly ash or siftings, employees shall wear dustproof goggles, dust respirator, gloves, and long-sleeved shirt buttoned at the collar.

y) Dustproof goggles shall be worn and care employed when removing inspection plugs from hoppers.

z) Ash pit doors and gates shall be opened and closed cautiously.

aa) The spray water shall be on if an occasion arises in which the ashes drop to the bottom of the pit (a jamming of large clinkers, etc.) and if it is necessary for an employee to "rod" the jammed passage.

bb) The employee shall wear an approved face shield, slagging jacket, and approved safety equipment to fully protect himself from any sudden release of hot ashes.

cc) The following apply to water and steam spaces associated with boilers:

(1) A designated employee shall inspect conditions before work is permitted and after its completion. Eye protection and full face protection, if necessary, shall be worn at all times when condenser, heater or boiler tubes are being cleaned.

(2) When it is necessary for employees to work near tube ends during cleaning, shielding shall be installed at tube ends.

510.4 Boiler and Pressure Vessel Chemical Cleaning

a) Areas where chemical cleaning is in progress shall be cordoned off to restrict access during cleaning.

b) The chemical cleaning area shall be posted with signs restricting entry and warning of the health hazards associated with the chemicals being used and the potential for fire and explosion.

c) Only properly trained employees shall be allowed in restricted areas and limited in number to those necessary to accomplish the task safely.

d) Employees in restricted areas shall wear protective equipment as required by Utility policy and the Material Safety Data Sheet for the chemicals in use.

e) An emergency shower or water source shall be available for emergency use.

f) All chemical cleaning waste material shall be properly disposed of according to federal, state, and local regulations.

510.5 Turbine Generators

Turbine generators shall be started and stopped in accordance with approved station operating instructions.

a) When working on or above open grating, a suitable covering shall be used to cover the grating in order to prevent tools or parts from dropping to a lower level.
b) Work area protection shall be provided or the danger area shall be barricaded when gratings are removed.
c) When opening any part of the turbine casing or steam side of the condenser, all valves or piping that may allow steam, air, or other fluids to enter the turbine shall be closed, physically rendered inoperative, and Hold Cards attached. Also, all equipment that can cause motion to the turbine such as turning gear shall be physically rendered inoperative and Hold Cards attached.
d) Before exciter or generator brushes are changed while the generator is in service, the exciter or generator field shall be checked to determine that a ground condition does not exist. If the equipment has ground protecting devices, the protective devices shall be disconnected and Hold Cards attached before the brushes are changed.

510.6 Gantry Cranes

a) Only qualified employees shall be permitted to operate a gantry crane.
b) Both rail clamps and wheel brakes shall be applied at all times when outdoor cranes are not in use.
c) Limit switches on cranes shall be tested regularly but should not be relied upon to stop the motor. Action of the crane shall be controlled by the operator at all times.
d) Gantry cranes shall not be used to make a side pull.
e) Automatic signals shall be sounded before starting and repeated during travel of the crane.
f) For additional information concerning the requirements for gantry cranes, refer to OSHA Standard 29 CFR 1910.179.

510.7 Process Safety

a) To minimize the consequences of catastrophic releases of toxic, reactive, flammable, or explosive chemicals (highly hazardous chemicals), employees shall follow the Utility's operating and maintenance procedures when working on systems that contain highly hazardous chemicals. Employees shall follow the Utility's operating

procedures for initial startup, normal operations, temporary operation, and emergency shutdowns. (Examples of highly hazardous chemical systems are chlorine systems, ammonia systems, and hydrogen cooling systems.)

b) Employees shall adhere to the requirements of Paragraph 304, Hazardous Materials; Paragraph 201, Confined or Enclosed Spaces; and Paragraph 202, Hazardous Energy Control/Lockout-Tagout, when working on systems that contain highly hazardous chemicals.

c) Only properly trained employees shall operate or work on systems containing highly hazardous materials.

d) In the event of a spill or release of a highly hazardous material, employees shall take action as required in the Utility's emergency action plans.

e) Contractors working on Utility property shall be informed of the hazards and safe work practices when working on or around systems that contain highly hazardous chemicals.

f) For additional information concerning process safety requirements, refer to OSHA Standard 1910.119.

510.8 Hydrogen Cooling Systems

a) Open flames shall be kept away from hydrogen cylinders and employees shall not smoke in the vicinity of cylinders or the manifolds to which they are connected. No smoking will be allowed in the immediate vicinity of the hydrogen seal oil unit or hydrogen dryers.

b) A sufficient quantity of CO_2 shall be readily available at all times to purge the hydrogen from the generator.

c) Any generator or other vessel containing air shall first be purged with CO_2 before hydrogen gas is admitted.

d) Any generator or other vessel containing hydrogen shall be purged before entering, first with CO_2, then with air. Tests for adequate oxygen shall be made with approved apparatus, and the removable link in the hydrogen supply line shall be removed before entering. Also, refer to Paragraph 201 for confined or enclosed entry requirements.

e) If hydrogen seal oil pressure is lost and cannot be immediately restored, the hydrogen shall be purged from the generator.

f) Only nonsparking tools shall be used in hydrogen areas.

510.9 Coal Handling--Railway Operations

a) Only authorized employees shall operate railroad equipment.

b) Before moving a locomotive, the operator shall give a proper warning (car dumper excepted). A warning shall always be sounded when approaching a walk or driveway, when passing cars on an adjacent track, or when passing any structure obscuring the operator's vision.

c) When operated manually, the operator shall not move the locomotive when he is unable to see his switchman.

d) Employees shall not ride on footboards of locomotives.

e) Switchmen or brakemen shall use adequate signaling devices and standard railroad signals when working in conjunction with locomotive engineers, hand signals, or appropriate flags for daytime use, or lantern or red flares at night, for switching purposes.

f) Employees shall not mount locomotives when they are in motion.

g) Only in emergencies shall a locomotive be returned from the empty yard through the car dumper and then only after the operator has obtained clearance from the car dumper operator.

h) Work (except testing procedures) shall not be performed on locomotives while they are moving.

i) Locomotives shall not be operated at unsafe speeds. The train shall be kept under control at all times.

j) Whenever the locomotive engines are shut off, the hand brake shall be set. The operator key (lever) shall not be left in an unattended locomotive.

k) Locomotive operators shall follow all signals carefully. If signals are not fully understood, operators shall not move the train until clarification has been made.

l) Employees engaged in switching or dumping cars shall not line up drawheads with their feet.

m) Drawheads or knuckles shall not be shifted while locomotives or cars are in motion.

n) Flying switches shall not be made.

o) Employees shall not jump from one car to another while either is in motion.

p) Cars shall not be spotted where they will foul another track.

q) When shoving cars, the operator shall protect the front end of the train.

r) Employees shall not go between cars or board or leave locomotive cranes or cars while such equipment is in motion.

s) When a car is spotted for unloading on other than level ground, it shall be held in place by approved blockers in addition to setting the brakes.

t) Cars and equipment marked with a blue flag shall not be moved.

u) When a string of cars has been separated at a crossing or walkway, it shall not be recoupled unless the operator is at the crossing.

v) Employees shall not walk, stand, or sit on tracks except when necessary for the proper performance of duty.

w) Employees shall cross or walk on tracks at a safe distance from cars or locomotives.

x) Trains, engines, and cars shall be expected to move at any time, on any track, in either direction.

y) Approved car movers shall be used for moving cars by hand.

z) Companionways and catwalks must be kept free of tools and materials.

aa) Employees shall not crawl under or work beneath cars or locomotives unless the wheels have been blocked in both directions and warning flags placed at both ends.

bb) When thawing operations are in progress by use of oil-fired torches, adequate face protection and ear protection shall be used.

cc) Fire protection and first aid equipment shall be available in open flame thawing areas.

dd) When dusty coal conditions exist, dust respirators shall be used.

ee) Emergency safety key switches and pull ropes should be checked frequently and maintained in good condition.

ff) Pulley drives, gearing, motor couplings, and idlers at sealing strips shall be adequately guarded.

gg) When a railroad car is stopped for unloading, the car shall be secured from displacement that could endanger employees.

hh) An emergency means of stopping dump operations shall be provided at railcar dumps.

510.10 Barges, Boats, and Docks

a) Employees shall stay clear of barge cables while barges are being moved.

b) When barges are moored at docks, the mooring lines shall be loose enough to allow sufficient movement of the barge to keep sway from passing boats from breaking lines, yet shall be tight enough to permit the passage of personnel from dock to barge.

c) Only authorized employees shall operate Utility boats.

d) The lifeboat and workboats shall, at all times, be equipped with a pair of oars and a ring buoy attached to a 50 foot coil of 1/2 inch line attached to the boat.

e) Docks and walkways shall be maintained in safe condition at all times. They shall be kept clear of all obstructions.

f) While working on boats, barges, rafts, or other floating equipment or on docks, employees shall wear approved life jackets or a belt and lifeline.

g) Employees shall not enter a barge that is being unloaded by a grab bucket, unless he is in full view of the crane operator or signalman.

h) Before working on a barge, the gunwales and end decks shall be cleared of loose coal.

i) Employees shall not work under a crane or grab bucket at any time.

j) Crane buckets shall always be lowered before the crane is left unattended.

510.11 Car Shakers and Dumpers

a) Only tools approved by the Utility shall be used for releasing doors on hopper type cars.

b) Car shakers shall be shut off before employees climb onto the car, and the car shall not be moved until all personnel are out of the car.

c) Employees engaged in car shaker operations shall use suitable eye protection, hearing protection, and respiratory equipment as prevailing conditions dictate.

d) Cars shall not be moved through the car dumper for refueling purposes.
e) Only coal cars shall be permitted on the car dumper and car shaker tracks.

510.12 Conveyors and Crushers

a) Employees shall stay clear of conveyors as they may start at any time.
b) Employees shall not ride conveyor belts or buckets.
c) Employees shall not attempt to clear a blocked conveyor or crusher or loosen any material therein (except from established positions outside the equipment) without first shutting off the power, physically rendering the switch inoperative, and tagging the control with a Hold Card.
d) Employees shall not clean around conveyor rollers while belt is in operation.
e) Coal dust shall not be cleaned up in a manner that will create a hazardous, dusty atmosphere. Use of compressed air is especially prohibited.
f) Belt conveyors shall be equipped with emergency stop cords for their entire exposed lengths.
g) Repairs shall not be made except when the electric system is shut off, physically rendered inoperative, and tagged with a Hold Card.
h) Employees shall cross over or under conveyors only where permanent walkways with railings have been installed.

510.13 Coal Storage

a) Before entering a coal bunker, the associated mill feeder shall be physically rendered inoperative and tagged with a Hold Card. An air test shall be made to determine if toxic or explosive gas is present. If found, it shall be expelled before entering and frequent air tests shall be made during the progress of the work.
b) Employees entering a bunker for the purpose of dislodging coal or inspection shall wear an approved harness with lifeline attached. The lifeline shall be secured to a fixed support outside the bunker and another employee stationed to attend it and render assistance if needed.

c) When cleaning down coal in a bunker, employees shall not work from a position under the lodged coal and shall use nonsparking tools.

d) Employees shall not smoke in coal storage buildings or buildings housing coal crushing and handling equipment except in designated areas.

e) Only portable lights and extension cord lights meeting dust-proof requirements shall be used in coal storage buildings or buildings housing coal crushing and handling equipment. Portable electrical tools and appliances shall not be operated in these areas unless special precautions are taken to eliminate explosion hazards.

f) When welding or use of open flame is required in the coal conveyor system, the area shall be cleaned and wet down. Fire protective equipment shall be available and ready for use.

g) Refer to Paragraph 201 for additional confined or enclosed space requirements.

510.14 Hydro Stations

a) Whenever it is necessary to work in a location where there is a possibility of falling into dangerous water, employees shall wear a U.S. Coast Guard-approved life jacket and/or safety belt with an approved lifeline attached.

b) Rigging equipment shall be inspected before and after using. Wood scaffold planks shall be free and clear of cracks and large knots.

c) Employees shall be protected from falling by secured guardrails or the use of approved belts, straps, harness, and lines.

d) A Hold Tag procedure shall be established before entering penstocks, scroll cases, and similar water passages.

e) A Hold Tag procedure shall be established before any internal work is performed on a generator.

f) The unit shall be secured by cables or blocked to prevent turning when working in the turbine or generator.

g) The elevation of the water shall be maintained at a safe level below crest when working flashboards and making other repairs.

h) Employees working on or close to water gates, valves, intakes, forebays, flumes, or other locations where increased or decreased water

flow or levels may pose a significant hazard shall be warned before water flow changes are made.

i) Employees using boats in dangerous water shall wear approved life jackets.

j) At least two employees shall be present where any work is done inside tanks, tunnels, conduits, deep manholes, and other confined or deep spaces.

k) Deep and confined spaces shall be ventilated with fans or blowers before entering. Refer to Paragraph 201 for additional confined or enclosed space requirements.

510.15 Hazardous Energy Control

a) If an energy isolating device is not capable of being locked out, a tagout system shall be used.

b) Tags shall be attached to the same location as the lock would have been in a system that is capable of being locked out.

c) Tagging should offer the same degree of protection as locking. This may require additional safety measures such as removal of an isolating circuit, blocking of a control switch, opening of an extra disconnecting device or the removal of a valve handle.

d) Employees shall be trained to ensure that the purpose and function of the energy control programs are understood. Employees shall have the knowledge and skills required for the safe application, usage, and removal of energy controls.

e) Lockout and tagout devices shall be the only devices used for controlling energy and may not be used for other purposes.

f) Lockout and tagout devices shall be capable of withstanding the environment to which they will be exposed for the maximum period of time that exposure is expected.

g) Tags shall be so constructed as to not deteriorate in corrosive environments.

h) Locks and tags shall be standardized within the facility by color, shape or size. For tags, print and format shall be standardized.

i) Locks shall be substantial enough to prevent unauthorized removal without the use of excessive force.

j) Tags shall be substantial enough to prevent accidental removal. Tag device means of attachment shall be nonreusable,

attached by band, self-locking, and nonreleasable with a minimum unlocking strength of no less than 50 lbs.

k) Lockout and tagout devices shall have the capability of identifying the employee applying the devices.

l) Tags shall warn against hazardous conditions if the machine or equipment is energized and shall include a legend such as “Do Not Start,” “Do Not Open,” “Do Not Operate,” etc.

m) Lockout and tagout application and removal may only be performed by the authorized employees who are performing the servicing or maintenance.

n) Affected employees shall be notified of the application and removal of lockout or tagout devices. Notifications shall be given before controls are applied and after they are removed. Another notification must occur before the machine or equipment is re-energized.

o) The sequence of lockout/tagout application is as follows:

(1) Before an authorized or affected employee turns off a machine or equipment, the authorized employee shall have knowledge of the energy to be controlled and the method or means used to control it.

(2) The machine or equipment shall be turned off or shut down using the procedures established to do so in an orderly manner.

(3) All energy isolating devices that are needed to control the energy to the machine or equipment shall be physically located and operated in such a manner as to isolate them from energy sources.

(4) Lockout or tagout devices shall be attached in a manner that will hold the energy isolating device in a “safe” or “off” position by authorized employees.

(5) When tags are used on energy isolating devices capable of accepting a lock, the tag shall be affixed at the same point of attachment as a lock would be.

(6) When a tag cannot be affixed directly to the energy isolating device, the tag shall be located as close as safely possible to the device, in a position that will be immediately obvious to anyone attempting to operate the device.

(7) After application of the lock or tag, all potentially hazardous energy shall be relieved, disconnected, restrained, or otherwise rendered safe.

(8) If there is a possibility of reaccumulation of stored energy to a hazardous level, verification of isolation shall be continued until the servicing or maintenance is complete or until the possibility of reaccumulation no longer exists.

(9) Before starting work on locked out or tagged out machines or equipment, the authorized employee shall verify that isolation and de-energizing have been accomplished. If normally energized parts are exposed to contact by an employee while the machine or equipment is de-energized, a test shall be performed to ensure that these parts are de-energized.

p) The sequence of release from lockout/tagout is as follows for the authorized employee:

(1) The work shall be inspected to ensure that nonessential items have been removed and that machine or equipment components are operationally intact.

(2) The work area shall be checked to ensure that all employees have been safely positioned or removed.

(3) After lockout or tagout devices have been removed and before a machine or equipment is started, affected employees shall be notified that the lockout or tagout devices have been removed.

(4) Each lockout or tagout device should be removed by the authorized employee who applied it.

(5) If the lockout/tagout device cannot be removed by the authorized employee who applied it, the following conditions shall be met:

(a) Verify that the authorized employee who applied the device is not at the facility.

(b) Make all reasonable efforts to contact the authorized employee to inform him that the device has been removed.

(c) Ensure that the authorized employee has this knowledge before resuming work at the facility.

q) If the lockout/tagout devices must be temporarily removed from energy isolating devices and the machine or equipment must be energized to test or position the machine, equipment, or component, the following sequence of actions shall be followed:

(1) Clear the machine or equipment of tools and material.

(2) Remove employees from the area.

(3) Remove the lockout or tagout device.

(4) Energize and proceed with testing or positioning.

(5) De-energize all systems and reapply energy control measures to continue servicing or maintenance.

r) When servicing or maintenance is performed by a crew, craft department, or other group, they shall use a procedure which gives the employee a level of protection equivalent to that provided by the use of a personal lockout/tagout device. This procedure will consist of the following requirements, as a minimum:

(1) Primary responsibility shall be given to an authorized employee for a set number of employees working under the protection of a group lockout/tagout device.

(2) The authorized employee shall be able to ascertain the exposure status of all individual group members with regard to the lockout or tagout of the machine or equipment.

(3) When more than one craft, crew, department or other group is involved, assignment of overall job-associated lockout or tagout control responsibility shall be given to an authorized employee designated to coordinate the workforce and ensure continuity of protection.

(4) Each authorized employee shall affix a personal lockout or tagout device to the group lockout device when he begins work and shall remove those devices when he stops working on the machine or equipment.

s) Procedures shall be used during shift or personnel changes to ensure the continuity of lockout/tagout device protection between offgoing and ongoing employees.

t) Whenever outside servicing personnel are used, they and the Utility shall inform each other of their respective lockout/tagout procedures and ensure that employees from both sides understand and comply with each other's procedures.

u) If energy isolating devices are installed in a central location under the exclusive control of a system operator, the following requirements shall apply:

(1) The procedure shall afford employees with a level of protection equivalent to that provided by a personal lockout/tagout device.

(2) The system operator shall place and remove lockout/tagout devices in place of the authorized employee.

(3) Provisions shall be made to identify the authorized employee who is responsible for (that is, being protected by) the lockout or tagout device, to transfer responsibility for lockout and tagout devices. Provisions shall also be made to ensure that an authorized employee requesting removal or transfer of a lockout/tagout device is the one responsible for it before the device is removed or transferred.

511 Communication Facilities

511.1 Fiber-Optic Systems

a) Employees shall be properly trained on the specific hazards of handling fiber-optic cable and equipment.

b) Under normal operating conditions, lightwave transmission systems are completely enclosed. The following precautions shall be observed with these systems:

(1) Employees shall not disconnect any fiber-optic cable or splice and stare into the optical connectors terminating the cables because of the potential for eye damage.

(2) Under no circumstances should an employee who has not satisfactorily completed an approved training course perform lightwave/fiber-optic operations.

(3) Because viewing lightwave emissions directly with an optical instrument, such as an eye loupe, greatly increases the risk of eye damage, an appropriate label must appear in plain view on the front of the main frame or fiber-optic termination/interconnection equipment identifying this hazard.

c) During service, maintenance, or restoration work, a lightwave transmission system can no longer be considered enclosed. Under such conditions, employees shall observe the following:

(1) Only authorized, trained employees are permitted to perform service, maintenance, and restoration work. Employees shall avoid exposing the eye to emissions from unterminated, energized fiber-optic connectors at close distances. The connectors associated with lightwave regenerators are normally recessed, thereby limiting the exposure distance. Under normal conditions, the regenerators can be removed or replaced without fear of eye injury. However, employees performing the removal or replacement work shall not stare or look directly into the vacant regenerator slot with optical instruments or magnifying lenses.

(2) Only authorized, trained employees are permitted to use lightwave test equipment during installation/servicing work, since this equipment contains semiconductor lasers.

(3) Unauthorized employees shall be excluded from the immediate area of lightwave transmission systems during installation and service work. The area shall be properly barricaded and posted.

d) If a fiber-optic cable breaks or is removed from its normal position, employees should observe the following precautions:

(1) Do not examine or stare into broken, severed, or disconnected fiber-optic cables.

(2) Report any cable problems to your supervisor, who can arrange for authorized, trained installation/service personnel to repair or replace the cables.

e) Employees who install, operate, maintain, or repair fiber-optic systems have, in addition to normal safety precautions, the following responsibilities:

(1) Observe all Utility rules, procedures, and practices established for the safe operation of these systems.

(2) Notify a supervisor immediately of conditions or practices that may cause potential personal injury or property damage.

(3) Report to a supervisor immediately any known or suspected accidental exposure to laser radiation.

(4) Use appropriate safety glasses and gloves when working with fiber-optic systems.

(5) When using an ultraviolet lamp for curing adhesive during splicing of fiber-optic material, only approved eyewear shall be worn.

(6) Employees shall always treat every fiber as active and when using laser, take the appropriate safety precautions.

(7) Eating or drinking in the fiber work area is prohibited.

(8) Employees shall be informed not to rub eyes or use the restroom without washing hands first.

(9) Do not assume that fiber-optic cable does not pose an electrical hazard. The fibers themselves are dielectric, but if the cable contains any metallic parts at all, the cable is conductive and should be treated accordingly.

(10) Always apply temporary grounding and bonding harnesses to the cable while working with it.

(11) Solvents and chemicals used for stripping fibers and cleaning shall be used in adequately ventilated areas.

f) Cleaved glass fibers are very sharp and can pierce the skin easily. Do not let cut pieces of fiber stick to your clothing or drop in the work area. Use tweezers to pick up cut pieces of the glass fibers and place them on a loop of tape kept for that purpose.

g) Employees shall wear safety glasses and gloves when handling fibers.

h) When using tools such as hook blades to strip cable, employees shall guard against the blade slipping and cutting their hands and arms.

i) When using diagonal cutters to cut or trim the metallic strength members of the cable, do not cut more than one strand member at a time and be sure to hold the portion to be cut as close to the floor as possible away from other people.

j) When using razor blades for light trimming operations, always cut away from body, do not use a dull blade, do not attempt heavy cutting with a razor blade, and dispose of razor blade properly.

k) When using utility knives for heavier cutting operations, always cut away from the body, never use a dull blade, and hold the knife in one hand and the cable with the other.

l) Fiber cable sheath ease of removal is contingent on temperature. Use extra caution in colder temperatures.

511.2 Radio Frequency Radiation

a) Utilization of Radio Frequency (RF) Source Equipment Which Meets Applicable Safety Standards:

(1) RF source equipment shall meet all Federal Communication Commission (FCC) RF regulations and other applicable safety standards.

(2) FCC certification will be required on all future purchase orders for RF amplified equipment.

(3) Any service, modification, or action that has been performed on equipment that is responsible for amplifying or coupling amplified signals will be checked with RF survey equipment immediately after service and before returning that system to operational status.

b) RF Hazard Identification and Periodic Surveillance:

(1) Screening measurements shall be completed to identify potentially hazardous RF areas. More complex measurements may be necessary when employee exposures approach FCC established maximum permissible exposure (MPE) limits. (Refer to Table 5.13.)

(2) Conducting objects in close vicinity shall be evaluated to ensure that they do not constitute RF shock and burn hazards.

(3) Surveys of RF levels shall be conducted during the development of work practices to ensure they are effective in preventing excessive exposures to RF radiation.

(4) Appropriate work practices must be followed during the repair and maintenance of RF equipment.

(5) Surveys of RF levels shall be conducted to ensure that personal protective equipment is applicable and effective for the specific worksite conditions.

c) Identification and Implementation of Controls in RF Hazard Areas:

(1) Access to any areas where RF fields could exceed the FCC established maximum permissible exposure (MPE) limits for the general public shall be restricted.

Table 5.13
Limits for Maximum Permissible Exposure (MPE)

(A) Limits for Occupational/Controlled Exposure

Frequency Range (MHZ)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time IEI^2, IHI^2, or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1,842/f	4.89/f	($900/f^2$)*	6
30-300	61.4	0.163	1.0	6
300-1,500	--	--	f/300	6
1,500-100,000	--	--	5	6

(B) Limits for General Population/Uncontrolled Exposure

Frequency Range (MHZ)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time IEI^2, IHI^2, or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	($180/f^2$)*	30
30-300	27.5	0.073	0.2	30
300-1,500	--	--	f/1,500	30
1,500-100,000	--	--	1.0	30

f = frequency in MHz *Plane-wave equivalent power density

Note 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment, provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply, provided he is made aware of the potential for exposure.

Note 2: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

(2) Exposure time and distance between the RF source and employee shall be controlled in order to ensure that workers' exposures remain below recommended levels.

(3) RF hazard areas shall be identified to alert employees of areas that are not to be occupied during RF application.

(4) The antenna and transmitter shall be deactivated prior to being serviced.

(5) Access to RF hazard areas shall be controlled with standard lockout/tagout procedures to ensure employees are not occupying these areas during the application of RF energy.

(6) Transmitters shall not be operated without shields.

(7) Appropriately selected and properly used RF protective clothing shall be used to reduce whole body RF absorption below established MPE.

(8) Employees working near or in the vicinity of radiating antennas or transmitters may be required to wear and use appropriately selected personal RF monitoring devices to ensure exposure levels are below the established MPE.

(9) RF hazard areas shall be clearly marked with appropriate signs, barricades, floor markings, etc., such that any worker who has access to the facility will be alerted not to occupy the hazardous locations.

(10) Signs shall be of standard design and shape, and of sufficient size to be recognized and readable from a safe distance. Refer to Figure 5.6.

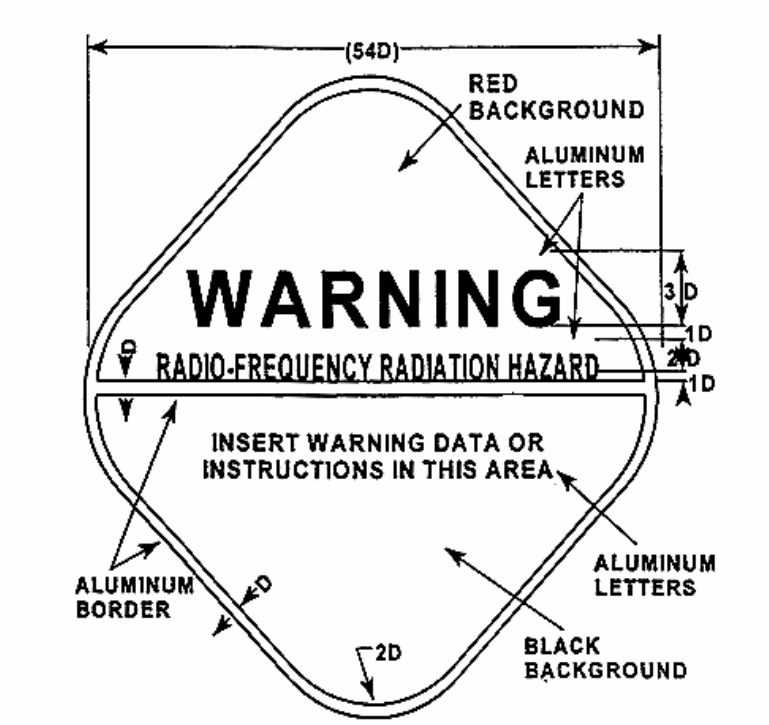
(11) Screening measurements shall be used to determine where signs are to be located in order to alert workers approaching a RF hazard area.

(12) The evacuation of hazard areas prior to RF application shall be strictly enforced.

d) RF Safety and Health Training:

(1) All employees who are required to work in a controlled environment, where power densities could exceed the FCC general public MPE limits, shall be aware of the potential exposure RF fields and should be informed of the steps they must take to ensure they are not exposed to RF fields in excess of the MPE limits.

Figure 5.6
Radio Frequency Radiation Warning Symbol



1. Place handling and mounting instructions on reverse side.
2. D = Scaling unit.
3. Lettering Ratio of letter height to thickness of letter lines.
   Upper triangle = 3 to 1 Large
   6 to 1 Medium
   Lower triangle = 4 to 1 Small
   6 to 1 Medium
4. Symbol is square, triangles are right-angle isosceles.

(2) RF awareness training shall include applicable principles for working safely near energized communications antennas and equipment as well as guidance for personal protection that will be encountered under specific workplace conditions.

(3) Employees shall adhere to the following principles when working around RF equipment:

(a) Employees shall assume all antennas are active and energized.

(b) Employees shall maintain an established safe distance from all antennas.

(c) Employees shall obey all posted signs and warnings.

(d) Employees shall not stop near omnidirectional antennas or in front of directional antennas, and should keep below elevated antennas.

(4) All employees relying on and using personal monitoring equipment require training in the appropriate use and limitations of the device.

e) Medical Surveillance Program:

(1) Employees shall report the occurrence of RF burns, or the sensation of nonroutine heating, to their supervisor.

(2) Employees shall notify their supervisor of any implanted medical devices prior to working around RF equipment.

f) Periodic RF screening and measurements are necessary to ensure conditions have not changed and that the RF protection program continues to be effective in preventing excessive RF exposures.

g) For more information on working with communication facilities, refer to OSHA Standards 29 CFR 1910.197, 29 CFR 1910.268, and 29 CFR 1910.269(s).

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