



Santee Cooper's Safety Manual

1st Edition



Date: April 2023
 To: All Employees
 From: Jimmy Staton, President and CEO
 Subject: Santee Cooper Safety Manual

Our Safety Council, Corporate Engagement and Oversight Committee (CEOC) and C-Staff have approved the following as Santee Cooper’s official Safety Manual, replacing the APPA safety manual. The subsequent protocols are a compilation of the minimum expectations of our corporate safety policies and are designed to ensure we maintain a safe and healthful workplace for you and your coworkers.

A copy of the Santee Cooper Safety Manual is available to all employees on Safety’s iPort page. Print copies are available from the Occupational Safety Department upon request. You are expected to read, understand and comply with all aspects pertaining to your job duties.

Working safely is imperative and getting home to our families every day is something we can control. Some of you perform duties that can be extremely hazardous, but all of us perform duties that can result in accidents if we aren’t safe. Performing every task with safety in mind will help eliminate preventable accidents and injuries.

If you have any questions regarding this manual, please contact your supervisor or Occupational Safety.

Jimmy Staton, President and CEO

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Safety Mission Statement

Successful performance of our work is founded on our belief that the safety and health of employees, contractors, visitors, and the public are more important than production, quality, and cost. The benefits of a safe workplace and safe work practices extend far beyond monetary savings. We recognize and accept that the avoidance of injury is a responsibility that impacts our quality of life as well as that of our families and associates.

Purpose of the Safety Manual

- To provide consistent safe work practices for all Santee Cooper personnel.
- To provide, in one document, specific safe work practices readily accessible to all personnel to help train, plan and perform work activities.

Note: This manual is not intended to be an all-inclusive list of policies and procedures. It does not cover every rule or manufacturer guideline. As new policies or regulations are developed by OSHA or the manufacturers, additions and/or deletions will be made to this manual. It is a document intended to help answer the most commonly asked questions and sets forth the guidelines to perform work safely. If a safety concern arises that is not addressed in the Safety Manual, consult your supervisor and/or the Occupational Safety and Health Department.

Implementing Principles

1. Our goal is to prevent all accidents. Adherence to the Santee Cooper Safety Manual is the minimum requirement.
2. Santee Cooper Safety Programs will be the same for each employee.
3. Each employee's acceptance of responsibility for their own safety and the safety of others, including those they supervise, is a continuous requirement.
4. Personnel will be trained in the hazards of their work, safe work practices, and established safety programs to minimize their risk of injury.
5. Appropriate safety behavioral concepts will be incorporated into all aspects of our work.

Responsibilities Managers, Supervisors and Work Leaders are responsible for:

1. Taking ownership for Occupational Safety and Health.
2. Ensuring that applicable laws, regulations, or permits are complied with.
3. Reviewing incident reports and recommended corrective actions and assigns responsibility for completion of recommendations.
4. Providing resources necessary to perform training, tools, equipment, manpower, and observations.
5. Establishing clear standards and expectations for safe work practices, stopping unsafe acts, and ensuring compliance with the Santee Cooper Safety Manual.

6. Ensuring that all new employees in the work area are thoroughly trained in environmental, health, and safety rules, practices, and procedures.
7. Ensuring that proper protective clothing and other safety equipment are worn to perform any job assignment.
8. Monitoring the workplace continuously for environmental, health, and safety conditions and taking immediate corrective action.
9. In case of unsafe acts/Safety Manual violations, coaching the worker and co-workers on the job task and notifying appropriate supervision. The worker's supervisor will take appropriate action up to and including disciplinary action.
10. Assisting in investigations of all near misses, injuries, and illness to determine cause, in order to take necessary actions to prevent recurrence.
11. Ensuring an incident report is written for all injuries Occupational Safety is responsible for:
 1. Updating and maintaining the Safety Manual.
 2. Advising and consulting regarding safety and industrial hygiene.
 3. Conducting industrial hygiene surveys and monitoring activities.
 4. Auditing compliance – Santee Cooper policies, Local, State, and Federal regulations.
 5. Evaluating existing and new exposure control technologies.
 6. Serving as technical advisor to project management on Safety and health, planning and problems.
 7. Reviewing and investigating injuries, conditions, and incidents to determine causal factors.
 8. Assist with the evaluation of safety equipment prior to purchase.
 9. Monitoring compliance with safety and health policy.
 10. Identifying OSHA required training that is applicable.
 11. Tracking and communicating changes to OSHA and other safety-related regulatory requirements. Note: Safety specialists will track safety concerns safety suggestions to resolution with the assistance of the Corporate Safety Council, as needed.

All employees are responsible for:

1. Following the requirements of the Santee Cooper Safety Manual.
2. Taking personal responsibility for themselves and their co-workers.
3. Accepting coaching for non-compliance with the Santee Cooper Safety Manual.
4. Identifying hazardous conditions, taking steps to correct, and reporting issue to supervision.
5. Stopping unsafe acts and providing peer-to-peer coaching as appropriate.
6. Reporting all injury, illness, and near misses immediately.

The Corporate Safety Council is responsible for:

1. Actively promoting safety and health throughout Santee Cooper.
2. Reviewing, as needed, Santee Cooper programs, policies, processes, and procedures to ensure corporate and regulatory safety requirements are met.
3. Providing input into the development or revision of corporate safety policies and procedures.
4. Providing input into the development of the annual Safety Improvement Plan.
5. Reviewing incident investigations and lessons learned, to provide assistance in ensuring actions are properly assigned, communicated, and incorporated into affected operations. Safety Council members may participate in incident investigations, as situations warrant.
6. Providing input, when requested, in determination of incident classifications.
7. Assisting in developing and/or reviewing the Corporate Safety Manual to ensure operations are provided with proper direction in safe work practices and rules.
8. Recommending resource allocation, as necessary.
9. Reviewing regulatory changes that may affect safety policies and procedures.
10. Making recommendations to the Corporate Engagement and Oversight Committee.
11. Providing Safety CGI (Corporate Goal Incentive) Targets to the CEOC.

Applicability

This manual applies to all employees, contractors, and vendors.

Safe Work Practices Principle

Whenever practical, eliminate hazards by changing the work process or by substituting a less hazardous component. When it is impractical to eliminate the hazard, safeguard it using the practices outlined in this manual. If no specific practices are identified for safeguarding the hazard, use the work planning process to evaluate the hazard and to specify appropriate precautions. Never rely on personal protective equipment alone to prevent an injury. Personal protective equipment is used as a back-up to established safeguards only, as the last line of defense against injury.

Employee Observation Responsibility

When a violation of the safety manual or a safety policy is observed by any employee, the employee shall immediately discuss the infraction with the employee involved and assist them in correcting the infraction. If additional follow-up inspections are necessary, the employee shall communicate the incident to the involved employee's supervisor including a description of the infraction and action taken to correct it. Any follow-up actions are the responsibility of the employee's supervisor.

Other Safety Programs

While the safe work practices in this manual should eliminate duplicate safety directives and procedures from various departments, they are not intended to replace specific safety and health programs (e.g., Confined Space Entry Program), but rather to complement these programs.

Revisions to the Santee Cooper Safety Manual Efforts have been made to make this manual clear and easy to understand. However, changes will be needed from time to time. Submit requests for Safety Manual revisions to Occupational Safety and Health. The Safety Manual will be reviewed at a minimum of every three (3) years and updated as needed.

Requests for a Variance of a Safe Work Practice

Efforts must be made to meet the requirements of the Santee Cooper Safety Manual. If a situation arises and all options have been evaluated and no solution is available, a request for a variance of a Safe Work Practice shall be initiated. Approval of all variance requests will be determined by the Corporate Safety Council. The approved variance will allow personnel to do some act contrary to the usual rule as defined in the Santee Cooper Safety Manual. The variance may be temporary or may remain in effect until the next revision of the Santee Cooper Safety Manual. A listing of variances will be maintained by Occupational Safety. Blank variance forms can be obtained from Occupational Safety and Health.

Stopping Unsafe Work

All employees have the right and responsibility to question the safety of work activities and stop work to have emerging safety issues evaluated and resolved. Resolution must begin with the supervisor.

Additional assistance may be requested. Ultimately, it is the supervisor's responsibility, along with the workers performing the work, to ensure work is performed safely. If the employee feels their safety concern has not been adequately addressed, they should take the concern to the next level of management.

Santee Cooper also maintains an anonymous hotline, where issues can be reported. The numbers are as follows:

- English: 888-350-0003
- Spanish: 800-216-1288

Safety Concerns

Immediate Safety Concerns: a safety concern that has a high potential of resulting in the injury of an employee the day the concern is noted.

When an immediate Safety Concern is brought up, the following must be done:

1. Stop work and place equipment in a safe condition.
2. Determine if the concern meets the definition of "Immediate Safety Concern." If it does not, it should be addressed in the normal course of business

for any

safety concern that is noted.

3. If the item is determined to be an Immediate Safety Concern, action must be initiated to address the immediate concern as soon as reasonably possible but no later than the day it is noted. The actions may include (but are not limited to) such things as:
 - a. Fixing or eliminating the hazard.
 - b. Taking the equipment out of service, if applicable.
 - c. Barricading the area to ensure personnel will not be injured.
 - d. Notifying the Safety specialists of the condition/concern.

Non-immediate Safety Concerns: a safety concern that is not life threatening but should be resolved to prevent a future safety incident. Such safety concerns should be addressed in the normal course of business. This may include immediately taking action to address the concern and initiation of a work order.

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Definitions

The following definitions shall apply for terms used in the Santee Cooper Safety Manual.

Accident: An undesirable or unfortunate happening that occurs unintentionally and usually results in harm, injury or damage.

Aerial Lift: Any vehicle-mounted device, telescoping and/or articulating, that is used to lift a person or persons.

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.

Alternate Relay Settings: When overcurrent or other modified settings are enabled on a relay. For example, slowing trip elements down during cold load pickup operations, or changing settings to coordinate with different field devices when a circuit is in an abnormal configuration.

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

American Society for Testing and Materials (ASTM): An international standards organization that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems and services.

American National Standards Institute (ANSI): A group that sponsors a wide spectrum of consensus standards for industry. Some of these standards are used as minimum lawful standards.

Approved: When used in connection with methods, tools or equipment, the term “approved” means those items have been approved by the company through committee, departmental action or safety rule. Manufacturers approval should include a manufacturer’s stamp.

Attendant: An employee who has completed the required training in emergency response and specific work practice (e.g., vault/manhole, confined space, overhead line, etc.) and shall be stationed in the immediate area of the work being done.

Authorized Person: A person who has the authority to perform specific duties under certain conditions. A person who is carrying out orders from responsible authority.

Automated External Defibrillator (AED): a medical device designed to analyze the heart rhythm and deliver an electric shock to victims of ventricular fibrillation to restore the heart rhythm to normal. Ventricular fibrillation is the uncoordinated heart rhythm most often responsible for sudden cardiac arrest.

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.

Barricade: A physical obstruction, such as tape, screens, cones or other items, used to warn and limit access to a hazardous area.

Barrier: A physical obstruction that is used to prevent contact with potential hazards.

Basket (crane): A single-point suspension platform specifically designed to hoist personnel and tools for work at elevated locations. A basket shall not be used while working on an energized conductor, except when grounding.

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.

Biological Hazards: includes vector-borne diseases, venomous wildlife and insects, and poisonous plants.

Bloodborne Pathogen: are infectious microorganisms in human blood that can cause disease in humans.

Blue Flag: A clearly distinguishable blue flag or blue light by day and a blue light at night. When attached to the operating controls of a locomotive, it need not be lighted if the inside of the cab area of the locomotive is sufficiently lighted so as to make the blue signal clearly distinguishable.

Body Belt (Safety Belt): A strap with means both for securing it about the waist and for attaching it to a lanyard, lifeline, or deceleration device.

Body Harness: straps, which may be secured about the worker in a manner that will distribute the fall arrest forces over at least the thighs, pelvis, waist, chest and shoulders with means for attaching it to other components of a personal fall arrest system.

Bond: An electrical connection from one conductive element to another.

Bucket: An enclosed insulated working platform used to hoist personnel and tools for any type of work at elevated sites.

Bundled Conductor: An assembly of two or more conductors used as a single conductor and employing spacers to maintain a predetermined configuration. The individual conductors of this assembly are called subconductors.

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).

Cardiopulmonary Resuscitation (CPR): an emergency lifesaving procedure performed when the heart stops beating.

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.

Certified Person: A person who has successfully completed and documented the class work training and on-the-job training to be able to perform a specific skill.

Circuit: A conductor or system of conductors through which an electric current may flow.

Clearance (for working): Specific permission to work on equipment. This includes identification for specific persons receiving permission and granting permission from proper authority. Refer to clearance procedures.

Clearance (from hazard): Adequate separation or protection by using devices to prevent accidental contact by persons or objects on approach to a point of danger.

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

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

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

Clearance Tags (Hold/LOTO): A card or tag-type device that prohibits the operation of a particular piece of equipment, such as a switch, device, circuit, tool or machine.

Climbing Belt: Lineman use for climbing poles. Has attachments for tools and other pieces of equipment.

Combustible Liquid: Any liquid having a flash point at or higher than 100° F when tested by closed-cup methods. (Also see Flammable Liquid.)

Commercial Driver's License (CDL): commercial driver licenses are required for drivers who operate commercial motor vehicles that are designed or used to transport passengers or property.

Commercial Motor Vehicle (CMV): As defined by the Federal Motor Carrier Safety Administration (FMCSA), a commercial motor vehicle (CMV) is a motor vehicle or combination of motor vehicles used in commerce to transport passengers or property if the motor vehicle:

- a. has a gross combination weight rating or gross combination weight of 26,001 pounds or more, whichever is greater, inclusive of a towed unit(s) with a gross vehicle weight rating or gross vehicle weight of more than 10,000 pounds, whichever is greater;
- b. has a gross vehicle weight rating or gross vehicle weight of 26,001 pounds or more, whichever is greater;
- c. is designed to transport sixteen or more passengers, including the driver; or
- d. is of any size and is used in the transportation of hazardous materials as that term is defined in 49 C.F.R. Section 390.5. Note: To drive a CMV, you must have a commercial driver's license (CDL).

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

Company: The employer; that entity having jurisdiction and control of the utility's operation. For purposes of this manual, Santee Cooper or South Carolina Public Service Authority is the Company.

Competent Person: one who is capable of identifying existing and predicable 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.

Conductor: A material suitable for carrying an electric current. This usually includes wire, cable, or bus bar.

Confined Space: a space that is large enough and so configured that an employee can bodily enter; has limited or restricted means for entry and exit; and is not designed for continuous employee occupancy.

Contact Area: The area around exposed, energized parts above 600 volts in which a person could potentially reach, move, fall, or turn and make contact.

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

Controllers (Distribution [DCC]): A person, designated by Santee Cooper, to have the authority over switching and clearances of high voltage lines and equipment.

Corporate Safety Council: committee consisting of personnel from each line of business who assist with aligning safety efforts and activities with corporate business functions.

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

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

Dead: Parts and/or conductor to be worked have been disconnected from any electrical source or supply and properly tagged, shorted, and grounded, and clearance has been issued.

Dead Front: Equipment that has no exposed, energized parts greater than 50 volts, using an effectively grounded metallic shield.

De-Energized: Parts and/or conductor have been disconnected from all sources of electrical energy by means of a mechanical device, such as an open disconnect, a cutout or a breaker. Parts and conductor are not to be worked on until they are electrically isolated or tested for the presence of voltage, are grounded, and have obtained a clearance.

Defibrillator: A device used to correct a dangerously abnormal heart rhythm, usually ventricular fibrillation, or to restart the heart by depolarizing its electrical conduction system and delivering brief measured electrical shocks to the chest wall or the heart muscle itself. (Also see Automated External Defibrillator.)

Designated Person: See Authorized Person.

Dielectric Overshoes: Rubber shoes worn over the top of normal shoes. They are worn by people who are at risk of electric shock due to working or contact with live electricity.

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: Electrical conductor or equipment removed from any electrical source.

Do Not Operate Tag/Card: Also known as Hold Card. A physical card, or virtual graphic within SCADA system, notifying personnel not to operate a device, used as part of Distribution and Transmission Lockout/Tagout procedures.

Drawhead: The head of an automatic coupler, exclusive of the knuckle, knuckle pin and lock.

Effectively Grounded: Intentionally attached to earth through a ground connection or connections of sufficiently low impedance. This connection will have sufficient current-carrying capacity to prevent a buildup of voltage or fault current that may result in undue hazard to connected equipment or 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.

Electrically Isolated: Physically separated, electrically and mechanically, from all sources of electric energy. Having a visible opening. Such separation may not eliminate the effects of electric or magnetic induction.

Emergency: Unforeseen circumstances that call for immediate action.

Energy Isolation (LOTO): process to prevent the unexpected release of hazardous energy.

Enclosed: Surrounded by a case, cage or fence that will protect the contained equipment and prevent a person's accidental contact with energized equipment.

Enclosure: An area enclosed by natural or artificial barriers. In the case of electrical equipment, an enclosure may represent the case or housing of apparatus, or the fence or walls surrounding an installation to prevent personnel from accidentally contacting energized parts, or to protect the equipment from physical damage.

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.

Energized (also HOT or LIVE): Connected either directly or indirectly induced to a source of electrical energy. When tested, has voltage.

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 employees.

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

Equipotential Zone Grounding: a work zone in which the worker is protected from electric shock from differences in electric potential between objects in the work area. These differences in potential can be caused by induced voltage, line reenergization, or lightning. The worker in an equipotential zone is protected from electric shock because there is a near identical state of electrical potential between any two points on the body.

Excavation: Any man-made cut, cavity, trench, or depression in the Earth's surface formed by earth removal. (noun) the action or process of excavating.

Exhaust Ventilation: A system of ventilation in which the fan draws air through the workings by suction. Opposite of forced ventilation.

Exposed: Equipment, objects, or devices not guarded, insulated, or shielded.

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.

Fall Arrest System: A system designed to stop a free fall (of up to 6 feet in length) of a user and limit the maximum arresting force imposed on the user to 1,800 pounds (lbs) or less. Such systems include an anchorage, connectors, or body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these. Use of a body belt for fall arrest is prohibited. See Personal Fall Arrest System for Additional requirements

Fall Distance: The actual distance from the workers support to the level where a fall would stop.

Fall Prevention System: A system intended to prevent a worker from reaching the fall hazard by creating a barrier between the person and the fall hazard. Such systems include warning lines and guardrails. Consists of either a fall prevention system or a fall arrest system. Such equipment includes, but is not limited to, warning lines, guardrails, lanyards, harness, and anchorage points.

Fell: The process of cutting, knocking, or bringing down a tree or pole from the stump so that it drops to the ground.

Feller: is a person who fells a tree.

First Aid: refers to medical attention that is usually administered immediately after the injury occurs and at the location where it occurred.

First Aid Kit: a set of materials and tools used for giving emergency treatment to a sick or injured person.

Flagger (work zone): an employee, after having documented training, contributes to work zone safety with the use of signals and flags. They offer the necessary guidance to vehicles, pedestrians, bicyclists, work crews.

Flammable Liquid: Any liquid having a flash point less than 141°F and having a vapor pressure not exceeding 40 lbs per square inch (absolute) at 100°F. (Also see Combustible Liquid.)

Flare: Beside an actual flare, this term applies to red lanterns, reflectors and any other equipment that is adaptable for warning.

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

Gloving: When tested rubber insulated gloves are the primary form of protection from electrical hazards.

Government: Any type of federal, state, county or city political agency that controls a certain activity.

Ground (noun): A conductive connection, whether intentional or accidental, that

connects an electric circuit or equipment to reference ground.

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

Ground (verb): The accidental or intentional act of connecting or establishing a connection of an electric circuit or equipment to reference ground.

Ground System: A system of conductors in which at least one conductor or point is intentionally grounded.

Grounding Electrode (or GROUND ELECTRODE): A conductor, embedded in the earth, used for dissipating current into the earth.

Guarded: Protected by persons and/or covered, fenced or enclosed by means of suitable casings, barrier rails, screens, mats, platforms or other suitable devices in keeping with standard barricading techniques. This is done to prevent dangerous approach or contact by persons or objects. (Note: Wires that are insulated but not otherwise protected are not considered guarded.)

Hazard Communication Program: to protect against chemical source illnesses and injuries among employees who work with potentially hazardous materials. Santee Cooper's Hazard Communication Program (HAZCOM) is a comprehensive plan for hazardous materials management, container labeling or other forms of warning, safety data sheets (SDS), and training designed to protect employees by making them aware of potential hazards and safe work practices.

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 Flammability 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 (PEL) is published in 29 CFR 1910, 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; and (5) any other atmospheric condition that is immediately dangerous to life or health.

Hazardous Duty Crew: Employees with an elevated risk potential, the majority of their day, due to their work in the Generation, Transmission, Distribution power and water.

Hazardous Energy: Hazardous energy is energy sources like electrical, mechanical, hydraulic, pneumatic, chemical, thermal or other sources found in machines and equipment that can be hazardous to workers. These energy

sources can become dangerous during the servicing and maintenance of machines and equipment, when the unexpected startup or release of stored energy could cause injury to employees.

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.

Heat Stress: occurs when the body cannot get rid of excess heat. When this happens, the body's core temperature rises, and the heart rate increases. Exposure to extreme heat can result in occupational illnesses and injuries. Heat stress can result in heat stroke, heat exhaustion, heat cramps, or heat rashes.

High Wind: A wind of such velocity that could blow an employee from an elevated location, cause an employee or equipment handling material to lose control of the material or expose an employee to other hazards. At a sustained wind speed of 35 MPH, all aerial devices (bucket trucks, derrick trucks, etc.) shall cease operations. At a sustained wind speed of 50 MPH, all vehicles shall cease operations. While these are max wind speed, employees in the field will have authority to cease operations based on their threshold of safety. Equipment operators must be familiar with the wind rating set by the manufacturer of their aerial device they are operating.

Hold Tag: (a) An approved tag or card that warns against the operation of a particular switch, device, circuit, tool, machine, gate, or other equipment. (b) The disabling of a reclosing operation of a breaker or recloser. (c) Provides protection for personnel working on the energized equipment.

Hot: See ENERGIZED.

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

Hot Line Work Permit: Permission has been granted by the System Operator/ Distribution Controller to perform work on or near energized conductors, where the breaker's automatic reclosing feature has been turned off.

Hotline Tools: Tools specially designed for work on energized high-voltage lines and equipment.

Hot stick (Live-Line Tool): An approved insulated tool used when working on energized high-voltage conductors, cables, or equipment.

Hours Of Service: a) An employee should not be required to work more than 24 continuous hours. However, emergency operating conditions may require continuous work hours in excess of the provisions in Santee Cooper Policy 7-21. 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.

Industrial Hygiene: A science and art concerned with the protection and improvement of the health and well-being of workers and communities from environmental factors or stresses arising in or from the workplace.

Insulated: Separated from other conducting surfaces by a dielectric substance or an air space.

Immediate Safety Concern: a safety concern that has a high potential of resulting in the injury of an employee the day the concern is noted

Isolated: Equipment, objects, or devices that are guarded, insulated, or shielded to prevent approach within the contact area. (See also ELECTRICALLY ISOLATED.)

Ladders: a structure for climbing up or down that consists essentially of two long sidepieces joined at intervals by crosspieces on which one may step. See this section for proper use and inspection on various types of ladders

Live: See ENERGIZED.

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 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.

Live Front: Facilities/equipment having exposed, energized parts over 600 volts.

Live-Line Tag/Card: A physical card, virtual graphic in a SCADA system, or other written notification to communicate that live-line work is being performed on a circuit.

Live-Line Tools: Those tools that are specifically designed for work on energized lines and equipment operating at 600 volts or greater.

Load Dispatcher--Power Dispatcher--System Operator (ECC): 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.

Local: Also known as Supervisory Off. A relay operation that disables remote SCADA control of a device.

Lower Flammability Limit (LFL): The lower end of the concentration range (usually expressed in volume percent) of a flammable solvent at a given temperature and pressure for which air/vapor mixtures can ignite.

Machine Guarding: a safety feature on or around manufacturing or other engineering equipment consisting of a shield or device covering hazardous areas of a machine to prevent contact with body parts or to control hazards like chips or sparks from exiting the machine.

Manhole: An enclosure that persons may enter when installing, operating, and maintaining systems and/or cable.

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

Maximum Angle of Slope of Excavation: The greatest angle above a horizontal plane that material will lie without movement.

Medical Treatment: Treatment beyond first aid.

Minimum Approach Distance (MAD): The closest distance an employee is permitted to approach an energized object or while grounding an object.

MSDS: Material Safety Data Sheets. See SDS, as the naming has changed in Hazard Communication

Motor vehicle accidents (MVAs): occur when a motor vehicle strikes or collides with another vehicle, a stationary object, a pedestrian, or an animal. They are classified as Preventable (PMVA) or Non-Preventable (NPMVA).

Must: denotes a requirement or a mandatory activity. "May" denotes a lesser possibility.

National Electrical Safety Code (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.

Non-immediate safety concern: A safety concern that is not life threatening but should be resolved in order to prevent a future safety incident.

Non-Reclosing: Also known as Single Shot. The operation, either by activation at the relay or remote via SCADA, of inhibiting a recloser from automatic reclosing after a trip operation. Note: This is different from Hot-Line Tag in that a successful close command may still be issued at the relay or via SCADA.

Non-Permit Required Space: a confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm. Oxygen deficient atmosphere means an atmosphere containing less than 19.5 percent oxygen by volume. Oxygen enriched atmosphere means an atmosphere containing more than 23.5 percent oxygen by volume.

Occupational Safety and Health Act of 1970 (OSHA): Occupational Safety and Health Act; was enacted by Congress to provide for a safe and healthful workplace. The Occupational Safety and Health Act, created the Occupational Safety and Health Administration to ensure safe and healthful working conditions for workers by setting and enforcing standards and by providing training, outreach, education and assistance. 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.

Outage: The act of removing equipment from service. Either by planned event or unplanned event.

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

P1 Restriction: A CDL restriction where you cannot operate any CMV outside of the authorized activities defined by Federal Motor Carrier Safety Administration, and you are not required to meet the USDOT medical certificate requirements.

Permissible Exposure Limits (PELs): Regulatory limits on the amount or concentration of a substance in the air. They may also contain a skin designation. OSHA PELs are based on an 8-hour time weighted average (TWA) exposure.

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 Fall Arrest System: A system used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, a body belt or body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these. The use of a body belt for fall arrest is prohibited. Components of a Personal Fall Arrest System shall be inspected annually by a competent person.

PCB: Polychlorinated biphenyl; an oily synthetic liquid used in some transformers and capacitors as a coolant and an insulator.

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.

Personal Protective Equipment (PPE): Items to protect employees from unnecessary exposure to job hazards. PPE may apply to the head, eyes, face, ears, respiratory system, hands and arms, trunk, and feet and legs.

Pre-Job Briefing: A thorough, documented discussion about the work to be done and the safety measures to be followed. At a minimum, the following subjects: hazards associated with the job, work procedures involved, special precautions, energy source controls, personal protective equipment (PPE) requirements and emergency response information.

Primary Compartment: A compartment containing voltages of 600 volts or more.

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

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

Qualified Electrical Worker: A qualified person involved in construction and maintenance of transmission and distribution lines and equipment.

Qualified Rigger: A person who meets the criteria for a qualified person to properly rig the load for a particular job.

Recordable Injury: It includes a work-related injury or illness that results in any of the following: Medical treatment beyond first aid; Loss of consciousness; One or more days away from work following the date of the incident; Restricted work or transfer to another job; Any work-related fatality.

Registered Professional Engineer: (as it relates to Trenching and Excavations) 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. (see OSHA 1926.650, 1926.651, 1926.652)

Remote: Also known as Supervisory On. A relay operation that enables remote SCADA control of a device.

Risk Assessment: a systematic process that involves identifying, analyzing, and controlling hazards and risks. It is performed by a competent person to determine which measures are, or should be, in place to eliminate or control the risk in the workplace in any potential situation.

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 Rule: A rule that requires compliance by all persons involved.

Safety Violation Guidelines: Guidelines developed by the Corporate Safety Council to classify violation severity.

SDS: A Safety Data Sheet (formerly called Material Safety Data Sheet or MSDS) is a detailed informational document prepared by the manufacturer or importer of a hazardous chemical. It describes the physical and chemical properties of the product.

Secondary Compartment: A compartment containing voltages less than voltages contained within the primary compartment. Typically operates at 600 volts or less.

Secondary Container: Any container holding a product which is not the original container supplied by the manufacturer.

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

Shall: Denotes a requirement or a mandatory activity. When “shall” appears in the wording of a rule, the rule must be obeyed as written.

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.

Shock Load: An instantaneous or excessive overload that may weaken or damage equipment.

Should: When “should” appears in the wording of a rule, the rule must be obeyed as written when it is reasonable or practical to do so.

Single-Phase Arc: A single-phase arc occurs when electric current arcs from a circuit part for one phase to ground or to a circuit part for another phase.

Single Shot: See Non-Reclosing

Sling: A flexible strap, belt, rope, or cable used in the form of a loop to support a raised weight.

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.

Signal Person: A person who knows and understands the signals used at the work site, understands the operations and limitations of the equipment, and has demonstrated competency by passing an oral or a written test and a practical test.

Snap Hooks: A connector comprised of a hook-shaped member with a normally closed keeper, or similar arrangement, which may be opened to permit the hook to receive an object and, when released, automatically closes to retain the object.

Supervisory Control and Data Acquisition (SCADA): The remote electronic operation of field and substation devices. Analog and digital measurements and data collection of points in the electrical system.

Switch: A device for opening and closing or changing a circuit connection.

Switch Person (Rail Operations): One who operates railway points.

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.

Tailboard Safety Talk: A 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,” “toolbox talks,” or “5 minute safety talks.” See also Pre-Job Briefings.

Task Training: Specific training and Instruction on a work assignment prior to performing a task where worker has no previous work experience or job knowledge.

Three-Phase Arc: A three-phase arc involves arcing between all three phases of a three-phase circuit.

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

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

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

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: Dangerous conditions, hazardous conditions, defective conditions, or unusual conditions that could cause accidents.

Utility: In this case, the employer. An entity that has jurisdiction and control over the operation of the Utility (including such entities as municipal utilities, electrical cooperatives, etc.).

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

Vehicle Use: outlines policies on the authorized use and operation of vehicles in connection with official company activities.

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.

Visible Open: A disconnect that can be visually verified as open.

Voltage: The effective (RMS) potential difference between any two conductors or between a conductor and ground. RMS (root mean square) is a way of measuring the effective working voltage of an alternating current (AC) circuit. The voltage specified in this manual shall mean the maximum effective voltage to which people or protective equipment may be subjected. Low/secondary voltage includes voltages of less than 600 volts. High/primary voltage shall mean voltages of 600 volts or more.

Warning Sign: Any sign, poster, or similar notification about an actual or a possible hazard.

Will: denotes a requirement or a mandatory activity.

Wireless Electronic Devices: This includes portable telecommunication devices that use electromagnetic waves to carry a signal over a part or all of the communication path rather than a wired connection. Examples include but are not limited to telephones, laptop computers, tablets, and portable music players.

Working around Water: Generally defined as 6 feet or closer to water 2 feet or deeper. If employees are within the stated parameters, additional safeguards must be applied.

Work Leader: an employee assigned the responsibility of directing the work of a group of employees and is required to perform some of the same work as that of the group directed.

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.

Section 1 General Safety

Section 1

General Safety

The following rules apply to all employees. Additional rules for specific Santee Cooper departments, divisions and other work groups are located throughout this booklet.

1.1 Clearances (Safe Working Distance)

Non-qualified personnel, along with anything they are holding, shall maintain the following clearances while working around energized lines.

Voltage (nominal, KV, alternating current)	Safe Working distance (feet)
Up to 50	10
Over 50 to 200	15
Over 200 to 350	20
Over 350 to 500	25
Over 500 to 750	35
Over 750 to 1,000	45
Over 1,000	(as established by the utility owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution)

Note: The value that follows "to" is up to and includes that value.

For example, over 50 to 200 means up to and including 200kV.

1.2 Clothing and Personal Protective Equipment

1.2.1 Overview

In this Manual, "Personal Protective Equipment" encompasses 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.

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.

Before any employee is assigned a new article of PPE to use, a risk assessment should be performed and training should be conducted to instruct the employee on the use, care, inspection, and maintenance of the PPE.

When working on or near live electricity, the employer shall complete 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.

Personal protective equipment has its intended uses and its limitations. It is important that the supervision properly informs and trains the employees in these limitations as well as the inspection, maintenance, care, and storage of the PPE assigned to and required of them.

Where employees provide their own protective equipment, the employer shall be responsible to ensure its adequate and properly maintained.

1.2.2 Clothing

- A. All employees shall dress in a manner suited to their occupation and the hazards of their job.
- B. Flame-resistant (FR) clothing shall be worn by Santee Cooper employees on jobs where work occurs within ten (10) feet of exposed conductors or equipment that has the potential for an electrical flashover, or as required by various departments or divisions. Sleeves must be rolled down and buttoned and shirt tails must be tucked in.
- C. Employees shall wear only FR clothing that is approved for use by Santee Cooper Occupational Safety and Health.
- D. When working on or near energized lines/line equipment, employees shall not wear conductive articles such as rings, key chains, wrist watches, necklaces, or bracelets.
- E. Rings, watches, necklaces, or other jewelry shall not be worn when climbing on or off structures or vehicles or performing any task that could cause the jewelry to be caught or create an additional hazard.
- F. 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.

1.2.3 Hard Hats

- A. Approved protective hats, (Type I or II, Class E [ANSI Z89.1]) or other headgear shall be worn by Santee Cooper employees, contractors and visitors on jobs requiring head protection and in specified areas as required by various departments or divisions. Hard hats shall be worn in designated locations.
- B. Prior to use, hard hats must be visually inspected inside and out to look for cracks, gouges and any other defects.
- C. Unless specified by manufacturer instructions (i.e., welding hard hats, etc.) hard hats shall be faced forward.
- D. Hard-hat areas shall include all designated locations where construction or maintenance work of any nature is in progress. These areas shall encompass the entire job site. The job site's supervisor or leadman shall require all employees and others entering the area to conform to this rule. Equipment operators and drivers, while within a closed compartment (cab of equipment), shall be considered outside the job site. These employees, when exiting the closed compartment for any reason, shall conform to the hard-hat rule.
- E. Hard hats shall not be painted or otherwise decorated in any manner other than with approved decals. Examples of approved decals are Santee Cooper logo, the contractor sticker and/or an employee name sticker.
- F. Approved head shields or hoods shall be worn when welding with hydrogen, heliarc, or electric arc.

1.2.4 Eye and Face Protection

- A. Employees, contractors, and/or visitors shall wear eye protection when they are near any substances, flying particles or chemicals that may cause injury to their eyes. Specific eye protection shall be used when performing specialized work that creates hazardous conditions for employees' eyes. Employees shall wear goggles when working with chemicals that may splash into the eyes.
- B. 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 risk assessment:
 - 1. Drilling or chipping stone, brick, concrete, paint, pipe coatings, or metal.
 - 2. Power grinding, buffing, or wire brushing.
 - 3. Flame welding, cutting, or burning (approved colored lenses shall be used).
 - 4. Hand drilling or sawing of overhead objects.
 - 5. Use of powered tools such as drills, saws, or sanders.
 - 6. 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).
 - 7. Gunniting, pouring hot lead or hot compounds, or using other hot or injurious substances.
 - 8. Handling acids, caustics, chlorines, ammonia, or other similar liquids or gases, except when approved complete head coverings are worn (chemical goggles are necessary).
 - 9. Brush chippers.
 - 10. Thermit (cadweld) type welders
 - 11. 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).
 - 12. Any other danger of injury to the eyes, or at the direction of a supervisor.
 - 13. Any time there is a possibility of electrical flash, or work activities (as determined by a Risk Assessment) 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 the most recent ANSI Z87.1 to determine appropriate eyewear and prescription eyewear. The employer shall ensure employees wear non-metallic frame prescription eyewear.
 - 14. While using powder-actuated tools.
 - 15. While pressure washing.
- C. 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.
- D. When put into situations where there are machines or operations that present potential eye or face injury, employees shall be provided with eye and face protection equipment
- E. Employees whose vision requires the use of corrective lenses in spectacles shall be protected by over glasses/ goggle over their own corrective lenses or by prescription safety glasses. The goggles or lenses shall meet

the current requirements of ANSI Z87.1. Prescription safety glasses can be obtained from Occupational Health, with Santee Cooper providing a supplement for reimbursement.

- F. Face and eye protection equipment shall be kept clean and in good repair. Equipment of this type with structural or optical defects shall not be used.
- G. Portable eyewash stations and showers shall be maintained according to the manufacturer's instructions. Eyewash stations and emergency showers shall be identified, tested, and operating before work begins on a specific job and/or as part of the routine monthly inspection.

1.2.5 Foot Protection

- A. Employees shall wear protective footwear (steel/composite toed boots, meta-tarsal protection, rubber boots, insulated boots, etc.) where there is a danger of foot injury. This danger could result from the potential of falling or moving objects or from burning, scalding, cutting, penetration or like hazards. The company will provide or subsidize specialized footwear, as needed
- B. Protective Footwear shall provide adequate ankle support, as determined by a risk assessment.
- C. Employees shall not use footwear that is deteriorated to a point where it does not provide required protection.

1.2.6 Hand Protection

- A. Gloves shall be worn by employees whose hands may be exposed to burns, splinters, cuts, abrasions or blisters
- B. Gloves are not to be used when operating rotating power tools, such as:
 1. Lathes
 2. Circular saws (including table saws, miter saws, and radial arm saws)
 3. Bandsaws
 4. Routers
 5. Planers
 6. Drill presses, etc.If you have questions on proper glove use with power tools, contact Occupational Safety.

1.2.7 Hair Protection

Long hair can be drawn into machine parts such as suction devices, blowers, chains, belts and rotating devices. It can also be drawn into machines guarded with mesh. 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 securely fastened with a bandanna, hair net, soft-cap or the like.

1.2.8 Life Jackets/ Personal Flotation Devices

- A. When working in an area where there is a danger of drowning (within six feet from the water's edge), employees shall wear an approved personal flotation device or be protected by a belt and lanyard or by a safety net.
- B. Employees shall wear US Coast Guard approved Personal Flotation Devices (PFD) while transferring to and from marine transportation and when working over water near unguarded edges.

- C. PFD's must be securely fastened when worn.
- D. PFD's shall be inspected prior to use and after each use for defects that would lessen their strength or buoyancy.

1.2.9 Personal Protective Equipment for Pressure Cleaning

Any employee performing pressure-washer cleaning of any kind shall wear a full-face shield over approved eye protection, hand protection and foot protection provided by Santee Cooper

1.3 Fall Protection

Santee Cooper policy is to take every reasonable precaution to protect employees from fall hazards. Employees shall use effective and approved fall protection systems when working in any situation that presents a foreseeable exposure to fall hazards.

- A. When an employee is exposed to the risk of 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 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 lift devices shall wear full body harnesses with a shock-absorbing lanyard, attached to the appropriate anchor point on the aerial lift device.
- B. In addition to wearing personal fall protection in aerial devices, it shall also be worn while working from Mobile Elevated Work Platforms (MEWP) (such as scissor lifts, manlifts, etc.).
- C. All fall protection equipment shall be inspected prior to use by the wearer as required by the manufacturer.
- D. Employees shall rig body harness and lanyard equipment so that they cannot free fall more than 6 feet or contact any lower level. When body-belts and positioning devices are used, they shall be rigged to limit free fall to 2 feet. Anchorages used for attachment of personal fall arrest equipment shall be independent (one anchor point per person) of any anchorage being used to support or suspend platforms, and body-belts with positioning devices shall be capable of supporting a shock load.

Note: Lower level does not include tree branches, utility line conductors or cables, tower legs, cross bracings, or lattice works found on towers, substation structures, or similar structures.

- E. Body belts used for restraint shall be worn snug just above the wearer's hips.
- F. 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 unless all

snaphooks are double-locking type.

3. Two snaphooks connected to each other.

4. A snaphook connected back on its integral lanyard, unless procedure is specifically allowed by the manufacturer on that piece of equipment.
5. Improper dimensions of the D-ring, rebar, or other connection to the snaphook dimension.
- G. Snaphooks may not be connected to loops made in webbing- type lanyards.
- H. 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.
- I. Horizontal lifelines should be limited to two persons at one time between supports.
- J. Employee(s) climbing or changing location on poles, towers, or similar structures must use fall protection equipment unless the employer can demonstrate that climbing or changing location with fall protection is infeasible or creates a greater hazard than climbing or changing location without it. When maneuvering above equipment/obstructions, work positioning systems alone can be used but shall be rigged so that an employee can free fall no more than 2 feet and the anchorages for work-positioning equipment shall be capable of supporting at least twice the potential impact load of an employee's fall, or 3,000 pounds-force, whichever is greater.

1.4 Respiratory Protection

1.4.1 Overview

To reduce the likelihood of employee exposure to airborne contaminants, a hierarchy of controls shall be used prior to using respirators. This hierarchy includes eliminating airborne hazardous chemicals, using less harmful chemicals, implementing policies designed to remove or reduce exposure, and training. When these controls are not feasible, or while they are being implemented, appropriate respirators shall be used in accordance with the Santee Cooper's Respiratory Protection Program. Respirators shall only be used as a final control measure to reduce or prevent exposure caused by breathing harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors.

1.4.2 Use of a Respirator

- A. Only employees who have been properly trained, fit tested, and determined physically able to perform the work while wearing respirators shall be assigned a task that requires their use.
- B. Respirators shall be used in accordance with the manufacturer's instructions, program administrator, and Santee Cooper's Respirator Protection Program guidance.
- C. Employees wearing respiratory protection must be clean shaven prior to donning the respirator. This includes fit testing.
- D. Emergency Response Team members must be clean shaven at all times.

1.4.3 Respirator Selection

A sufficient number of National Institute of Occupational Safety and Health

(NIOSH) certified respirator models and sizes shall be available to ensure a means of protection from various respiratory contaminants, that are acceptable and a proper fit for the user.

1.4.4 Medical Evaluation

- A. Santee Cooper shall ensure employees who are expected to wear a respirator are examined and certified capable, by a licensed health care professional at no cost to the employee.
- B. The medical evaluation shall, at a minimum, obtain the information required in sections 1 and 2 of OSHA 29 CFR 1910.134, appendix C, section A.

1.4.5 Fit Testing

- A. Before an employee may be required to use a respirator, the employee must be fit tested with the same make, model, style, and size of respirator that will be used.
- B. Employees must be clean shaven prior to donning respirator to be fit tested. The fit test shall be conducted in accordance with OSHA 29 CFR 1910.134 (F)(1).
- C. Santee Cooper shall ensure that employees using a tight- fitting facepiece respirator pass an appropriate qualitative fit test (QLFT) or quantitative fit test (QNFT).
- D. Employees shall be fit tested prior to initial use of the respirator, whenever a different respirator facepiece (size, style, model or make) is used, and at least annually thereafter.

1.4.6 Face Piece Seal for Respirator

- A. Tight-fitting respirators shall not be used by employees who have:
 1. Facial hair that comes between the sealing surface and the face or that interferes with valve function; or
 2. Any condition that interferes with the face-to- facepiece seal (hair, etc.) or valve function.
- B. If an employee wears corrective glasses or goggles or other personal protective equipment, the employee shall ensure that such equipment is worn in a manner that does not interfere with the seal of the facepiece to the face of the user.
- C. For all tight-fitting respirators, employees shall perform a user seal check each time they put on the respirator using manufacturer's guidelines.

1.4.7 Respirator Maintenance and Care

Santee Cooper respirator users, shall ensure respirators are maintained, cleaned/disinfected after use, and stored in accordance with manufacturer's guidelines.

1.4.7.1 Inspection

Santee Cooper shall ensure that respirators are inspected prior to use and in accordance with manufacturer's guidelines.

For further information on component inspections or programs, see Appendix F.

1.4.7.2 Repairs

- A. Santee Cooper shall ensure that respirators that defective respirators are

removed from service, and are discarded or repaired as follows:

1. Repairs shall be made according to the manufacturer's recommendations and specifications; and
2. Reducing and admission valves, regulators, and alarms shall be adjusted or repaired only by an authorized manufacturer's repair facility or a manufacturer trained and certified repair technician

1.4.7.3 Identification of Filters, Cartridges, and Canisters

Santee Cooper shall ensure that all filters, cartridges and canisters used in the workplace are labeled and color coded with the NIOSH approval label and that the label is not removed and remains legible.

1.4.7.4 Training and Information

- A. Santee Cooper shall provide understandable training to employees who are required to use respirators, prior to requiring respirator use, and at least annually thereafter.
- B. Training must also be provided to those employees who may be issued a respirator, but who are not required to use them.
- C. A new employee who has received training within the last 12 months that meets the requirements of this section is not required to repeat such training as long as that the employee can demonstrate knowledge of those element(s).
- D. Retraining shall be administered done when:
 1. Changes occur in the workplace or the type of respirator
 2. Knowledge gaps are Identified, or
 3. Any situation that arises in which retraining appears necessary to ensure safe respirator use.

1.4.7.5 Program Evaluation

- A. Santee Cooper shall conduct periodic workplace evaluations to ensure employees are properly using the respirators, and that the respiratory protection program is being properly implemented and is effective.
- B. Santee Cooper shall regularly consult employees required to use respirators to assess the employees' views on program effectiveness and to identify any problems. Any problems that are identified during this assessment shall be corrected. Factors to be assessed include, but are not limited to:
 1. Respirator fit (including the ability to use the respirator without interfering with effective workplace performance)
 2. Appropriate respirator selection for the hazards to which the employee is exposed
 3. Proper respirator use under the workplace conditions the employee encounters, and
 4. Proper respirator maintenance.

1.4.7.6 Recordkeeping

Santee Cooper shall retain written medical evaluations, fit testing, and the respirator program. This information will facilitate employee involvement in the respirator program, assist in auditing program adequacy, and provide a record for compliance.

For additional information concerning respiratory protection equipment, refer to the Santee Cooper Respiratory Protection Program

1.5 Compressed Gases

NOTE: This section is for the High-Pressure Gas Cylinders that are equipped with protective caps by the manufacturer (e.g., argon cylinders, acetylene cylinders, etc.). SCBAs, CO2 Fire Extinguishers, Freon Containers, and other similar containers are not specifically addressed by this section.

Key Point: Compressed gas cylinders can be 2000 to 6000 psi. If the valve is damaged, they can become missiles that can penetrate concrete walls.

1.5.1 Key Definitions

A. In Storage

1. Compressed gas cylinders are considered to be "in storage" when they have cylinder caps on them and properly secured.
 - a. In storage, oxygen cylinders shall be separated from fuel gas cylinders or combustible materials a minimum of 20 feet, or by a non-combustible barrier at least five feet high having a fire-resistant rating of at least one-half hour.
 - b. Secure all cylinders when in use, transport, and storage
 - c. Keep cylinder valves closed and capped at all times except when the cylinder is in use

B. In Use

1. Compressed gas cylinders are considered to be "in use" whenever gas is flowing from the cylinder to the intended application, or the cylinder is attached to an active manifold or supply line. If cylinders are connected for use, as in the case of oxygen and acetylene cylinders attached to regulators and staged in a welding/cutting torch arrangement. They are also considered to be "in use" only if they are planned to be used in the next 24 hours if cylinders are separated by adequate firewall (a noncombustible barrier at least 5 feet (1.5 m) high having a fire resistance rating of at least one half hour). The number of oxygen acetylene welding/cutting torches connected for use should be kept to a minimum. If oxygen/acetylene cylinders are not to be used within the next 24 hours, they must be stored properly.
 - a. Open cylinder valves slowly. Fuel valves should not be opened more than 1 ½ turns. Close cylinder valves fully before moving them when work is finished and when cylinder is empty.
 - b. Free standing compressed gas cylinders which are "in use" shall be secured. Structural members of the facility can be used for securing.

1.5.2 Overview

- A. If a cylinder leaks and the leak cannot be stopped by simply tightening the valve or packing nut, move the cylinder outdoors to a well-ventilated area. No attempt shall be made to repair leaking cylinders.
- B. Wrenches shall not be used on valve hand wheels. If wheels are hard to open or close, or frozen, contact the supplier for instruction. Non-sparking tools shall be used on flammable gas systems including the Hydrogen System.

- C. Close cylinder valves before moving them, when work is finished, and when the cylinder is empty
- D. Never use cylinders as rollers or supports whether they are full or empty.
- E. Never attempt to mix gases in a cylinder.
- F. Never tamper with a safety relief device or valve of a cylinder.
- G. Keep cylinders far enough away from welding, cutting, and other spark producing operations so sparks and slag will not reach them, or provide a fire-resistant shield to protect the cylinder.
- H. Do not place cylinders where they can become part of an electrical circuit. Keep them away from piping systems and other equipment that may be used for grounding electrical circuits.
- I. Whenever they are in use, fuel gas cylinders shall be placed with the valve end up.
- J. Do not take oxygen, acetylene, or other fuel gas cylinders into confined spaces unless allowed by Confined Space Permit.
- K. When working with air and gas regulators:
 1. Make sure the regulator is rated for the pressure to be used.
 2. Make sure the fittings are rated for the pressure to be used.
 3. Make sure the gauges are appropriate for the pressure to be used.
 4. Relieve all pressure on regulator seats when not in use.
- L. When placing compressed gases in service, if regulator pressure setting is unknown, adjust the regulator to minimum pressure and open cylinder valve slowly.
- M. Empty cylinders shall have valves closed, be marked appropriately, and expeditiously removed from the area.
- N. Gas hoses used for cutting, welding, brazing, etc., shall be inspected before use or inspected daily if in continuous use. Inspect for slits, cracking, chalking, bulging, and burns that are deeper than a surface discoloration. Fittings shall be checked for damage, deformation, splits, cracks, or loose compression sleeves. Hoses showing signs of this kind of damage shall be removed from service.
- O. Do not hoist cylinders without using a cylinder truck, pallet or similar device. The intent is to rig to the device holding the cylinder and not to the cylinder itself.
- P. Do not use valve protection caps for lifting cylinders.
- Q. When moving cylinders short distances (< 10 ft.), tilting, and rolling them on their bottom edges is acceptable. If it is a shaft cylinder that can be hand carried, use extreme care when carrying. When transferring cylinders off a skid or to a lower level use the skid ramp when possible.
- R. When moving cylinders long distances (> 10 ft.) or up and down stairs or ramps, a hand truck, fork truck or similar device should be used. They must be secured and capped.
- S. When transporting cylinders by powered vehicles, they must be secured in vertical position and capped.
- T. Regulators shall be removed, and caps replaced when moving cylinders unless the cylinder is firmly secured on a special carrier intended for that purpose.
- U. Mark and segregate empty cylinders separate from full cylinders. Close valves on empty cylinders. Do not store oxygen and fuel gas cylinders in unventilated enclosures such as lockers unless they are specifically designed for that purpose.
- V. Post the names of the stored cylinders in cylinder storage areas. Store

cylinders grouped by types of gases considering the hazards of the gases.

- W. Do not expose cylinders to continuous dampness or store near salt or other corrosive chemicals or fumes. Do not store cylinders in direct sunlight or temperatures exceeding 125° F.
- X. Compressed gas cylinders shall be secured to an adequate support in an upright position, using a non-combustible material of sufficient strength, for example, tie wire, chain, or synthetic strap to keep them stationary. Gas cylinders shall be secured near the top and the bottom of the cylinder or secured in an engineered rack that will prevent the cylinder from falling over. Liquid nitrogen tanks mounted on metal frames meet this requirement.
- Y. When compressed gas cylinders are stored, the use of adequate support for securing compressed gas cylinders can be of either combustible or non-combustible materials that have the strength greater than or equal to a 1" polyester (or similar material) ratchet strap.
- Z. Liquid Propane (L.P.) cylinders may be stored in either a vertical or horizontal position. LP cylinders may be stored outside in direct sunlight. When stored in a horizontal position, pressure relief valve shall be upright.

1.6 Concrete

- A. Concrete workers will be required to wear protective clothing, including rubber boots and gloves, to reduce the danger of concrete burns.
- B. Wear appropriate personal protective equipment when using tools and equipment associated with concrete masonry work.
- C. Finishers shall be required to wear safety glasses or face shields when chipping, wire brushing or using power impact or rotary tools in patching concrete. Respiratory protection may also be required, based on the dust levels generated from the work.
- D. Eye wash stations and bottles of neutralizer should be available in the pour area.
- E. Handles on bull floats used where they may contact energized electrical conductors shall be constructed of nonconductive material or insulated with a nonconductive sheath whose electrical and mechanical characteristics provide the equivalent protection of a handle constructed of nonconductive material.
- F. When discharging on a slope, the wheels of ready-mix trucks shall be blocked, and the brakes set to prevent movement.
- G. Exposed gears, chains and rollers of mixers shall be properly guarded.
- H. Powered and rotating-type concrete troweling machines that are manually guided shall be equipped with a control or dead-man switch that will automatically shut off the power whenever the operator removes his hands from the equipment handles.
- I. The use of concrete trucks may create traffic problems, which proper planning and care can lessen and/or eliminate. Backing operations should be controlled by a properly attired flag person/spotter who shall be positioned so that they have a clear view of the area behind the truck as well as be clearly visible to the truck driver. Movement of personnel and project equipment should be routed away from this area so that they do not have to cross the truck's means of egress.
- J. Formwork and shoring shall be designed, erected, supported, braced, and maintained so that it will safely support all vertical and lateral loads that

may be imposed upon it during placement of concrete.

- K. Stripped forms and shoring shall be removed and stockpiled promptly after stripping, in all areas in which persons are required to work or pass. Protruding nails, wire ties, and other form accessories not necessary to subsequent work shall be pulled, cut or other means taken to eliminate the hazard.
- L. The sills for shoring shall be sound, rigid, and capable of carrying the maximum intended load.
- M. All shoring equipment shall be inspected prior to erection to determine that it is as specified in the shoring layout. Any equipment found to be damaged should not be used for shoring.
- N. Erected shoring equipment shall be inspected immediately prior to, during, and immediately after the placement of concrete. Any shoring equipment that is found to be damaged or weakened shall be immediately reinforced or re-shored
- O. Building of shoring or form systems shall be in accordance with the excavation procedures when working in excavations over four (4) foot deep.
- P. Handling and storage of masonry building materials shall be in accordance with Santee Cooper Material Handling Procedures and scaffolds for masonry construction shall be built in accordance with Santee Cooper Scaffolding Procedure.
- Q. Power saws for cutting brick or stone should be equipped with dust collectors or employees shall be provided with approved respirators. The exhausted dust should be directed away from vehicle or personnel traffic.
- R. Employees cutting brick or stone shall wear approved safety goggles and hearing protection.
- S. Mortar tubs shall be kept free from ragged edges, which may cut the hands, legs, and arms of bricklayers.
- T. All walls or vertical surfaces shall be properly braced during construction to withstand wind and other pressure.

1.7 Conduct on the Job

- A. Practical jokes, horseplay, scuffling or any other conduct that would subject anybody to risk of bodily injury shall not be tolerated.
- B. Only safe, approved work methods and procedures shall be used. Employees shall not take unnecessary risks while working.
- C. Accidents and injuries, no matter how minor, shall be reported immediately to your supervisor.
- D. Employees shall not alter or disconnect any vehicle or equipment safety device that has been installed for improved safety performance or risk reduction.

1.7.1 Working on Customer Property

- A. 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.
- B. 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.
- C. In the event of elevated threat or confrontation arises, contact Santee Cooper Law Enforcement or local law enforcement, as needed.

1.8 Confined or Enclosed Spaces

- A. 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. An enclosed space is an indoor space, other than a confined space, that may contain or accumulate a hazardous atmosphere due to inadequate natural ventilation. Examples of enclosed spaces are trailers, railcars, and storage rooms.
Entry into a Confined or Enclosed space is to have occurred when any part of a person's body breaks the plane of the opening of the space
- B. 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.
- C. Determine if the space to be entered is a permit-required confined space and enter accordingly.
- D. 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.
- E. 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.
- F. 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.
- G. When covers are removed from confined or enclosed spaces, the opening shall be guarded by a railing, temporary cover, or other temporary barrier.
- H. Before employees enter 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 properly calibrated.
- I. 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.
- J. As a general rule during hot work, continuous monitoring is preferred and should be employed in all cases where access is limited and ventilation (air flow) is poor.

Exceptions to continuous monitoring are limited to areas with the following characteristics (and in these cases periodic monitoring may be employed at the discretion/approval of the Entry Supervisor):

- Large spaces with multiple open accesses (two or more)
- Good ventilation/air flow (natural and/or forced air)
- Historical test results that have consistently demonstrated no atmospheric hazards exist
- Examples include (must meet all three of the above criteria):

- o Boiler (including furnace, backpass, windbox, penthouse and all associated air and gas spaces from the FD fans to the stack exit)
 - o SCR
 - o Precipitator
 - o FGD Module and associated areas
 - o Deaerator
 - o LP Turbine
 - o Condenser steam inlet (top of tube bundle)—if hotwell and LP turbine accesses are open
 - o Demineralization vessels (anion, cation, mixed bed)
 - o Open top tanks (such as limestone slurry tanks, solid waste surge tanks, FGD reagent tanks, pretreatment clarifiers) – if bottom access door is open
- K. 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. Employees should be aware of oxygen, combustible gas, toxic gas and vapor levels in a confined space.
- L. 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, Santee Cooper's written permit system shall be followed.
- M. 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.
- N. Entry into a confined or enclosed space with an unsafe atmosphere shall be avoided if possible. Employees required to enter a confined or enclosed space with an unsafe atmosphere shall be equipped with proper PPE, including 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. In the case of a confined space with one point of egress, considerations should be given to establishing alternative escape routes or the use of permanent or portable refuge stations.
- O. 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.
- P. Compressed gas bottles shall not be taken into a confined space.
- Q. 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.
- R. 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.

1.9 Cranes, Derricks, and 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. Assembly and disassembly operations must be directed by a person who meets the criteria for both a competent person and a qualified person, or by a competent person who is assisted by one or more qualified persons. The assembly and/or disassembly of the equipment shall meet all of the components outlined within 29 CFR 1926.1404.
- C. Crane operators shall be certified or qualified where required. See OSHA 29 CFR 1926.1427 for more information.
- D. No person shall be permitted to ride the hook, sling, or load of any hoisting equipment.
- E. Load limits as specified by the manufacturer shall not be exceeded under any circumstances.
- F. Operating and maintenance procedures as specified by the manufacturer shall be followed. If manufacturer procedures are unavailable, the employer must develop and ensure compliance with all procedures necessary for the safe operation of the equipment and attachments that meet the following criteria:
1. Procedures for operational controls must be developed by a qualified person
 2. Procedures related to the capacity of the equipment must be developed and signed by a registered professional engineer familiar with the equipment.
- G. The following are the minimum checks which shall be made by a competent person each shift the equipment will be used and must be completed before or during that shift. The inspection must consist of observation for apparent deficiencies. Taking apart equipment components and booming down is not required as part of this inspection unless the results of the visual inspection or trial operation indicate that further investigation necessitating taking apart equipment components or booming down is needed. Determinations made in conducting the inspection must be reassessed in light of observations made during operation. At a minimum the inspection must include all of the following:
1. All control mechanisms.
 2. Control and drive mechanisms for apparent excessive wear of components and contamination by lubricants, water or other foreign matter.
 3. Air, hydraulic, and other pressurized lines for deterioration or leakage, particularly those which flex in normal operation.
 4. Hydraulic system for proper fluid level.
 5. Hooks and latches for deformation, cracks, excessive wear, or damage such as from chemicals or heat.
 6. Wire rope reeving for compliance with the manufacturer's specifications, and in accordance with 1926.1413(a).
 7. Electrical apparatus for malfunctioning, signs of apparent excessive deterioration, dirt or moisture accumulation.
 8. Tires (when in use) for proper inflation and condition.

9. Ground conditions around the equipment for proper support.
10. Equipment for level position within the tolerances of the equipment manufacturer's recommendation.
11. Operator cab windows for significant cracks, breaks, or other deficiencies that would hamper the operator's view.
12. Safety devices and operational aids for proper operation.
13. Where applicable, fire extinguisher should be available.

Note: If any of the above-mentioned items are found to be deficient, an immediate determination must be made by the competent person as to whether the deficiency constitutes a safety hazard. If the deficiency is determined to constitute a safety hazard, the equipment must be taken out of service until it has been corrected.

- H. Inspections that take place (each shift), shall be documented and maintained by the employer that conducts the inspection for a minimum of 3 months. Inspections must meet the following criteria:
1. Contain items checked and the results of the inspection.
 2. Name and signature of the person who conducted the inspection and the date of inspection.
 3. Each month the equipment is in service, the equipment must be inspected on the same criterion that is covered during the daily inspection, and the equipment must not be used until an inspection demonstrates that there is no corrective action required to be taken.

Note: Equipment that has been idle for 3 months or more must be inspected by a qualified person, and meet the requirements identified prior within this section prior to initial use.

- I. At a minimum of every 12 months, the equipment must be inspected by a qualified person in accordance with the same criteria as the daily inspection with the following exceptions:
1. If any deficiency is identified, an immediate determination must be made by the qualified person as to whether the deficiency constitutes a safety hazard or, though not a safety hazard, needs to be monitored in the monthly inspections.
 2. If the deficiency is a safety hazard, the equipment must be taken out of service until it has been corrected, except when temporary alternatives measures are implemented in accordance with 29 CFR 1926.1416(d) or 29 CFR 1926.1435(e).
 3. If the deficiency is not presently a safety hazard, but needs to be monitored, the employer must ensure that the deficiency is checked in the monthly inspections.
 4. The equipment must be inspected by a qualified person and disassembled, if required, as necessary, to complete the inspection. The equipment must be inspected in accordance with the specifics as identified within 29 CFR 1926.1412(f)(1).

Note: Annual/comprehensive inspections must be documented, maintained, and retained for a minimum of 12 months, by the employer that conducts the inspection. The information must contain at a minimum: items checked and results of the inspection, and the name and signature of the person who conducted the inspection and the date.

- J. Manufacturer's procedures regarding inspections that relate to safe operations that is more comprehensive or has a more frequent schedule of inspection than the requirements of this section must be followed.

- K. 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.
- L. No load shall be lifted until its weight has been determined. For more information on maximum safe loads for wire ropes see OSHA Subpart H 1926.251.
- M. For the first lift of each day, the load shall be test lifted and the brakes checked (load lifted several inches, then tested).
- N. With every load, the slings and bindings shall be checked and shall be readjusted as necessary to ensure safety and stability.
- O. Signal person must be provided in each of the following situations:
 1. The point of operation, meaning the load travel or the area near or at load placement, is not in full view of the operator.
 2. When equipment is traveling, the view in the direction of travel is obstructed.
 3. Due to site specific safety concerns where the operator or the person handling the load determines that it is necessary.
- P. Signals to the equipment operator shall be given by one person designated to perform this task and must be maintained throughout the operation between the operator and the signal person. If communication between the operator and signal person become interrupted during in tasks that require a signal person, the operator must stop operations until communication can be reestablished. The signal person shall be properly qualified. The operator shall, however, obey a "Stop" signal given by anyone. Other means to signal the operator can be used (i.e. hand, voice, or other audible means) in lieu of standard hand signals; however, the employer must demonstrate that the signals provide an equally effective means of communication or comply with national consensus standards that are equally as effective.
- Q. 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.
- R. 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.
- S. Winch lines, ropes, or wire cables shall not be guided by hand when standing within reach of the drum or sheave.
- T. 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.
- U. 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 101-2 in Tables and Charts Section of Manual. The U-bolt shall be applied so that the U section is in contact with the dead end of the rope.
- V. Operators shall not leave their position at the controls of cranes, hoists, derricks, or other lifting devices while the load is suspended except where all of the following conditions are met:

1. The operator remains adjacent to the equipment and is not engaged in any other duties.
2. The load is to be held suspended for a period of time exceeding normal lifting operations.
3. The competent person determines that it is safe to do so implements measures necessary to restrain the boom hoist and telescoping, load, swing, and outrigger or stabilizer functions.
4. Barricades or caution lines, and notices, are erected to prevent all employees from entering the fall zone. No employees, are permitted in the fall zone.

Note: This does not apply to working gear (such as slings, spreader bars, ladders, and welding machines) where the weight of the working gear is negligible relative to the lifting capacity of the equipment as positioned, and the working gear is suspended over an area other than an entrance or exit

- W. Operators of cranes, derrick, hoists, and other hoisting equipment shall exercise extreme caution when in proximity to energized lines or equipment:
1. performing power transmission or distribution construction, refer NESC Rule 441, for applicable clearance requirements.
 2. When work does not involve power transmission or distribution construction and maintenance, the minimum clearance distances, as listed below, shall be followed.

Voltage (nominal, kV, alternating current)	Safe Working Distance (feet)
Up to 50	10
Over 50 to 200	15
Over 200 to 350	20
Over 350 to 500	25
Over 500 to 750	35
Over 750 to 1,000	45
Over 1,000	(as established by the utility owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution)

Source: OSHA Standard 29 CFR 1926.1408 Table A

- X. 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.

1.10 General Electrical

1.10.1 Capacitors

- A. Before any work is done on primary capacitors of any voltage:
1. The capacitors shall be de-energized and electrically isolated before work begins.
 2. After waiting five minutes, the capacitor's leads shall be shorted and grounded using a temporary jumper installed with an insulated live line tool and insulated gloves for the appropriate voltage with a hot stick.
 3. The terminals of separate capacitors removed from service shall be shorted after removal and during transportation and storage.
- B. Where capacitors are installed on 600 volts or less:
1. The capacitors shall be de-energized and electrically isolated before work begins.
 2. Rubber Insulated gloves for the appropriate voltage or hot sticks live line tools shall be used to ground the capacitor.

1.10.2 Grounding

Specific information about grounding rules and practices are compiled in this section. These rules shall be followed when training and working on all electrical conductors and equipment.

Note: Transmission voltages shall be grounded according to Santee Cooper's Transmission Operations Personal Protective Grounding Guideline.

- A. All primary conductors and equipment shall be treated as energized until tested and grounded or isolated from all potential sources of feed.
- B. Before starting work on de-energized primary circuits or equipment, the following conditions shall be met:
1. A visible open shall be used to isolate the circuit or equipment. (Exception: sub-surface mounted switchgears; they have a grounded position switch)
 2. A test for the presence of voltage shall be made.
 3. The primary circuit and/or equipment shall be grounded or electrically isolated.
- C. All grounding of primary conductors shall be done using approved and inspected, insulated live line tools and insulated gloves, rated for the appropriate voltage, along with all other necessary PPE. Hot sticks and adequate personal protective equipment. High-voltage rubber gloves shall not be used as the only protective device when grounding conductors and equipment operating in excess of 600 volts. They may be used as an extra precaution, in addition to the hot stick. An employee may use either an approved hot stick or high-voltage rubber gloves to attach the ground end of the grounding device (the first grounding connection only) in an energized enclosure and/ or on a neutral cable
- D. When attaching grounds, the ground end shall be attached first. The other end shall be attached and removed using insulated live line tools hot sticks. When removing grounds, the grounding device shall first be removed from the line or equipment using live line tools hot sticks
- E. Grounds shall be installed according to the Santee Cooper safety manual. Where the installation of a ground is impractical, the grounds may be

omitted and the line or equipment may be worked as energized using hot sticks, or after the line or equipment has been electrically isolated, appropriate-class rubber gloves may be used.

- F. Grounds may be temporarily removed only when necessary for test purposes. Extreme caution shall be exercised while testing.
- G. All personal protective grounding conductors, electrodes and clamps shall conform to and be installed per the Santee Cooper safety manual. Grounding equipment shall be inspected before each use to ensure proper electrical and mechanical operation.
- H. Trucks and other equipment subject to becoming energized shall be grounded or barricaded in accordance with the Santee Cooper safety manual.

1.10.3 Working on Energized Equipment

- A. A Qualified Electrical worker shall not work on energized conductors or equipment carrying 600 volts or more unless accompanied by another Qualified Electrical worker.
- B. Qualified Electrical workers may work alone performing limited work on energized equipment outside the Minimum Approach Distance. Employees undergoing on-the-job training may perform limited work outside the Minimum Approach Distance while under direct supervision of a qualified employee. Types of limited work that may be performed are:
 - 1. Opening or closing disconnects and switches.
 - 2. Installing a fuse in equipment.
 - 3. Removing foreign objects from a conductor.
 - 4. Emergency repairs necessary to safeguard the general public.
 - 5. Working energized conductors and apparatus under 600 volts.
 - 6. Working within the confines of a primary dead-front enclosure.
- C. When a vault or manhole contains energized conductors and/ or equipment that by nature of construction is dead-front, work other than that considered hot may be performed by a qualified employee under direct visual supervision with a second employee assisting outside the enclosure, vault or manhole. Any energized splice or cable not part of the work scope but within the work area shall be protected from possible damage by a flash blanket.
- D. When working with energized conductors of 50 V or greater, employees shall wear rubber gloves of the appropriate class rating.

1.10.4 Rubber and Plastic Approved Protective Equipment and Devices

- A. Only qualified employees shall work on or near exposed, energized lines or apparatus and only with appropriate electrical protective equipment.
- B. Personal protective equipment, including proper-class rubber gloves, shall be worn before entering the Minimum Approach Distance where exposed, energized lines or apparatus may be reached. This protective equipment shall not be removed until the employee is completely out of reach of this area.
- C. Rubber gloves are authorized in five voltage categories:

Rubber Insulating Equipment Voltage Requirements <i>(Source: OSHA 29 CFR 1910.137 Table I-4)</i>			
Class of Equipment	Maximum Use Voltage ¹ (ac rms)	Retest Voltage ² (ac rms)	Retest Voltage ² (dc avg)
00	500	2,500	10,000
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

¹The 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 if:

- (1) There is no multiphase exposure in a system area and if the voltage exposure is limited to the phase-to-ground potential, or
- (2) The electrical equipment and devices are insulated or isolated or both so that the multiphase exposure on a grounded wye circuit is removed

²The proof-test voltage shall be applied continuously for at least 1 minute, but no more than 3 minutes.

1. Class 00 is for use on secondary voltage. Rubber gloves with protective leathers may not exceed 500 volts. Rubber gloves used without leather protectors may not exceed 250 volts.
2. Class 0 is for use on secondary voltage not to exceed 600 volts.
3. Class 2 rubber gloves shall be used when working in the Minimum Approach Distance of the 5kV or 12.4kV systems.
4. Class 3 gloves shall be used when working in the Minimum Approach Distance of the 22kV system

Note: Leather protectors need not be worn over Class 0 or 00 gloves under limited-use conditions and if sharp surfaces and objects are not expected to be encountered.

5. Class 00 gloves can be used without leather protectors but only up to 250 volts.
 6. If Class 0 and 00 gloves are worn without leather protectors, they must be tested electrically before being reused on a higher voltage.
 7. Leather protectors shall not be worn, except in use over rubber gloves.
- D. Rubber gloves shall be inspected for corona cracks or other damage by using the roll and air test before daily use or at any other time when their condition is in doubt.
1. Before issue, rubber gloves and blankets shall be electrically tested.
 2. Issued rubber gloves shall be electrically tested every two (2) months. Rubber blankets shall be electrically tested every six (6) months.
 3. Gloves and blankets shall be wiped clean of any substances as soon as possible.
 4. Gloves and blankets shall neither be marked on nor have any adhesive tapes or labels applied to them by other than authorized employees
 5. Gloves and blankets with any of the following defects shall be destroyed and discarded:
 - a. Holes, tears, punctures or cuts.
 - b. Ozone cutting or checking.
 - c. Imbedded foreign objects.
 - d. Texture changes — swelling, softening, hardening or stickiness.
 6. Rubber gloves shall never be worn inside out. They shall be exchanged at any time they become damaged or the employee to whom they are assigned suspects their condition.
- E. When work is to be done on or near energized lines, all energized and grounded conductors or guy wires within the Minimum Approach Distance shall be covered with protective equipment. Exception: That part of the conductor on which the employee is to work
- F. Protective equipment shall be applied from underneath the conductor when possible. If applying protective equipment, an employee always shall cover the nearest wires first. In removing rubber protective equipment, the reverse order shall be used.
- G. Protective devices shall be placed on a tarpaulin, canvas or protective mat.
- H. Only protective equipment approved for this purpose may be left on overnight. Other protective equipment shall be removed nightly unless approved by the qualified electrical worker.

- I. Protective equipment shall be visually inspected before use.
- J. Protective devices shall be stored in special compartments, special containers or elsewhere where they are protected from damage.

1.10.5 Minimum Approach Distances

The following table indicates the Minimum Approach Distances from exposed, non-grounded conductors and apparatus while using live-line insulated tools and aerial equipment, reference the National Electrical Safety Code (NESC) Rule 441.

- A. Qualified employees shall not approach or bring conductive objects within the distances shown in the tables, unless:
1. The part has been de-energized and properly grounded.
 2. The employee is insulated from the exposed part using insulated tools, or rubber gloves rated for the voltage involved. The exposed part is insulated for the voltage involved from the employee and any other part at a different potential
 3. The employee is performing barehand live-line work.

AC Live-Work Minimum Approach Distance (NESC Rule 441)						
Voltage in Kilovolts	Distance to employee ⁴					
Phase-to-Phase ^{1,2,3}	Phase-to-ground			Phase-to-phase		
	(m)	(ft-in)	(m)	(ft-in)	(m)	(ft-in)
0 to 0.050	Not specified			Not specified		
0.051 to 0.300	Avoid contact			Avoid contact		
0.301 to 0.750	0.33	1-1	0.33	1-1	0.33	1-1
0.751 to 5.0	0.63	2-1	0.63	2-1	0.63	2-1
5.1 to 15.0	0.65	2-2	0.68	2-3	0.68	2-3
15.1 to 36.0	0.77	2-7	0.89	3-0	0.89	3-0
36.1 to 46.0	0.84	2-10	0.98	3-3	0.98	3-3
46.1 to 72.5	1	3-4	1.2	4-0	1.2	4-0
Distance to employee from energized part ^{4,5,6,10}						
Voltage in Kilovolts Phase-to-Phase	Without tools phase-to- ground		With tools phase-to- ground ^{7,9}		Without tools phase-to- phase ⁸	
	(m)	(ft-in)	(m)	(ft-in)	(m)	(ft-in)
72.6 to 121	1.06	3-6	1.13	3-9	1.42	4-8
121.1 to 145	1.21	4-0	1.3	4-4	1.64	5-5
145.1 to 169	1.36	4-6	1.46	4-10	1.94	6-5
169.1 to 242	1.87	6-2	2.01	6-8	3.08	10-2
242.1 to 362	3.19	10-6	3.41	11-3	5.52	18-2
362.1 to 420	3.99	13-2	4.25	14-0	6.81	22-5
420.1 to 550	4.78	15-9	5.07	16-8	8.24	27-1
550.1 to 800	6.53	21-6	6.88	22-7	11.38	37-5

Footnotes for previous table (NESC Rule 441)

¹For single-phase lines off three phase systems, use the phase-to-phase voltage of the system.
²For single-phase systems, use the highest voltage available.
³Inadvertent movement factors used in these tables are as follows:
0.301 kV to 0.750 kV = 0.31 m (1 ft)
0.751 kV to 72.5 kV = 0.61 m (2 ft)
72.6 kV to 800 kV = 0.31 m (1 ft)
⁴Distances 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 h or 24 km per h, unsaturated air, normal barometer, uncontaminated air, and clean and dry insulators. If standard atmospheric conditions do not exist, extra care must be taken.
⁵For voltages above 72.5 kV, distances are based on altitudes below 900 m (3000 ft) above sea level. For altitudes above 900 m (3000 ft), Rule 441A6 applies.
⁶Distances were calculated using the following TOV values:
72.6 kV to 362 kV = 3.5
362.1 kV to 550 kV = 3.0
550.1 kV to 800 kV = 2.5
⁷Distances for live-line tools in the air gap were calculated by adding a tool factor to the electrical component (OSHA 29 CFR 1910.269 Appendix B[B68]).
⁸Phase-to-phase live-line tool in the air gap values are not available. If this situation exists, an engineering evaluation should be performed.
⁹With tools means a live-line tool bridging the air gap to the employee from the energized part.
¹⁰For barehand work where the employee is at line potential, this distance is to an object at a different potential.

1.11 Energy Isolation (LOTO)

- A. Proper lockout/tagout (LOTO) practices and procedures safeguard workers from the release of hazardous energy.
- B. Employers are also required to train each worker to ensure that they know, understand, and are able to follow the applicable provisions of the hazardous energy control procedures:
 1. Employees must be trained in the purpose and function of the energy control program and have the knowledge and skills required for the safe application, usage and removal of the energy control devices.
 2. All employees who work in the area where the energy control procedure(s) are utilized need to be instructed in the purpose and use of the energy control procedure(s) and about the prohibition against attempting to restart or reenergize machines or equipment that is locked or tagged out.
 3. All employees who are authorized to lockout machines or equipment and perform the service and maintenance operations need to be trained in recognition of applicable hazardous energy sources in the workplace, the type and magnitude of energy found in the workplace, and the means and methods of isolating and/or controlling the energy.
 4. Specific procedures and limitations relating to tagout systems where they are allowed
 5. Retraining of all employees to maintain proficiency or introduce new or changed control methods.
- C. Machine-specific procedures shall be developed to identify types of energy that needs to be controlled, methods to properly isolate those energies, as well as methods to test/ verify the energy is properly controlled
- D. For additional requirements, please refer to the Santee Cooper Energy Isolation program.

1.12 Extension and Drop Cords

- A. With continuous use over time, an extension cord can rapidly deteriorate, creating a potentially dangerous electric shock or fire hazard.
- B. Do not overload extension cords or allow them to run through water or snow on the ground.
- C. Do not substitute extension cords for permanent wiring.
- D. Do not run through walls, doorways, ceilings, or floors unless adequately protected. If a cord is covered, heat cannot escape, which may result in a fire hazard
- E. Do not use an extension cord for more than one appliance.
- F. Make sure the extension cord or temporary power strip you use is rated for the products to be plugged in and is marked for either indoor or outdoor use.
- G. The appliance or tool that you are using the cord with will have a wattage rating on it. Match this up with your extension cord, and do not use a cord that has a lower rating.
- H. Never use a cord that feels hot or is damaged in any way. Touching even a single exposed strand can give you an electric shock or burn.
- I. Never use three-prong plugs with outlets that only have two slots for the plug. Do not cut off the ground pin to force a fit. This defeats the purpose of a three-prong plug and could lead to an electrical shock.
- J. Never force a plug into an outlet if it doesn't fit.

- K. Use extension cords with polarized and/or three-prong plugs.
- L. Extension Cord Designations
 - S: Designed for general Use
 - W: Rated for Outdoor Use
 - J: Standard 300 Voltage Insulation
 - T: made from Vinyl Thermoplastic
 - P: Parallel Wire Construction (Air Conditioner Cords and Household Extension Cords)
 - O: Oil-Resistant
 - E: Made from TPE
- M. Follow manufacturers recommendation for length and amperage requirements.

1.13 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

1.14 Fire Protection

- A. Fire protection equipment shall always be properly located. Employees shall not move or remove such equipment, except for actual use.
- B. All fire extinguishers shall be mounted, except for wheeled-type extinguishing equipment and portable extinguishers carried to a specific job.
- C. Only employees trained and current in fire extinguisher use are permitted to operate fire extinguishers and only when comfortable doing so. Trained employees will know the classes of fire, burning characteristics and the proper type of fire extinguishers to be used.
- D. Extinguishers shall be inspected at least monthly to determine that they are at their assigned locations, that they are not obstructed and that they are in apparent working condition. Continuously monitored systems are excluded. Discrepancies shall be reported promptly to the supervisor.
- E. Employees shall not enter confined spaces after using a carbon dioxide extinguisher until the area has been thoroughly ventilated.
- F. The travel distances for portable fire extinguishers shall be within 50 feet of the identified hazards.
- G. Employees shall familiarize themselves with the emergency exits, alarm signals, and escape procedures when working inside a building or structure.
- H. 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.
- I. Employees shall be familiar with both the location and the operation of all fire protection equipment in the vicinity of their work area.
- J. 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.
- K. Only properly trained employees equipped with the necessary protective equipment shall attempt to extinguish or contain a fire.
- L. Fire brigade members shall follow the Santee Cooper's established policies and procedures.

1.14.1 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.

1.14.2 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.

1.14.3 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. See Hot Work for additional requirements

1.14.4 Fire Protection Housekeeping

- A. Clean the work area of all combustible materials before using any tools or equipment that could cause a fire.
- B. Inspect work areas for potential fire hazards and remove or protect any combustible materials.
- C. Store combustible materials away from equipment in properly designated storage containers.
- D. Do not store any combustible materials in the control house or other substation or switchyard buildings.
- E. Provide appropriate fire protection prior to using any flammable liquids.

1.15 First Aid, Cardiopulmonary Resuscitation (CPR) and Automated External Defibrillators (AED's)

1.15.1 General

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

- A. The information given is 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 to be better prepared to assist fellow employees in the event of an accident. All affected employees should have current first aid and CPR/AED training according to the latest standards.
- B. Due to potential hazards associated with bloodborne pathogens that cause diseases such as Hepatitis (A, B, C, D, and E) and HIV/AIDS, care shall be taken to limit or eliminate contact with blood or body fluids when administering any type of first aid. Use of protective gloves,

goggles or safety glasses, and a barrier device 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 Santee Cooper 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.

- C. Employees shall be familiar with the basic techniques for CPR, AEDs, and 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 is most valuable. All employees should be aware of the medical services available and how to obtain them.
- D. Personnel engaged in overhead line work shall know how to perform pole top and aerial lift device rescue. Personnel engaged in underground or confined space work should know how to address an emergency in these situations. Employees should also be familiar with the Santee Cooper's emergency procedures. 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.

1.15.2 Cardiopulmonary Resuscitation (CPR) – General

- A. The information given in this section is not intended as instruction for the administration of CPR. Such treatment should be given only by persons who are properly trained and qualified.
- B. Whenever a person is found unresponsive, make sure the scene is safe, then call 911 or local emergency number. If the victim is breathing or starts breathing as a result of treatment, place victim in the recovery position by rolling him or her on his side to keep the airway clear and continue to monitor airway, breathing, and circulation (ABCs). In electric shock cases, do not rush in and become another victim. If possible, de-energize the power source. Remove victim from electric lines with a live-line tool or rubber gloves appropriate for the voltage.

1.15.3 Wounds and Control of Bleeding

The following serves as an example of basic first aid for 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. At the earliest possible moment, call 911 or local emergency number.
- B. Bleeding may be controlled by the following methods:
 1. Direct pressure: Application of pressure directly on the wound. Use of a sterile dressing is preferred. In an emergency, use any dressing.
 2. Apply a bandage snugly over the dressing (pressure bandage).

3. Elevation: loss of blood can be slowed by raising the wound above the level of the heart
4. Tourniquet: The use of a tourniquet is a last resort act of desperation. 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.)

1.15.4 Shock

- A. Shock usually occurs following a serious injury to the body. It can occur from injury, blood loss, 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 has the potential to go into shock, and should be treated as such, whether the symptoms of shock are present or not.
- C. The following are symptoms of shock:
 1. Restless or irritable.
 2. Altered level of consciousness.
 3. Nausea or vomiting.
 4. Rapid breathing and pulse.
 5. Pale or ashen, cool, moist skin.
 6. Excessive thirst.
- D. Recommended treatment for shock includes the following:
 1. Call 911 or local emergency number immediately. Shock cannot be managed by first aid alone. Proper transportation is particularly imperative in the case of a person who has developed or may develop shock. Use an ambulance, if possible, but if other means must be used follow the guidelines below as closely as possible:
 - a. The victim should be kept warm and comfortable, but not hot; this may include placing a blanket over the victim. 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.
 - b. Keep the victim's body horizontal. If possible, elevate the victim's feet by 8 to 12 inches. Do not elevate the victim's feet if the injury is to the head, neck, back or hips. Do not elevate the victim's feet if broken leg bones are suspected.
 - c. Continue to monitor the victim's ABCs.
 - d. Do not give the victim anything to eat or drink, even though he is likely to be thirsty.

1.15.5 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. Tell the person to blink several times to try to remove the object and/or gently flush the eye with water. Seek medical attention if the object remains.
 2. Objects embedded in the eye must not be removed, except by a physician. Place a sterile dressing around the object in the eye;

stabilize the object, such as with a paper cup, for support. Bandage loosely, do not put pressure on the injured eye/eyeball, and seek immediate medical attention.

3. For any eye injury in which fluid is oozing out of the eye, the victim should be immediately put on his back. By putting the victim on his back, the eye can sink deeper into the eye socket and the fluid loss will stop or slow. This practice could save a person's sight, as the fluid is critical to the function of the eye ball.
 - 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 10 minutes. Always flush away from the uninjured eye.
 - C. All eye injury cases, regardless of first-aid measures taken, should be referred to a physician to be checked and applicable treatment administered.

1.15.6 Automated External Defibrillator (AED)

An AED is a device that analyzes the heart's electrical rhythm and, if necessary, prompts the user to deliver a shock to a person experiencing sudden cardiac arrest. Defibrillation is a process of delivering an electrical shock that stimulates a heart's electrical activity long enough to allow the heart to spontaneously develop an effective rhythm on its own.

Considering the significant increase of a person's chance at survival when an AED is used in the case of sudden cardiac arrest, it is recommended that employers make them available at as many work locations as possible (including, but not limited to, office locations, work site locations, and power plant locations).

The information given in this section is not intended as instruction for the administration of an AED. There are many different AEDs on the market, and while they are similar, specific instructions for use of each model should be taught on a case-by-case basis. Most AEDs, particularly those located in public areas, have voice commands that will instruct the user on how to operate the machine; follow these instructions carefully. Employees should be trained in AED operation to become more familiar with these devices. If the AED does not advise a shock, you should continue CPR.

1.16 Guarding

- A. If a machine has a part, function, or process, which can cause injury, it needs a safeguard. Guards are installed on machinery to protect you and others from injury. When a machine is in operation, its guards must be in place.
- B. A guard must never be bypassed or removed during use.
- C. If a guard is removed for machine cleaning or repairing, it must be put back into place before reuse or storage.
- D. Before beginning any work on a machine, check its moving parts to make sure that all guards are properly functioning and securely in place.
- E. Checking the guards should be part of your regular daily inspection.
- F. Missing or damaged guards should be reported to your supervisor – whether the equipment belongs in your work area or not.
- G. Make sure you understand and follow lockout/tagout rules for use,

- maintenance, and repair of moving machinery
- H. Power should be turned off and switches isolated and tagged during repair.
- I. Moving equipment should be blocked to protect against stored energy.
- J. When the repair has been completed, guards must be replaced and checked that they work properly.
- K. Before you use moving machinery, make sure you've been trained in its safe operation.
- L. Only trained and authorized workers are allowed to operate moving machinery.
- M. You should be instructed in the proper protocols for working around machines including required personal protective equipment.

1.17 Grinding Wheels

- A. Qualified persons shall be assigned to the mounting, care, and inspection of grinding wheels and machinery. The grinding-wheel operator shall be fully instructed in the use, care, and protection of grinding wheels.
- B. If a grinding wheel is broken, a careful investigation shall be made to determine and correct the cause. Grinding wheel shall then be replaced before next use.
- C. The speed of a grinder must be compared to the speed marked on the wheel or package to make sure the machine's speed is at or below the maximum operating speed of the wheel.
- D. After mounting a wheel, care should be taken to properly position the safety guards before starting the wheel.
- E. Grinding machines shall be equipped with approved safety guards.
- F. Compressible washers shall be used between flanges and abrasive wheel surfaces.
- G. All grinding wheels shall be run to operating speed with safety guards in place or in a protective enclosure before applying work.
- H. Wheels shall be rebalanced as often as needed. A qualified person shall balance unbalanced wheels. Wheels that cannot be balanced by truing or dressing shall be removed from the machine.
- I. All grinders shall be equipped with protective glass or approved plastic guards. These shall be used in addition to approved face and eye protection.
- J. Regardless of the pressure required and regardless of their weight, size or shape, objects shall be ground only on the face, not the side, of the wheel. Exception: Wheels designed for side grinding.
- K. Any grinding wheel thought to be unsafe shall be tagged and reported. The wheel shall be inspected visually, tested, and have its condition determined. If the wheel is found defective, it shall be discarded.
- L. Floor and bench mounted grinders shall be provided with work rests which are rigidly supported and readily adjustable. Such work rests shall be kept a distance not to exceed 1/8 inch from the surface of the wheel.

1.18 Hot Work (Open Flame) and Ignition Control

- A. All hot work activities performed outside of designated shop "hot work areas" shall require the use of Santee Cooper's Hot Work Permit.
- B. Do not perform hot work until all precautions have been taken to safeguard the area.
- C. Report any equipment defect or safety hazard to your supervisor. Do not

- use defective equipment.
- D. Fire extinguishers permanently installed in plant buildings and structures are not to be used by hot work fire watches unless needed as additional means to combat a fire.
- E. Inspect all equipment before being used.
- F. Turn off all welding equipment when not in use.
- G. Do not place material being welded or cut directly on concrete.
- H. Label or clearly mark hot material before leaving it unguarded.
- I. Disable automatic fire detection devices present in the immediate area (as necessary) to prevent nuisance alarms and/or actuation of suppression systems. Follow site specific fire protection impairment procedures.
- J. Hot work near hazardous materials or on equipment containing hazardous materials may require special precautions and respiratory protection. Contact Occupational Safety for guidance.
- K. Adequate ventilation shall exist, or respiratory protection used while welding in confined spaces or on zinc, brass, bronze, stainless steel, galvanized, or lead-coated materials.
- L. Before performing hot work on a painted surface, determine if the paint or undercoat contains harmful contaminants such as PCB's, lead or cadmium. Contact Occupational safety If these substances are suspected or present. The material shall not be cut or welded until necessary precautions are taken.
- M. Do not perform welding or cutting operations in areas containing combustible gases, vapors, or dusts until all precautions have been taken to safeguard the area from fire or explosions.
- N. Open flames shall not be brought near any vessel which may have contained flammable or explosive substances until the vessel has been thoroughly purged by steam, or filled with water, or otherwise handled by special approved safety procedures.
- O. When conducting hot work from elevated locations:
 1. Prevent hot slag from falling on people or on to combustible materials.
 2. Where flammable/combustible material cannot be removed from exposure to sparks/slag, protect it with a shield of noncombustible or fire-resistant material.
 3. Close off the work area beneath the hot work by barricades or other effective means.
 4. Take precautions to prevent activation of a sprinkler head or accidental operation of automatic fire detection or suppression systems.
- P. Where combustible materials are on the floor:
 1. The floor shall be made clean for a radius of 35-ft (50-ft for areas with flammable/combustible liquids), and the following criteria also shall be met:
 - a. Combustible floors shall be kept wet, covered with damp sand, or protected by a listed/approved welding blanket, welding pad, or equivalent.
- Q. Where floors have been wet down, personnel operating arc-welding equipment or cutting equipment shall be protected from possible shock exposures.
- R. If hot work is done on one side of a wall, partition, ceiling, or roof, one of the following criteria shall be met (unless the barrier does not transmit heat

through it):

1. Precautions shall be taken to prevent ignition of combustibles on the other side by relocating the combustibles.
- S. If it is impractical to relocate combustibles, an additional fire watch shall be provided on the side opposite from where the work is being performed.
- T. Use a listed/approved welding blanket, welding pad, or equivalent when:
 1. Relocation of combustible materials at least 35-ft in all directions from the work site, cannot be achieved.
- U. Openings or cracks in walls, floors, or ducts within 35-ft of the work exist. To prevent the entrance of sparks, the edges of covers at the floor shall be tight, including at the point at which several covers overlap where a large pile is being protected.
- V. Hot work is done near walls, partitions, ceilings, or roofs of combustible construction.

1.18.1 Welding and Cutting

- A. Welding equipment shall be used only by qualified persons.
- B. Approved fire-extinguishing equipment shall be readily available in the work area.
- C. Adequate ventilation shall exist, or job-approved respirators shall be used while welding in confined spaces or while working on zinc, brass, bronze, stainless steel, galvanized or lead-coated materials.
- D. Job-approved eye protection, gloves and clothing shall be worn during welding or cutting operations. Other employees shall not observe electric-welding operations unless they use approved eye protection.
- E. Lighting a torch of any kind (oxy/acetylene, butane, MAPP, etc.) shall be done only with a spark-producing striker made for this purpose.
- F. When welding equipment is not in use, the cylinder valves shall be closed and the pressure released, or the power-supply switch shall be opened.
- G. Open flames shall not be brought near, nor shall welding or soldering be done on, any vessel that may have contained a flammable or an explosive substance until the vessel has been thoroughly purged by steam or water, filled with an inert gas, or otherwise handled by special safety procedures authorized by supervision.
- H. Rules and instructions supplied by the manufacturer or affixed to the welding equipment shall be followed.
- I. Welding screens shall be used when feasible whenever other persons could be exposed to the arc of the welding operation. Welders shall not strike an arc with an electrode without first alerting persons nearby to the possible danger.
- J. When electrode holders are to be left unattended, the electrodes shall be placed or protected so they cannot make electrical contact with employees or conducting objects.
- K. The electric welding machine shall be properly grounded prior to use.
- L. Reverse-flow check valves are required on all oxygen acetylene equipment and on each regulator.

1.18.2 Hot Work Permit

- A. The Permit Authorizing Individual shall:
 1. Be responsible for the safe operation of all hot work activities.
 2. Determine potential fire hazards that are present or likely to be present.

3. Ensure that a fire watch is at the site.
 4. Ensure the hot work equipment to be used shall be in satisfactory operating condition and in good repair.
 5. Ensure ducts and conveyor systems that might carry sparks to distant combustibles are shielded, shut down, or both.
 6. Ensure no work is attempted:
 - a. On a partition, wall, ceiling, or roof that has a combustible covering or insulation, or on walls or partitions of combustible sandwich type panel construction.
 - b. On pipes or other metal that is in contact with combustible walls, partitions, ceilings, roofs, or other combustibles if the work is close enough to cause ignition by conduction unless mitigation steps are taken.
 7. Determine that fire protection and extinguishing equipment are present.
 8. Issue the Hot Work Permit and ensure the permit is at the work location.
 9. Inspect the area to ensure the requirements or restrictions listed on the permit are being followed.
 10. Protect combustibles from ignition. Properly shield combustibles against ignition if impractical to relocate the combustibles.
 11. Inspect the area at least once per shift while the hot work permit is in effect to ensure that it is a fire-safe area.
 12. Re-inspect the work area and re-validates the permit at the beginning of each work shift the hot work activity remains in progress.
 13. Supervisor will maintain copies of all Hot Work Permits for 1 calendar year.
 14. Extend the protected distances and areas as necessary in instances where the hot work results in the possible travel of slag, sparks, spatter or other sources of ignition further than 35-ft, (50-ft with flammable/combustible liquids).
 15. Assign additional fire watches when necessary, such as where hot work is performed near open shafts or at elevated heights or where sparks can travel through spaces such as openings
 16. Extend the time a fire watch is necessary if fire hazards warrant the extension.
- B. Upon completion of the hot work activity, the Permit Authorized Individual (PAI) ensures:
 1. Equipment used to perform hot work has been removed from the area.
 2. Fire detection system/equipment is restored to operable status
 3. Work area is cleaned in accordance with site housekeeping standards.
 4. That the designated fire watch maintains surveillance in the work area as specified in the permit.
 - C. When performing hot work under a hot work permit, employees shall:
 1. Have the PAI's approval (and written permit) before starting any hot work.
 2. Inspect all equipment to ensure a safe operating condition prior to use.
 3. Cease hot work operations if unsafe conditions develop and shall immediately notify the PAI of the situation.

D. The Fire Watch shall:

1. Be currently trained in accordance with Santee Cooper's Fire Watch protocols to understand the inherent hazards of the work site and of the hot work.
 2. Have fire extinguishing equipment readily available that is to be properly rated, inspected, and adequately sized for the task involved.
 3. Be permitted to perform additional tasks, but those tasks shall not distract them from their fire watch responsibilities. These tasks might include moving partitions relating to the hot work, cleaning in the immediate area, and minimal assistance to the person performing hot work.
 4. Maintain surveillance in the work area to detect and extinguish smoldering fires, only when the fires are within the capacity of the equipment available. If the fire is not within the capacity of the equipment, the fire watch shall sound the fire alarm immediately.
 5. Have the responsibility to make certain the hot work area is maintained in a fire-safe condition and has the authority to stop the hot work if unsafe conditions are observed.
 6. Understand the construction involved with the hot work area and the hazards associated with the occupancy
 7. Understand the fire exposure hazard that hot work creates to occupancies adjacent to or below the hot work operation.
 8. Understand the need to maintain proper isolation of all hot work operations from combustible or flammable materials.
 9. Remain on fire watch duty for at least 60-minutes after completion of hot work operations.
 10. Remain on intermittent duty for not less than 180 minutes after completion of hot work operations in areas with a hazardous location (combustible dust potential, including coal handling, etc.).
- E. One fire watch is permitted to cover multiple hot work activities provided they are on the same elevation, within 50-ft, and can see all areas.

1.20 Housekeeping

Work locations, vehicles, and the inside and outside of buildings shall always be kept clean and orderly.

- A. Inside buildings, combustible waste, such as oil-soaked rags, waste material and shavings, shall be disposed of in approved metal containers with tight-fitting metal lids. The waste should be stored in containers compatible with the waste being collected. Containers shall be emptied when practical, but at least daily. Combustible waste brought back from job sites in Santee Cooper vehicles shall be disposed of in designated waste containers at the end of that working shift.
- B. All rags shall be kept in metal or metal-lined bins having metal covers.
- C. Flammable liquids, such as gasoline, naphtha and lacquer thinner, shall not be used for general cleaning purposes.
- D. Flammable and combustible liquids with a flash point of 200° F or less shall be stored in approved, properly labeled containers when removed from original shipping containers. Such liquids shall be dispensed only in UL-listed safety containers. The contents of the containers shall be identified in accordance with Santee Cooper's Hazard Communication labeling

program. Removable tags shall not be used.

- E. Floors, platforms and entryways shall be kept free from dangerous projections or obstructions. Floors, platforms and entryways shall be kept free from oil, grease or water to prevent slipping hazards. Where the type of operation produces slippery conditions, mats, grates, cleats or other methods shall be used to reduce the hazard of slipping.
- F. Stairways, aisles, permanent roadways and walkways shall be kept clear and free from obstructions, depressions and debris. Switchgear, breaker panels, firefighting equipment and material- storage areas in yards also shall be kept clear and free from obstructions, depressions and debris.
- G. Materials and supplies shall be stored in an orderly manner to prevent their falling or spreading and to eliminate tripping and stumbling hazards.
- H. All scrap lumber, waste materials and rubbish shall be removed from the immediate work area as work progresses.
- I. Disposal of waste materials or debris by burning shall comply with SANTEE COOPER and local fire regulations.

1.21 Intoxicants

Being under the influence of or the use of intoxicating beverages or drugs on Santee Cooper 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.

1.22 Ladders

When working from a ladder, the ladder shall be securely placed, held, tied or otherwise made secure to prevent slipping or falling, and all the manufacturer's specifications will be followed.

A. General

1. Wooden ladders shall not be painted, as it might obscure a defect in the wood. Only a clear, nonconductive finish shall be used on wooden ladders.
2. All ladders shall be inspected monthly and prior to use. Ladders with weakened, broken or missing steps; broken side rails; or other defects shall be tagged and removed from service, repaired or discarded.
3. Ladders and scaffolds shall be strong enough for their intended use.
4. Only approved wood or fiberglass ladders shall be used around exposed electrical circuits.
5. Ladders shall not be placed in front of doors opening toward the ladder unless the door is open, locked, guarded or barricaded.
6. Employees shall have both hands free and shall face the ladder when ascending or descending it. Three points of contact shall be maintained.
7. 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.
8. Employees shall use only ANSI-approved ladders.
9. Ladders shall not be used as scaffold platforms.
10. Boxes, chairs and other furniture shall not be used as ladders.

B. Straight/ Extension Ladders

1. All portable straight/ extension ladders shall be equipped with nonskid bases.

2. The ladder shall be placed so that the base of the ladder and is out 1 foot for every 4 feet of height between the working surface and point of contact.
3. Employees shall not stand above the third step from the top of a straight ladder.
4. When dismantling from a ladder at an elevated position (such as a roof), the employee shall ensure that the ladder's side rails extend at least 3 feet above the dismount position or that grab bars are present.
5. Employees shall belt-off to a ladder or another secure point whenever both hands shall be used for the job or there exists a possibility of the employee falling from an elevated position.
6. Ladders shall not be spliced together to form a longer ladder.
7. A ladder shall not be placed against an unsafe support.
8. When using extension ladders, each section must overlap the adjacent section by at least 3 feet for ladders up to 36 feet and 4 feet for ladders that are 40 feet in length or longer.

C. Stepladders

1. The top step shall not be used, except for platform ladders.
2. Stepladder legs shall be fully spread when the ladder is in use.
3. Stepladders shall not be used as straight ladders.

LOAD CAPACITY*	DESCRIPTION	CSA CODE	ANSI CODE
200 lbs./91 kg	Household - Light Duty	Grade 3	Type III
225 lbs./102 kg	Tradesman and Farm - Medium Duty	Grade 2	Type II
250 lbs./113 kg	Construction and Industrial - Heavy Duty	Grade 1	Type I
300 lbs./136 kg	Construction and Industrial - Heavy Duty	Grade 1A	Type IA
375 lbs./170 kg	Construction and Industrial - Heavy Duty	Grade 1AA	Type IAA

**Includes user and materials*

1.23 Laser Systems

- A. Only certified employees shall install, adjust and operate laser equipment.
- B. Employees, when working in an area in which a potential exposure to direct or reflected laser light greater than 0.005 watts (5 milliwatts) exists, shall be provided with protective laser eyewear of the appropriate optical density.
- C. Laser equipment shall bear a label to indicate maximum output.
- D. Standard laser warning signs shall be posted in areas where lasers are used.
- E. Lasers shall be turned off or capped when not in use.
- F. Only approved methods shall be used as a detector for guiding the laser's alignment.
- G. The laser beam shall not be directed at employees.
- H. Approved eye protection shall be provided when necessary to operate a laser in rain, snow, fog or heavy-dust conditions.
- I. Employees shall not stare at or look directly into the laser beam or its mirror reflection.

1.24 Lighting

Where natural illumination is not sufficient, artificial lighting shall be used.

Temporary lighting (except 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.

1.25 Machine Guarding

- A. One or more methods of machine guarding shall be provided.
- B. Machine guards shall be designed, installed, and used in accordance with requirements in 29 CFR 1910, Subpart O, Applicable Sections.
- C. Guards shall be affixed to the machine where possible and secured elsewhere if attachment to the machine is not possible.
- D. The guard shall not offer an accident hazard in itself.
- E. The point of operation of machines, whose operation exposes an employee to injury, shall be guarded.
- F. The guarding device shall be in conformity with any appropriate standards, or, in the absence of specific standards, shall be designed, and constructed as to prevent the operator from having any part of their body in the danger zone during the operating cycle.
- G. Special hand tools for placing and removing material shall permit easy handling of material without the operator placing a hand in the danger zone. Such tools shall not be in lieu of other guarding but can only be used to supplement protection provided.
- H. The following are some of the machines that require point of operation guarding:
 1. Guillotine cutters
 2. Shears
 3. Alligator shears
 4. Power presses
 5. Milling machines
 6. Power saws
 7. Jointers
 8. Portable power tools
 9. Forming rolls and calendars
- I. Machines designed for a fixed location shall be securely anchored to prevent walking or moving.
- J. Bench Revolving drums, barrels, and containers shall be guarded by an enclosure, which is interlocked with the drive mechanism, so that the barrel, drum, or container cannot revolve unless the guard enclosure is in place.
- K. When the periphery of the blades of a fan is less than seven (7) feet above the floor or working level, the blades shall be guarded, and the guard shall have openings no larger than 0.5-inch.
- L. When power operated tools are designed to accommodate guards, the following applies:
 1. The tools shall be equipped with such guards when in use.
 2. Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other reciprocating, rotating, or moving parts of equipment shall be guarded if such parts are exposed to contact by employees or otherwise create a hazard.
 3. Guarding shall meet the requirements as set forth in ANSI B15, Safety Standards for Mechanical Power-Transmission Apparatus.
- M. On offhand grinding machines:

1. Work rests shall be used to support the work and shall be of rigid construction and designed to be adjustable to compensate for wheel wear.
2. Work rests shall be kept adjusted closely to the wheel with a maximum opening of one-eighth (1/8) inch to prevent the work from being jammed between the wheel and the rest, which may cause wheel breakage.
3. The work rest shall be securely clamped after each adjustment.
4. The adjustment shall not be made with the wheel in motion.

Note: Examples of a hazardous energy control program may include, but are not limited to: LOTO-locking or tagging of circuits, isolation devices for safety, etc.

1.25 Marine Operations (Barges, Boats, and Docks)

1.25.1 General Safe Work Practices

- A. Only qualified employees shall operate company boats.
- B. Watercrafts and workboats shall be equipped with a pair of oars and a ring buoy attached to a 90-foot coil of one-half-inch line attached to the boat and the distance between ring buoys shall not exceed 200 ft.
- C. Docks, walkways, gunwales, and end decks shall be kept clear of any debris before performing work and consistently maintained in safe condition.
- D. All marine equipment shall be inspected and certified as required under U. S. Coast Guard regulations before being placed in service.
- E. Employees shall wear US Coast Guard approved Personal Flotation Devices (PFD) while transferring to and from marine transportation and when working over water near unguarded edges.
- F. PFDs (Personal Flotation Devices) must be securely fastened when worn.
- G. Personal Flotation Devices shall be inspected prior to use and after each use for defects that would lessen their strength or buoyancy.
- H. Watercraft used as safety boats or personnel carriers shall have plainly marked thereon the maximum number of persons that can be safely carried, and the number shall not be exceeded.
- I. All watercrafts, regardless of size, should be operated according to the applicable navigational rules and regulations, and should be lighted in accordance there with.
- J. Smoking shall be prohibited during fueling operations. Each power-propelled watercraft shall be equipped with sufficient fire extinguishers to control fires.
- K. Fire extinguisher and hose stations shall be readily accessible and distinctly marked. Fire extinguishers shall be inspected, serviced, and maintained in accordance with manufacturer's recommendations

1.25.2 Barges

- A. Employees shall stay clear of barge cables while barges are being moved.
- B. When barges are moored at docks, care must be given to securing the mooring lines. The lines shall be loose enough to allow sufficient movement of the barge when there is wake from passing boats, yet they shall be tight enough to permit people to pass from dock to barge.
- C. There shall be at least one portable or permanent ladder in the vicinity of

each floating vessel on which work is being performed. The ladder shall be of sufficient length to assist employees to reach safety in the event they fall into the water.

- D. All flammable and combustible liquids, including paints and thinners, should be stored in metal lockers protected by automatic fire extinguishing systems or in NFPA approved double-walled metal cabinets.

1.25.3 Weather Considerations

- A. Weather Reports and Forecasts - Copies of all Weather Reports and Forecasts will be passed to the Barge Captain immediately after they are received and communicated to the crew.
- B. Warning of Deterioration in Weather - Weather reports include a look ahead, usually up to three days. It is this look ahead at deteriorating conditions, in association with the present situation, that is vitally important to the Barge Captain in arriving at the degree of down-weather procedure to be followed.
- C. Down-weather Criteria and Procedure
 1. The Barge Captain will issue appropriate directions based on down weather criteria
 2. Action - To assist the Barge Captain in deciding the course of action, the following steps shall be taken:
 - a. Cease all crane work by the main derrick, put boom in rack and secure. Tie down all piling hammers, commence fastening down of piling and any other bulky or heavy objects on deck.
 - b. Stop all other productive work and prepare for moving barge away from work site.
 - c. Move barge away from work site, if alongside platform, to the practical limit allowed by the working anchors. Continue to tie down all loose material on deck. Secure mobile deck crane and any other mobile plant to previously prepared tie downs. Secure and batten down all cargo hatches opening onto weather deck.
 - d. Bring working anchors into barge and move barge to leeward (sea room permitting) and anchor barge on chain anchor only. Continue all tie downs including reinforcing of any previous tie downs. Notify Construction Services Management of situation.
 - e. Seek shelter - before taking towline and getting underway for shelter, the severity of the situation shall be discussed. The Barge Captain will recommend one of the following courses of action:
 1. Remain at anchor near location.
 2. Get under tow to designated area.

1.26 Material Lifting, Carrying, Handling and Storage

- A. When physically lifting objects that cannot be safely handled, assistance shall be obtained. The right way to lift also is the easiest way. Take a firm grip, secure good footing, place your feet a comfortable distance apart, keep your back straight and lift with your legs. Move your feet; do not twist your body.
- B. There shall be a prearranged signal when two or more persons handle an object that is to be lifted, lowered, moved, or dropped.
- C. When two or more persons are carrying an object, each, if possible, should face the direction to which the object is being carried. It shall be determined in advance that there are no obstructions.

- D. Loads shall be carried so that vision is not obstructed.
- E. All materials stored in tiers shall be stacked, racked, blocked, interlocked, or otherwise secured to prevent sliding, falling, or collapsing.
- F. Aisles and passageways shall be kept clear to provide for the free and safe movement of material-handling equipment or employees.
- G. Employees required to work on stored materials in silos, hoppers, tanks, and similar storage areas shall be equipped with lifelines and harness.
- H. Non-compatible materials shall be segregated in storage.
- I. Bagged materials shall be stacked by stepping back the layers and cross keying the bags at least every 10 bags high.
- J. Materials shall not be stored on scaffolds or runways, except for supplies needed for immediate operations.
- K. Brick stacks shall not be more than 7 feet in height. When a loose brick stack reaches a height of 4 feet, it shall be tapered back 2 inches in every foot of height above the 4-foot level.
- L. When masonry blocks are stacked higher than 6 feet, the stack shall be tapered back one-half block per tier above the 6-foot level.
- M. Used lumber shall have all nails withdrawn before stacking. Lumber shall be stacked on level and solidly supported sills, not to exceed 20 feet in height unless handled manually. then shall not be more than 16 feet high.
- N. Structural steel, poles, pipe, bar stock and other cylindrical materials, unless racked, shall be stacked, and blocked.
- O. Only approved lifting devices shall be used to lift distribution transformers. Unshouldered bolts are not an approved device.
- P. Whenever materials are dropped more than 20 feet to any point lying outside the exterior walls of a building, an enclosed chute of wood or equivalent material shall be used.
- Q. When debris is dropped through holes in the floor, without the use of chutes, the area onto which the material is dropped shall be completely enclosed with barricades. The barricades shall not be less than 42 inches high and not less than 6 feet back from the projected edge of the opening above. Signs warning of the hazard of falling materials shall be posted at each lower level. Removal shall not be permitted in this lower area until handling of debris ceases above.

1.27 Forklifts and Powered Industrial Trucks

1.27.1 General Requirements

- A. Only trained and authorized operators shall be permitted to operate forklifts.
- B. Training shall be in accordance with 29 CFR 1910.178 (I).
- C. Unauthorized personnel shall not be permitted to ride on forklifts.
- D. An unattended forklift shall have the load engaging means fully lowered, controls neutralized, power shut off, and brakes set. On an incline, the brakes shall be set, and the wheels blocked.
- E. A safe distance shall be maintained from the edge of ramps or platforms while operating on any elevated dock.
- F. Brakes shall be set, and wheels blocked on trucks, trailers or railroad cars while loading or unloading.
- G. The forklift shall have an overhead guard for protection against falling objects.
- H. The following are requirements for personnel safety platform:

- a. Personnel safety platform shall be firmly secured to lifting carriage and/or forks
- b. personnel on platform shall have the means to shut off power to the forklift.
- c. Forklifts shall not be moved horizontally while personnel are in the platform.
- d. Forklift operator shall remain in control of the forklift while personnel is aloft.
- e. Personal fall protection shall be worn while in the platform.
- I. Employees are prohibited from walking under elevated forks or approved attachments.
- J. Slings and other rigging equipment shall only be used by manufacturer approved devices.
- K. All modifications shall require written approval from the manufacturer.

1.27.2 Inspection

- A. A pre-operation safety inspection shall be performed at the beginning of each shift by the operator.
- B. A forklift shall be tagged and taken out of service when defects affecting safe operation are found.
- C. Only certified mechanics are permitted to perform repairs.

1.27.4 Fuel Handling and Storage

- A. The storage and handling of liquid fuels such as gasoline and diesel shall be in accordance with NFPA Flammable and Combustible Liquids (NFPA No. 30).
- B. The storage and handling of liquefied petroleum gas fuel shall be in accordance with NFPA Storage and Handling of Liquefied Petroleum Gases (NFPA No. 58).

1.27.5 Changing and Charging Batteries

- A. Charging of batteries shall be in approved locations.
- B. Facilities shall be provided for flushing and neutralizing spilled electrolyte, for fire protection, for protecting charging apparatus from damage and for adequate ventilation for dispersal of fumes gassing batteries.
- C. Appropriate lifting equipment shall be provided for handling batteries.
- D. Reinstalled batteries shall be secured to forklift.
- E. Smoking shall not be permitted in battery charging areas.
- F. Precautions shall be taken to prevent open flames, sparks, or electric areas in battery charging areas.
- G. Tools and other metallic objects shall be kept away from the top of uncovered batteries.
- H. Appropriate personal protective equipment will be provided and worn by employees assigned to changing and charging batteries. This equipment may include, but is not limited to:
 1. Eye protection - safety goggles and a face shield
 2. Protective barrier cream
 3. Protective clothing and boots
 4. Protective gloves
 5. Respiratory protection

1.28 Office Safety

- A. Employees shall report all injuries, regardless of severity, to their supervisor as soon as possible.
- B. Employees shall walk with care and shall use handrails when using stairways.
- C. Employees shall walk on the right-hand side of hallways and stairs. Caution shall be exercised when walking around corners and in hallways.
- D. Desk drawers 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.
- F. Due caution shall be used when sitting in chairs. Do not tilt back or sit on the edge of chairs.
- G. Standing on boxes, chairs, or makeshift support to reach overhead objects is prohibited.
- H. Good housekeeping practices shall be observed. Slipping, tripping, and falling hazards shall be removed or barricaded.
- I. Clothing and other items should not be stored behind office doors for extended periods of time.
- J. Hallways and aisles shall not be obstructed.
- K. 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.
- L. Emergency exits and emergency equipment (i.e., Fire extinguishers, fire hoses, etc.) shall be clear of obstruction.
- M. Materials shall be stored securely on shelves; heavier objects shall be placed on lower shelves.
- N. Employees shall not use ventilating fans unless the blades are properly guarded, and the fan is securely placed. Do not place fans in aisles and walkways.
- O. Only qualified individuals shall clean, oil, or adjust any machine. 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. All electrical cords shall be properly identified, protected, and covered when crossing a walking path as to not create a tripping hazard. Do not use frayed, cut or cracked electrical cords.
- Q. Do not plug multiple electrical cords into a single outlet. Do not use extension or power cords that have the ground prong removed or broken off.
- R. Pointed objects with the points exposed, such as knives, scissors, pens and pencils, shall not be carried by a person through congested areas.
- S. Special care shall be exercised in the disposal of broken glass or other sharp objects. Do not place in waste receptacles unless covered and properly protected.
- T. Solvents and other volatile or toxic substances shall be used only with adequate personal protection or in well-ventilated areas.
- U. 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.
- V. Unsafe electrical cords, faulty electrical or other equipment, or any other hazardous condition shall be reported.
- W. 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.

- X. Cigarettes, cigars, and other burning materials shall not be placed in wastepaper containers. Santee Cooper is smoke-free in buildings and fleets.
- Y. Common or sharp-pointed pins shall not be used for fastening paper together. Staples, paper clips, or other approved fasteners shall be used.

1.28.1 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.
 7. Video display terminal users shall adjust position frequently to avoid muscle stiffness.

1.29 Rigging Equipment for Material Handling

1.29.1 General

- A. Rigging equipment for material handling shall be inspected prior to use on each shift and as necessary during its use to ensure that it is safe. Defective rigging equipment shall be repaired or discarded.
- B. Rigging equipment shall not be loaded in excess of its recommended safe working load.
- C. Rigging equipment, when not in use, shall be removed from the immediate work area to eliminate any hazard to employees.
- D. Custom-designed grabs, hooks, clamps or other lifting accessories for such units as modular panels, prefabricated structures and similar materials shall be marked to indicate the safe working load. These lifting accessories shall be proof-tested prior to initial use to 125% of their rated load by the manufacturer.
- E. A colored durable tag shall be placed on lifting components (excluding shackles, eye bolts and turn buckles) so it is readily apparent the component has been inspected for the current year. The color of the tag shall be changed between annual inspections. The color of the tag being used shall be noted in the inspection documentation.

1.29.2 Alloy Steel Chains

- A. Welded alloy steel chain slings shall have permanently affixed, durable identification that states size, grade, rated capacity, and sling manufacturer.
- B. Hooks, rings, oblong links, pear-shaped links, welded or mechanical coupling links, or other attachments, when used with alloy steel chains, shall have a rated capacity at least equal to that of the chain.

- C. Job or shop hooks and links, or makeshift fasteners formed from bolts, rods, or other such chain attachments, shall not be used unless tested by a qualified person and so labeled
- D. Rated capacity (working load limit) for any alloy steel chain sling shall conform to the values shown in the Data Section.
- E. Whenever wear at any point in the chain link exceeds Data Section wear standards, the assembly shall be repaired or discarded.

1.29.3 Rope (wire, synthetic and fiber)

- A. The Data Section or the manufacturer's label shall be used to determine the safe working loads of various sizes and classifications of improved plain steel wire rope slings with various types of terminals. For sizes, classifications and grades not included in these tables, the safe working load recommended by the manufacturer for specific, identifiable products shall be followed. A safety factor of not less than five times the working load must be maintained.
- B. Protruding ends of strands in splices on slings and bridles shall be covered or blunted.
- C. The following limitations shall apply to the use of wire rope:
 1. Any eye splice made in any wire rope shall have not less than three full tucks. However, this requirement shall not preclude the use of another form of splice or connection that can be shown to be as efficient and that is not otherwise prohibited.
 2. Each wire rope used in hoisting or lowering, or in pulling loads, shall consist of one continuous piece without a knot or splice. The only exception is for eye splices in the ends of wires and for endless rope slings.
 3. Eyes in wire rope bridles, slings or bull wires shall not be formed by wire rope clips or knots.
 4. Wire rope shall not be used if there exists 10 randomly distributed broken wires in one strand in one rope or five broken wires in one strand in one rope lay. Refer to ASME standard B30.9.
- D. When U-bolt wire rope clips are used to form eyes, the Data Section shall be used to determine the number and spacing of clips. When used for eye splices, the U-bolt shall be applied so that the U section is in contact with the dead end of the rope.

1.29.4 Fiber and Synthetic Rope

- A. Rope shall not be dragged over rough or sharp objects. (softeners)
- B. Short bends should be avoided over sharp-edged surfaces or when lifting.
- C. Kinks shall be removed before any strain is applied.
- D. Rope shall be dried and stored properly, free from mechanical damage and excessive heat and dryness.
- E. Rope shall be examined prior to use for cuts, worn spots, burns and rot. The outward appearance of the rope shall not be accepted as proof of quality or strength. The rope shall be untwisted at various places and inspected for poor fiber and dry rot.
- F. Hand lines shall be a minimum of a half-inch in diameter and have a minimum strength of 2,650 pounds. Any rope subjected to a shock load shall be tagged as such and retested.

1.29.5 Shackles, Hooks and Eyebolts

- A. The Data Section shall be used to determine the safe working loads of various sizes of shackles, hooks, and eyebolts. Higher safe working loads are permissible when recommended by the manufacturer for specific, identifiable products, provided that a safety factor of not less than five times the working load is maintained.
- B. The manufacturer's recommendations shall be followed in determining the safe working loads of the various sizes and types of specific and identifiable hooks and eyebolts. All hooks and eyebolts for which no applicable manufacturer's recommendations are available shall be tested to twice the intended safe working load before they are initially used. A record of the date and results of such tests shall be maintained.

1.29.6 Synthetic Webbing Slings

- A. Before use, be sure the sling capacity tag is in place and readable.
- B. Always protect the sling from cuts; avoid sharp edges and corners, pointed objects and rough surfaces.
- C. Never expose the sling to temperatures above 194° F.
- D. Never tie knots in sling webbing.
- E. Never pull objects that are stuck or snagged.
- F. Never use near acids with nylon or alkalis with polyester slings.
- G. Remove the sling from service if:
 1. The red core yarn is visible.
 2. The sling's rated-capacity tag is missing or not readable.
 3. There is any visible damage to the sling.

1.29.7 Taglines

- A. Taglines should be used to stabilize a suspended load that might otherwise rotate or swing in an uncontrolled fashion.
- B. If taglines are utilized, personnel holding the tag line must be wearing gloves (leather or similar).
- C. Taglines should not be used in the following situations:
 1. Near powerlines or other areas where the potential for electrical contact could be made (i.e., substations, etc.).
 2. In tight circumstances where personnel cannot move freely to respond to changes in the load position.
 3. In unsafe conditions (i.e., loads too heavy to control, elevated wind speeds, etc.).

1.30 Safe Supports and Scaffolds

- A. No employee, material or equipment shall be supported or permitted to be supported on any portion of a tree, a pole structure, scaffolding, a crane or derrick, or another structure without it first being inspected. The inspection shall determine that such support is adequately strong and properly secured in place.
- B. The footing or anchorage 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.
- C. Employees shall not use a scaffold from 4 to 10 feet in height that has a minimum horizontal dimension of less than 45 inches unless proper guardrails are present to provide employee protection.

- D. Employees shall not use a scaffold over 10 feet in height unless the scaffold has a standard guardrail with a mid-rail and a toe-board to provide adequate employee protection.
- E. Where persons are required to work or pass under a scaffold, the scaffold shall have a screen between the toe-board and the guardrail, extending along the entire opening.
- F. Scaffolds and their components shall be capable of supporting without failure at least four times the maximum intended load.
- G. Except for designed metal scaffolding, all planking, or metal platforms shall be overlapped a minimum of 12 inches or secured from movement.
- H. Employees shall use an access ladder or equivalent safe means to gain access.
- I. Scaffold planks shall extend over their end supports not less than 6 inches or more than 12 inches.
- J. No welding, burning, riveting or open-flame work shall be performed on any staging suspended by means of fiber or synthetic rope.

1.31 Safety Barricades and Barriers

- A. Use a type of barricade that is appropriate for the hazard and the expected duration of the work. For example, barricade tape may not be appropriate for a long-term outdoor project as it is harder to maintain and subject to the elements.
- B. Ensure barricades are set up and maintained in such a way that they are effective in warning workers of the hazard.
- C. Understand the hazards and how to protect yourself before entering any barricaded area.
- D. Remove the barricade when the hazard for which the barricade exists is eliminated.
- E. Never use conductive barricades around energized electrical equipment.
- F. Post an appropriate sign or tag such as DANGER or CAUTION identifying the person in charge, the hazard, and contact phone number in areas where barricades are used.
- G. Ensure safety signs or tags used to warn of a specific hazard are consistent in language and design (i.e., the same hazard barricaded in various parts of the plant shall have the same signage at each location).
- H. Use the guidance in the safety signs and signal words section of this manual to ensure wording and signage is correct and consistent
- I. Position barricade tape to alert the viewer in sufficient time to take appropriate evasive actions to avoid the hazard.
- J. Install barricade tape so that it is legible, non-distracting, and does not create another hazardous condition.
- K. Ensure barricade tape can withstand the environment to which it is exposed. Replace damaged or ineffective barricade tape immediately.
- L. Where Caution (yellow and black) barricade tape is being used:
 - 1. Post a sign or tag identifying the hazard if the area is not immediately occupied and controlled by the work group using the barricade tape.
 - 2. Signs or tags shall be readily visible at all points of potential access.
 - 3. Employees crossing caution tape shall read the caution tag or sign instructions and understand the hazards and steps necessary to protect themselves before crossing the tape.
- M. Where Danger (red and black) barricade tape is being used:

- 1. If hazards involving fall potential such as floor and wall openings are left unattended for any reason, a barricade with a DANGER sign must be used to alert employees of the hazard. This shall be used as a temporary solution only and not as a substitute for an approved railing, floor hole covers, or a hole watch.
- 2. Do not use red and black barricade tape for demarcating areas that are considered an occupational illness hazard such as high noise areas.
- N. Before crossing red and black danger taped areas:
 - 1. Obtain permission from the posting work group; and,
 - 2. Obtain a briefing on and fully understanding the hazards inside the boundary as well as how to avoid these hazards.
- O. The person responsible for establishing a restricted area tape as described in (b) or (c) above shall attach a tag or sign to the tape in a prominent location. The tag or sign shall include the name of the responsible person, the nature of the hazard and the date the barrier was established.

1.32 Smoking

- A. Smoking and open flames are not permitted where flammable, explosive gases or highly combustible materials are stored or used. The absence of "No Smoking" signs shall not be construed by the employee to permit smoking.
- B. Never discard matches, cigars, cigarettes, or any other burning substances. They shall be extinguished and placed in a proper receptacle or otherwise disposed of safely.
- C. Smoking is not permitted in fleet vehicles or enclosed equipment.

1.33 Tailgate Meeting/Toolbox Talk

- A. The employer shall ensure that the employee in charge conducts a thorough, documented tailgate meeting with the employees involved before they start each job. The briefing shall cover at least the following subjects:
 - 1. Hazards associated with the job.
 - 2. Work procedures involved.
 - 3. Special precautions.
 - 4. Energy-source control.
 - 5. Personal protective equipment requirements.
 - 6. Methods for emergency notification.
- B. If the work or operations to be performed during the workday 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 that might affect the safety of the employees occur during the course of the work. Significant changes such as work tasks or hazards differing, or additional un-briefed personnel arriving to perform work at the jobsite shall be addressed with a job briefing.
- 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.

1.34 Tools

1.34.1 Fuel Powered Tools

- A. All fuel-powered tools shall be stopped while being refueled, serviced, or maintained. Fuel shall be transported, handled, and stored in accordance with fire-prevention section instructions of the SDS.
- B. Fuel-powered tools shall not be used in enclosed or confined spaces without adequate ventilation.
- C. Flammable liquids shall be handled, transported, and stored only in approved containers and locations. Metal-to-metal contact shall be maintained while pouring gasoline from one container to another.
- D. Under no circumstances shall gasoline be used for cleaning.

1.34.2 Chainsaws

All personnel operating a chainsaw are required to be trained on the Safe Operating procedures and the required PPE, prior to use.

- A. Before Starting a Chainsaw
 - 1. Check controls, chain tension, and all bolts and handles to ensure that they are functioning properly and that they are adjusted according to the manufacturer's instructions.
 - 2. Make sure that the chain is always sharp and that the oil tank is full.
 - 3. Start the saw on the ground or on another firm support. Drop starting is never allowed.
 - 4. Start the saw at least 10 feet from the fueling area, with the chain's brake engaged.
- B. Fueling a Chainsaw
 - 1. Use approved containers for transporting fuel to the saw.
 - 2. Dispense fuel at least 10 feet away from any sources of ignition when performing construction activities. No smoking is allowed during fueling.
 - 3. Use a funnel or a flexible hose when pouring fuel into the saw.
 - 4. Never attempt to fuel a running or HOT saw.
- C. Chainsaw Safety
 - 1. Clear away dirt, debris, small tree limbs and rocks from the saw's chain path. Look for nails, spikes or other metal in the tree before cutting.
 - 2. Shut off the saw or engage its chain brake when carrying the saw on rough or uneven terrain.
 - 3. Keep your hands on the saw's handles and maintain balance while operating the saw.
 - 4. Proper personal protective equipment must be worn when operating the saw, which includes hand, foot, leg (chaps), eye, face (mesh face shield), hearing and head protection.
 - 5. Do not wear loose-fitting clothing.
 - 6. Be careful that the trunk or tree limbs will not bind against the saw.
 - 7. Watch for branches under tension; they may spring out when cut.
 - 8. Gasoline-powered chainsaws must be equipped with a protective device that minimizes chainsaw kickback.
 - 9. Be cautious of saw kickback. To avoid kickback, do not saw with the tip. Keep tip guard in place
 - 10. Personnel using chain saws shall be trained in the use of

equipment.

- 11. Inspection shall be completed prior to each use.
- 12. Face and eye protection, hand protection, footwear that meets ASTM standard F2413 for the latest year, hearing protection and a hard hat shall be worn. Chain-saw-resistant leg protection shall be worn while operating a chain saw during ground operations.
- 13. The operator shall follow the chain saw manufacturer's safe operating procedures.

1.34.3 Hand Tools

- A. All tools, regardless of ownership, shall be of an approved type and maintained in good condition.
- B. Defective tools shall be tagged to prevent their use, or they shall be removed from the job site.
- C. Employees shall always use the proper tool for the job to be performed. Makeshift and substitute tools shall not be used unless they have been approved and meet all requirements.
- D. Hammers with metal handles, screwdrivers with metal continuing through the handles, and metallic measuring tapes shall not be used on or near energized electrical circuits or equipment.
- E. Tools that can fall through grates or other openings shall never be placed unsecured on elevated places or on uncovered gratings.
- F. Impact tools, such as chisels, punches and drift pins, that become mushroomed or cracked shall be properly dressed, repaired or replaced before further use.
- G. Tools shall be used only for the purposes for which they have been approved.
- H. 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.
- I. Homemade or modified tools shall not be used.

1.34.4 Hydraulic Tools

- A. Hydraulic fluid used in hydraulic power tools must be an approved fire-resistant fluid.
- B. The manufacturer's recommended safe operating pressures for hoses, valves, pipes, filters and other fittings shall not be exceeded.
- C. If damage to hoses is likely an armored hose shall be used.
- D. The stop limit/maximum travel range shall not be exceeded.
- E. Manufacturer's load limits shall be permanently and prominently marked on the tool.
- F. Hydraulic tools used where it can contact exposed, energized parts shall be designed and maintained for such use.
- G. All manufacturer's recommendations shall be followed.
- H. Load limits shall not be exceeded.
- I. Hydraulic tools shall be loaded in such a manner to prevent slippage.
- J. Force shall be applied evenly during operations.
- K. Users shall ensure the surface/object to which force is being applied is able to withstand the force.
- L. Personnel shall be positioned out of the line-of-fire while hydraulic tools are being operated.
- M. Hydraulic tools shall not be used for supporting loads. Once a load is lifted it shall be immediately blocked.

- N. Pressure shall be released before connections are broken.
- O. Hoses shall not be kinked to relieve pressure for disconnecting.
- P. Employees shall not use any part of their bodies to find or stop a hydraulic leak.
- Q. Visual and operational inspections shall be completed prior to use, and every 6 months at a minimum.
- R. Hydraulic tools subjected to abnormal loads or shock must be inspected before and immediately after use.
- S. Hydraulic hoses shall be inspected prior to use.

1.34.5 Pneumatic Tools

- A. Compressed air and compressed-air tools shall be used with caution and only for the work for which they were intended.
- B. Pneumatic tools shall never be pointed at another person.
- C. Pneumatic power tools shall be secured to the hose or whip by positive means to prevent the tools 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. When using a blowgun, the compressed air shall be reduced to 30 pounds per square inch or less. The gun shall be operated only with effective chip-guarding and protective equipment.
- F. Compressed air shall not be used to blow dust or dirt from your person.
- 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. Before adjusting or changing air tools, the air shall be shut off at the air-supply valve ahead of the hose. (The only exception is if the tool is equipped with quick-change connectors.) The hose shall be bled at the tool before breaking the connection.
- J. Pneumatic tools shall be operated only by employees who are qualified.
- K. Eye protection, foot protection and other protection devices shall be worn when the supervisor or employee deems that this protection is necessary to reduce the possibility of injury. (Risk Assessment)
- L. The use of a metal-reinforced hose shall be avoided near energized electrical equipment. When this type of hose is used, proper clearances shall be maintained.

1.34.6 Portable Electric Tools

- A. The non-current-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 isolated transformer or other insulated power supply, such as a 24-volt direct-current system.
- B. All powered tools shall be examined prior to 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 manufacturer's instructions.

- D. All tools shall be kept in good repair by a qualified person. All tools shall be disconnected from the power source while repairs or adjustments are being made.
- E. Electrical tools shall not be used where there is a hazard of flammable vapors, gases or explosive dusts.
- F. All electric tools with magnetic bases when used in position shall have a safety line attached to them. This will prevent falling because of a power interruption or failure of the magnetic base.

1.34.7 Powder- Actuated Tools

- A. Only employees who have been trained in the operation of the particular tool in use shall be allowed to operate a powder-actuated tool.
- B. The tool shall be tested each day before the loading to see that safety devices are in proper working condition. The method of testing shall be in accordance with the manufacturer's recommended procedure.
- C. Any tool not in proper working order, or that develops a defect during use, shall be immediately removed from service. The tool shall be tagged until it is properly repaired.
- D. Tools shall be maintained in good condition and serviced regularly by qualified individuals. The material upon which these tools are to be used shall be examined before work is started. This is done to determine the material's condition and to eliminate the possibility of hazard.
- E. The operator shall ensure that all protective devices are in place and in working order prior to the tool's use.
- F. Tools shall not be loaded until just prior to the intended firing time. Neither loaded nor empty tools are to be pointed at anybody. Hands shall be kept clear of the open barrel end.
- G. These tools shall not be used in an explosive or a flammable atmosphere.
- H. Fasteners shall not be driven into very hard or brittle materials. Such materials include, but are not limited to, cast iron, glassed tile, surface-hardened steel, glass block, rock, face brick and hollow tile.
- I. Driving into materials that are easily penetrated shall be avoided. The only exception is if such materials are backed by a substance that will prevent the pin or fastener from passing completely through and creating a flying missile hazard on the other side.
- J. Only cartridges with an explosive charge adequate for the job and for proper penetration shall be used.
- K. Tools and cartridges shall never be left unattended in the work area. Tools and cartridges should be stored in a secure room, cabinet or box when not in use.

1.34.8 Power Landscaping Tools

- A. All power lawn mowers shall be equipped with adequate guards. Employees shall ensure that all applicable guards are in place when power lawn mowers are used.
- B. The employee shall turn off the equipment and permit it to come to a complete stop and disconnect the plug wire prior to making inspections or repairs other than carburetor adjustments.
- C. When operating a power mower, the operator shall:
 1. Inspect the area and remove any foreign objects that may be struck by the mower.
 2. Avoid exposing the body in front of the discharge opening. Keep

- hands and feet clear of blade.
- 3. Mow horizontally across the face of the slope when mowing a slope or an incline.
- 4. Wear proper personal protective equipment.

1.34.9 Woodworking Tools

- A. Only qualified and authorized employees shall operate shop equipment.
- B. Each power-driven woodworking machine shall be provided with a disconnect switch that can be locked in the off position.
- C. On each machine operated by electric motors, positive means shall be provided for rendering such controls or devices inoperative while repairs or adjustments are being made to the machines they control.
- D. Waste materials shall not be removed from a saw while it is operating.
- E. Saw guards shall be used, except when grooving, dadoing or rabbeting.
- F. A push-stick, a block or another safe means shall be used in close operations on saws, jointers and sanders.

1.40 Trenching and Shoring/Excavation

At no time shall the engine of a riding-type trencher be left running without the operator being on the equipment. While the engine of a hand trencher is running, the operator shall be at the controls.

Excavations in the vicinity of known underground utilities, whether by machine or hand, shall be done with caution. When this work is to be done by hand, an employee shall use adequate eye protection, proper digging tools (nonconductive shaft), and good judgment in maintaining a sufficient distance between the metal shovel tip and his hands. Locates must be completed prior to digging.

Santee Cooper employees assigned to expose energized conductors over 600 volts, either direct burial or in plastic conduit, shall be a competent Technician. A radio for communications shall be provided at the job site. A hold tag shall be in effect for the duration of exposing conductors or conduit.

Note: This section applies to all excavation work, not just URD (Underground Residential Distribution) 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.
- E. If gas lines are damaged, the following steps shall be taken as soon as possible:

- 1. Work stops immediately. The area shall be barricaded, and the public kept out until hazardous conditions can be eliminated.
- 2. 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.
- 3. Residents of the area shall be warned when necessary, and the public kept out of the area.
- 4. The local fire department shall be notified immediately.
- 5. The gas company shall be notified at once.
- 6. 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 high visibility retro reflective 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. The trench shall only be opened to what 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. Soil type in our area will always be Type C.
- 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 or horizontally.
- 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 1-4 for soil type maximum slope requirements for excavations less than 20 feet.
- DD. "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.

Maximum Allowable Slopes for Excavations Less Than 20 Feet Deep ¹	
Soil or Rock Type	Maximum Allowable Slopes (H:V) ²
Stable Rock	Vertical (90°)
Type A ³	3/4:1 (53°)
Type B	1:1 (45°)
Type C	1 1/2:1 (34°)
<p>¹ Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.</p> <p>² Numbers in parentheses are angles expressed in degrees from the horizontal.</p> <p>³ 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°).</p> <p>Type A: A cohesive soil with an unconfined, compressive strength of 1.5 ton per square foot (tsf)(144 kPa); or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered type A.</p> <p>Type B: Cohesive soil with an unconfined strength greater than 0.5 tsf (48kPa), but less than 1.5tsf (144 kPa); or Granular cohesionless soils including; angular gravel (similar to crushed rock) silt, silt loam and in some cases silty clay loam and sandy clay loam.</p> <p>Previously disturbed soils except those that would otherwise be classified as Type C soils.</p> <p>Soils that meets the unconfined compressive strength or cementation requirements of Type A, but is fissured or subject to vibration; or dry rock that is not stable; or material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.</p> <p>Type C: Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less, or granular soils including gravel, sand and loamy sand; or submerged soil or soil from which water is freely seeping; or submerged rock that is not stable, or material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4H:1V) or steeper.</p>	

1.41 Warehouse Operations

- 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. Loads shall not be carried 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.

1.41.1 Shipping and Receiving

- A. When employees are 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 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 radiation source containers are received, the Radiation Safety Officer must be notified.

1.42 Work Area Protection

- A. Work area protection is done to safeguard employees, the public, and equipment. It involves protecting people and equipment by using a variety of items. Examples include adequate barriers, warning signs, lights, flags, traffic cones, high-level standards, barricade rope and flagmen. Work area protection shall be implemented, as the job requires, on approaches to work areas, excavations, open manholes and parked equipment. Proper work area protection shall be planned to ensure the safety of employees, the public and the equipment.
- B. Work area protection is accomplished by using good informative and protective devices. Remember that a safe installation requires using these devices in relation to where employees and equipment are involved. The use of these devices shall be coupled with proper planning, design, installation, inspection, maintenance, and common sense. It is very important that the work area be properly identified. Warning devices must mean what they are intended to mean. Warning devices should convey the message to the traveling public and all working individuals well in advance of their arrival to the work area.

- C. The public shall be warned, then regulated and guided safely through or around the work area.

1.42.1 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. Special precautions shall be taken during night operations or periods of reduced visibility. Adequate warning equipment, which may include flashing lights, flares, or area illumination, shall be used.
- D. Warning devices and equipment shall be removed when 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.

1.42.2 Flagmen

- A. Flagmen or other appropriate traffic controls shall be used if there is a doubt that signs, signals, and barricades can achieve effective protection.
- B. Flagmen shall wear an approved warning vest. Warning garments worn at night shall be of a reflective material.
- C. Flagmen using hand-signaling equipment shall ensure that signals provide sufficient warning to protect themselves and the work site.
- D. Signal flags shall be red and at least 24 inches square.
- E. Sign paddles ("Stop" and "Slow") shall be on a 6-foot staff.
- F. In periods of darkness or reduced visibility, red lights shall be used.
- G. Flagmen shall place themselves in a protected position to reduce the possibility of injury from traffic.
- H. 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
- I. When flagmen are used at both ends of a job site, reliable communications or prearranged signals shall be used to ensure proper traffic flow.
- J. Flagmen shall face traffic when giving signals.
- K. Flagmen shall give positive, direct signals that leave no doubt as to their meaning.

1.42.3 Traffic Vests

- A. Traffic vests are required when a worker is exposed to the danger of being struck by the vehicles operating near them in a work zone.
- B. Class 2 high-visibility safety apparel and traffic vests meet all the requirements while working during daylight and/or where traffic speeds are less than 50 miles per hour.
- C. Class 3 high-visibility safety apparel and traffic vests meet all the requirements while working at night or where traffic speeds exceed 50 miles per hour.

1.43 Work Area Access

- A. Employees shall observe and use unobstructed walkways to work sites.
- B. Employees shall not jump over or across obstacles to reach work sites.
- C. Employees shall not jump onto or from elevated work sites.

1.44 Vehicle Use

- A. It is the driver's responsibility to operate the vehicle in a safe manner and to drive defensively to prevent injuries and property damage.
- B. The operator is personally responsible for the safe movement and/or operation of equipment.
- C. Company vehicles are to be driven by authorized persons only, except in case of repair testing by a mechanic.
- D. Any employee who drives a fleet vehicle and who has a driver's license revoked or suspended shall immediately notify Occupational Safety, and immediately discontinue operation of the company vehicle. Failure to do so may result in disciplinary action, including termination of employment.
- E. All accidents in company vehicles, regardless of severity, must be reported to the Occupational Safety and Risk Management. Accidents are to be reported immediately (from the scene, during the same day, or as soon as practicable if immediate or same day reporting is not possible). Accidents in personal vehicles while on company business must follow these same accident procedures. Failing to stop after an accident and/or failure to report an accident may result in disciplinary action, up to and including termination of employment.
- F. Drivers must report all ticket violations received during the operation of a company vehicle, or while driving a personal vehicle on company business, within 72 hours to Occupational Safety
- G. Company business is defined as driving in the direction, or for the benefit, of employer. It does not include normal commuting to and from work.

1.44.1 Driver Criteria & Administration

- A. Employees must have a valid and current Driver's license to operate a company vehicle, or a personal vehicle with current auto insurance while on company business.
- B. Employees are expected to drive in a safe and responsible manner and to maintain a good driving record. Occupational Safety is responsible for reviewing records, including accidents, moving violations, etc., to determine if an employee's driving record indicates a pattern of unsafe or irresponsible driving, and to make a recommendation to Executive Management for suspension or revocation of driving privileges.

1.44.2 Driver Safety Rules

- A. Driving on company business and/or driving a company vehicle while under the influence of intoxicants and other drugs (which could impair driving ability) is forbidden and is sufficient cause for discipline, up to and including termination of employment. Refer to the Corporate Substance Abuse Policy for additional details.
- B. Cell phone use while driving should be kept to a minimum. Drivers need to be aware when use of the cell phone is creating a distraction from safe driving and adjust their usage, accordingly, including pulling off the road to continue/finish the conversation if needed. Whenever possible, Drivers should complete calls while the vehicle is parked and/or use the phone in a "hands free" mode via a headset or speaker. While driving, attention to the road and safety should always take precedence over conducting business over the phone.
- C. No driver shall operate a company vehicle when his/her ability to do so safely has been impaired by illness, fatigue, injury, or prescription

medication.

- D. All drivers and passengers operating or riding in a company vehicle must wear seat belts, even if air bags are available.
- E. No unauthorized personnel are allowed to ride in company vehicles.
- F. Drivers are responsible for the security of company vehicles assigned to them. The vehicle engine must be shut off, ignition keys removed, and vehicle doors locked whenever the vehicle is left unattended.
- G. All State and Local laws must be obeyed.
- H. All vehicles transporting material must comply with city, county or state laws pertaining to weight, height, length, and width. If permits are required for these loads, they shall be obtained.
- I. Seat belts are required for all operators, drivers and passengers for company owned or leased vehicles and equipment.
- J. Vehicles used to transport explosives; gasoline, fuel oils, or other flammable material will not be allowed to haul passengers other than those authorized by supervision.
- K. Smoking will not be allowed on, in or within 50 feet of vehicles hauling fuel oils, gasoline or explosives.
- L. No person should be permitted to ride in a standing position on the body, or on running boards or seated on side fenders, cabs, cab shields, rear of truck bed, or on the load.
- M. No personnel shall be permitted to get off or on moving vehicles or equipment.
- N. Personnel shall not ride on trailers.
- O. All vehicles shall be equipped with the appropriate safety and emergency equipment, such as fire extinguisher and first aid kit. Additional equipment such as traffic cones, signs, flares, and reflectors should be equipped as needed.
- P. No vehicle shall be driven at a speed greater than is reasonable and proper, with due regard for weather, traffic, intersections, width and character of the roadway, type of motor vehicles, and any other existing condition.
- Q. No equipment will be operated beyond its safe load or operational limits.

1.44.3 Commercial Driver's License (CDL)

- A. Certain positions within the company require the employee to obtain their commercial driver's license to comply with the Federal Commercial Motor Vehicle Safety Act of 1986 and South Carolina's Commercial Driver's License Act. Refer to the Santee Cooper Commercial Driver's license program for additional information.

1.44.4 Defensive Driving Guidelines

- A. Drivers are required to always maintain a safe following distance. Drivers should keep a two second interval between their vehicle and the vehicle immediately ahead. During slippery road conditions, the following distance should be increased to at least four seconds. If you are towing a trailer and driving below 40 mph, you should leave at least one second for every 10 feet of vehicle length. For a typical tractor-trailer, this results in 4 seconds between you and the leading vehicle. For speeds over 40 mph, you should leave one additional second.
- B. Drivers must yield the right of way at all traffic control signals and signs requiring them to do so. Drivers should also be prepared to yield for safety's sake at any time. Pedestrians and bicycles in the roadway always

have the right of way.

- C. Drivers must honor posted speed limits. In adverse driving conditions, reduce speed to a safe operating speed that is consistent with the conditions of the road, weather, lighting, and volume of traffic. Tires can hydroplane on wet pavement at speeds as low as 40 mph.
- D. Radar Detectors are strictly prohibited in company Vehicles. Drivers are to drive at the speed of traffic but never to exceed the posted speed limit.
- E. Turn signals must be used to show where you are heading, while going into traffic and before every turn or lane change.
- F. When passing or changing lanes, view the entire vehicle in your rear-view mirror before pulling back into that lane.
- G. Be alert of other vehicles, pedestrians, and bicyclists when approaching intersections. Never speed through an intersection on a caution light. When the traffic light turns green, look both ways for oncoming traffic before proceeding.
- H. When waiting to make left turns, keep your wheels facing straight ahead. If rear ended, you will not be pushed into the lane of oncoming traffic.
- I. When stopping behind another vehicle, leave enough space so you can see the rear wheels of the car in front. This allows room to go around the vehicle if necessary and may prevent you from being pushed into the car in front of you if you are rear-ended.

1.44.5 Safety Cone Policy

- A. A safety cone is required to be placed at the rear of parked fleet vehicles. The placement and removal of the cone provides the opportunity for the operator to survey the area at the rear of the vehicle before backing, for any structure, vehicle, or other object which the fleet might strike and cause damage. This policy does not apply to sedans or off-road heavy equipment (T classification). If fleet is backed into a space and driving forward is the only option, a cone is not required.

1.44.6 Backing

- A. Avoid backing where possible, but, when necessary, keep the distance traveled to a minimum and be particularly careful.
- B. Check behind your vehicle before backing.
- C. Back to the driver's side. Do not back around a corner or into an area of no visibility.
- D. If the employee is accompanied by an authorized passenger, the passenger shall exit the vehicle and guide the employee while he is backing the vehicle. Vehicles with back-up cameras are not exempt from this protocol.
- E. 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.
 - 6. The vehicle or equipment is backed up only when an observer signals that it is safe to do so.

1.44.7 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 or equipment must be tag "out of service" until repairs are made.
- 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

1.44.8 Exhaust Gas

- A. The driver shall not operate the engine in any garage or enclosed space 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.

1.44.9 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 Santee Cooper 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.

- L. When driving a vehicle into the Ash or Slurry ponds, the vehicle must be equipped with a rotating strobe light or equivalent.

1.44.10 Parking

- A. When vehicles must be parked on the roadway, they shall be parked facing in the direction of traffic flow, whenever possible. Backing into spaces where drive through isn't available is recommended (strongly encouraged).
- B. When parking on a roadway, vehicles shall park off the traveled road surface, whenever possible.
- 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.

1.44.11 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 as follows:
 - 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 Federal Highway Administration (FHWA) Manual on Uniform Traffic Control Devices.

1.44.12 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.

1.44.13 Accident Procedures

- A. To minimize the results of an accident, the driver should attempt to prevent further damages or injuries, whenever it is safe and possible to do so. Obtain all pertinent information and report it accurately.
- B. Call for medical aid if necessary.
- C. Call the police. All accidents, regardless of severity, must be reported to the police. If the driver cannot get to a phone, he should write a note giving

location to a reliable appearing motorist and ask him to notify the police. Use Santee Cooper installed radios for assistance in reaching emergency authorities.

- D. After securing the scene and it is safe to do so, contact your immediate supervisor.
- E. Record names and addresses of driver, witnesses, and occupants of the other vehicles and any medical personnel who may arrive at the scene.
- F. Complete the form located in the Vehicle Accident Packet. Pertinent information to obtain includes license number of other drivers; insurance company names and policy numbers of other vehicles; make, model, and year of other vehicles; date and time of accident; and overall road and weather conditions.
- G. Do not discuss the accident with anyone at the scene except the police. Do not accept any responsibility for the accident. Don't argue with anyone.
- H. Provide the other party with your name, address, driver's license number, and insurance information.
- I. Immediately report the accident to the Security and Fleet offices (what about Safety and Risk Management?). Provide a copy of the accident report and/or your written description of the accident to the Fleet office ASAP (Corporate Policy 2-10 states that the accident be reported no later than the next business day (if after hours)).
- J. There will be a formal incident review conducted on each accident to determine cause and how the accident could have been prevented.

1.45 Walking and Working Surfaces

1.45.1 Wall and Floor Openings

- A. Every wall opening from which there is a drop of more than 4-ft shall be guarded by one of the following:
 - 1. Rail, roller, picket fence, half door, or equivalent barrier. Where there is exposure below to falling materials, a removable toe board or the equivalent shall also be provided. When the opening is not in use for handling materials, the guard shall be kept in position regardless of a door on the opening. In addition, a grab handle shall be provided on each side of the opening with its center approximately 4-ft above floor level and of standard strength and mounting.
 - 2. Extension platform onto which materials can be hoisted for handling, and which shall have side rails or equivalent guards of standard specifications.
- B. One or more of the barriers shall guard every chute wall opening from which there is a drop of more than 4-ft
- C. Every window wall opening at a stairway landing, floor, platform, or balcony, from which there is a drop of more than 4-ft, and where the bottom of the opening is less than 3 feet above the platform or landing, shall be guarded by standard slats, standard grill work, or standard railing
- D. Where the window opening is below the landing, or platform, a standard toe board shall be provided.
- E. Every temporary wall opening shall have adequate guards.
- F. Where there is a hazard of materials falling through a wall hole, and the lower edge of the near side of the hole is less than 4 inches above the floor, and the far side of the hole more than 5-ft above the next lower level, the hole shall be protected by a standard toe board, or an enclosing screen

either of solid construction.

1.45.2 Guarding Floor and Wall Openings

- A. A standard railing shall guard stairway floor openings. The railing shall be provided on all exposed sides (except at entrance to stairway). For infrequently used stairways where traffic across the opening prevents the use of fixed standard railing (as when located in aisle spaces, etc.), the guard shall consist of a hinged floor opening cover of standard strength and construction and removable standard railings on all exposed sides (except at entrance to stairway).
- B. Every ladderway floor opening or platform shall be guarded by a standard railing with standard toe board on all exposed sides (except at entrance to opening), with the passage through the railing either provided with a swinging gate or so offset that a person cannot walk directly into the opening.
- C. Every hatchway and chute floor opening shall be guarded by one of the following:
 - 1. Hinged floor opening cover of standard strength and construction equipped with standard railings or permanently attached thereto to leave only one exposed side. When the opening is not in use, the cover shall be closed, or the exposed side shall be guarded at both top and intermediate positions by removable standard railings
 - 2. A removable railing with toe board on not more than two sides of the opening and fixed standard railings with toe boards on all other exposed sides. The removable railings shall be kept in place when the opening is not in use.
 - 3. Where operating conditions necessitate the feeding of material into any hatchway or chute opening, protection shall be provided to prevent a person from falling through the opening.
- D. A standard skylight screen or a fixed standard railing on all exposed sides shall guard every skylight floor opening and hole.
- E. A floor opening cover of standard strength and construction shall guard every pit and trapdoor floor opening, infrequently used. While the cover is not in place, the pit or trap opening shall be constantly attended by someone or shall be protected on all exposed sides by removable standard railings.
- F. A standard manhole cover, which need not be hinged in place, shall guard every manhole floor opening. While the cover is not in place, the manhole opening shall be constantly attended by someone or shall be protected by removable standard railings.
- G. Every temporary floor opening shall have standard railings or shall be constantly attended by someone.
- H. Every floor hole into which persons can accidentally walk shall be guarded by either:
 - 1. A standard railing with standard toe board on all exposed sides, or
 - 2. A floor hole cover of standard strength and construction. While the cover is not in place, the floor hole shall be constantly attended by someone or shall be protected by a removable standard railing.
- I. Every floor hole into which persons cannot accidentally walk (because of fixed machinery, equipment, or walls) shall be protected by a cover that leaves no openings more than 1-inch wide. The cover shall be securely held in place to prevent tools or materials from falling through.
- J. Where doors or gates open directly on a stairway, a platform shall be

provided, and the swing of the door shall not reduce the effective width to less than 20 inches.

1.45.3 Stairway Railings and Guards

- A. Every flight of stairs having four or more risers shall be equipped with standard stair railings or standard handrails. The width of the stair to be measured clear of all obstructions except handrails.
- B. On stairways less than 44-in wide having both sides enclosed, at least one handrail, preferably on the right-side descending.
- C. On stairways less than 44-in wide having one side open, at least one stair railing on open side.
- D. On stairways less than 44-in wide having both sides open, one stair railing on each side.
- E. On stairways more than 44-in wide but less than 88 inches wide, one handrail on each enclosed side and one stair railing on each open side.
- F. On stairways 88 or more inches wide, one handrail on each enclosed side, one stair railing on each open side, and one intermediate stair railing located approximately midway of the width.
- G. Winding stairs shall be equipped with a handrail offset to prevent walking on all portions of the treads having width less than 6 inches.

1.45.4 Railing, Toe-Boards, and Cover Specifications

- A. A standard railing shall consist of top rail, intermediate rail, and posts, and shall have a vertical height of 42 inches nominal from upper surface of top rail to floor, platform, runway, or ramp level. The top rail shall be smooth surfaced throughout the length of the railing. The intermediate rail shall be approximately halfway between the top rail and the floor, platform, runway, or ramp. The ends of the rails shall not overhang the terminal posts except where such overhang does not constitute a projection hazard.
- B. A stair railing shall be of construction similar to a standard railing, but the vertical height shall be not more than 34 inches or less than 30 inches from upper surface of top rail to surface of tread in line with face of riser at forward edge of tread.
- C. For wood railings, the posts shall be at least 2-inch by 4-inch stock spaced not to exceed 6 feet; the top and intermediate rails shall be of at least 2-inch by 4-inch stock. If the top rail is made of two right-angle pieces of 1-inch by 4-inch stock, posts may be spaced on 8-foot centers, with 2-inch by 4-inch intermediate rail.
- D. For pipe railings, posts and top and intermediate railings shall be at least 1-1/2 inches nominal diameter with posts spaced not more than 8 feet on centers.
- E. For structural steel railings, posts, and top and intermediate railings shall be at least 1-1/2 inches nominal diameter with posts spaced not more than 8 feet on centers.
- F. For structural steel railings, posts, and top and intermediate rails shall be of 2-inch by 2-inch by 3/8-inch angles or other metal shapes of equivalent bending strength with posts spaced not more than 8 feet on centers.
- G. The anchoring of posts and framing of members for railings of all types shall be of such construction that the completed structure shall be capable of withstanding a load of at least 200 pounds applied in any direction at any point on the top rail.
- H. Other types, sizes, and arrangements of railing construction are acceptable

provided they meet the following conditions:

1. A smooth-surfaced top rail at a height above floor, platform, runway, or ramp level of 42 inches nominal.
 2. A strength to withstand at least the minimum requirement of 200 pounds top rail pressure.
 3. Protection between top rail and floor, platform, runway, ramp, or stair treads, equivalent at least to that afforded by a standard intermediate rail.
 4. A standard toe board shall be 4 inches nominal in vertical height from its top edge to the level of the floor, platform, runway, or ramp. It shall be securely fastened in place and with not more than 1/4-inch clearance above floor level. It may be made of any substantial material either solid or with openings not over 1 inch in greatest dimension.
- I. Where material is piled to such height that a standard toe board does not provide protection, paneling from floor to intermediate rail or to top rail shall be provided.
- J. A handrail shall consist of a lengthwise member mounted directly on a wall or partition by means of brackets attached to the lower side of the handrail to offer no obstruction to a smooth surface along the top and both sides of the handrail.
- K. The handrail shall be of rounded or other section that will furnish an adequate handhold for anyone grasping it to avoid falling. The ends of the handrail shall be turned in to the supporting wall or otherwise arranged so as not to constitute a projection hazard.
- L. The height of handrails shall be not more than 34 inches or less than 30 inches from upper surface of handrail to surface of tread in line with face of riser or to surface of ramp.
- M. The size of handrails shall be:
1. When of hardwood, at least 2 inches in diameter.
 2. When of metal pipe, at least 1-1/2 inches in diameter.
 3. The length of brackets shall be such as will give a clearance between handrail and wall or any projection thereof of at least 3 inches.
 4. The spacing of brackets shall not exceed 8 feet.
- N. The mounting of handrails shall be such that the completed structure is capable of withstanding a load of at least 200 pounds applied in any direction at any point on the rail.
- O. All handrails and railings shall be provided with a clearance of not less than 3 inches between the handrail or railing and any other object.
- P. Floor opening covers may be of any material that meets the following strength requirements:
1. Trench or conduit covers and their supports, when located in plant/facility roadways, shall be designed to carry a truck rear-axle load of at least 20,000 pounds.
 2. Manhole covers and their supports, when located in plant/facility roadways, shall comply with local standard highway requirements, if any; otherwise, they shall be designed to carry a truck rear-axle load of at least 20,000 pounds.
 3. The construction of floor opening covers may be of any material that meets the strength requirements. Covers projecting not more than 1 inch above the floor level may be used providing all edges are chamfered to an angle with the horizontal of not over 30 degrees. All hinges, handles, bolts, or other parts shall set flush with the floor or

cover surface.

- Q. Skylight screens shall be of such construction and mounting that they are capable of withstanding a load of at least 200 pounds applied perpendicularly at any one area on the screen. They shall also be of such construction and mounting that under ordinary loads or impacts, they will not deflect downward sufficiently to break the glass below them. The construction shall be of grillwork with openings not more than 4 inches long or of slat work with openings not more than 2 inches wide with length, unrestricted.
- R. Wall opening barriers (rails, rollers, picket fences, and half doors) shall be of such construction and mounting that, when in place at the opening, the barrier is capable of withstanding a load of at least 200 pounds applied in any direction (except upward) at any point on the top rail or corresponding member.
- S. Wall opening grab handles shall be not less than 12 inches in length and shall be so mounted as to give 3 inches clearance from the side framing of the wall opening. The size, material, and anchoring of the grab handle shall be such that the completed structure is capable of withstanding a load of at least 200 pounds applied in any direction at any point of the handle.
- T. Wall opening screens shall be of such construction and mounting that they are capable of withstanding a load of at least 200 pounds applied horizontally at any point on the near side of the screen. They may be of solid construction, of grillwork with openings not more than 8 inches long or of slat work with openings not more than 4 inches wide with length unrestricted.

1.45.5 Protection of Open-Sided Floors, Platforms, and Runways

- A. A standard railing or the equivalent on all open sides except where there is entrance to a ramp, stairway, or fixed ladder shall guard every open-sided floor or platform 4-ft or more above adjacent floor or ground level. The railing shall be provided with a toe-board wherever, beneath the open sides,
1. persons can pass,
 2. there is moving machinery, or
 3. there is equipment with which falling materials could create a hazard.
- B. A standard railing or the equivalent on all open sides 4-ft or more above floor or ground level shall guard every runway. Wherever tools, machine parts, or materials are likely to be used on the runway, a toe-board shall also be provided on each exposed side.
- C. Runways used exclusively for special purposes may have the railing on one side omitted where operating conditions necessitate such omission, providing the falling hazard is minimized by using a runway of not less than 18 inches wide. Where persons entering upon runways become exposed to machinery, electrical equipment, or other danger that is not a falling hazard, additional guarding may be essential for protection.
- D. Regardless of height, open-sided floors, walkways, platforms, or runways above or adjacent to dangerous equipment shall be guarded with a standard railing and toe-board.

Section 2
Distribution and Transmission Operations

2.1 Clothing

2.1.1 General

- A. Santee Cooper shall ensure that each employee exposed to hazards from electric arcs wears protective clothing and other protective equipment with an arc rating greater than or equal to the estimated heat energy whenever that estimate exceeds 2.0 cal/cm². This protective equipment shall cover the employee's entire body, except as follows:
1. Arc-rated protection is not necessary for the employee's hands when the employee is wearing rubber insulating gloves with protectors or, if the estimated incident-energy is no more than 14 cal/cm², heavy-duty leather work gloves with a weight of at least 407 gm/m² (12 oz/yd²).
 2. Arc-rated protection is not necessary for the employee's feet when the employee is wearing heavy-duty work shoes or boots.
 3. Arc-rated protection is not necessary for the employee's head when the employee is wearing head protection meeting OSHA Standard 29 CFR 1910.135 if the estimated incident-energy is less than 9 cal/cm² for exposures involving single-phase arcs in open air or 5 cal/cm² for other exposures.
 4. The protection for the employee's head may consist of head protection meeting 29 CFR 1910.165 and a face shield with a minimum arc rating of 8 cal/cm² if the estimated incident-energy exposure is less than 13 cal/cm² for exposures involving single-phase arcs in open air or 9 cal/cm² for other exposures.
 5. For exposures involving single-phase arcs in open air, the arc rating for the employee's head and face protection may be 4 cal/cm² less than the estimated incident-energy.
- B. Where there is exposure to live lines, cables, stations, or equipment, NESC tables are given as a guideline for evaluation of flame resistant and flame-retardant clothing. In accordance with NESC Section 41.410. A.3., General Requirements, Santee Cooper shall ensure that an assessment is performed to determine potential exposure to an electric arc for employees who work on or near energized lines, parts, or equipment. If the assessment determines a potential exposure greater than 2 calories per centimeter squared (cal/cm²) exists, Santee Cooper shall estimate arc exposure values based on the fault current and work practice separation distance from the arc to the employee. Santee Cooper uses this detailed arc hazard analysis, to determine the effective arc rating of clothing or a clothing system to be worn by employees working on or near energized lines, parts, or equipment at voltages 50 V to 800,000 V.
- C. The wearing of short pants when performing any type of electrical line work is prohibited.
- D. 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. When working on or near energized conductors or equipment the employee shall ensure that Flame Retardant shirts are tucked inside pants and sleeves are rolled down and buttoned to prevent accidental injury

under the shirt due to an arc.

- E. Employees shall not wear any clothing made from acetate, nylon, polyester or polypropylene unless arc rated, and shall not wear an outer layer of clothing that could ignite and continue to burn when exposed to flames or the electric arc identified in the assessment
- F. Conductive jewelry 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.
- G. 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.
- H. Due to the potential for heat-related illness when wearing protective clothing in ambient temperatures greater than 78° F, Santee Cooper should provide employees additional awareness materials regarding the recognition and prevention of signs and symptoms of heat-related illness (Refer to the American Conference of Governmental Industrial Hygienists 2012 Threshold Limit Values and Biological Exposure Indices).
- I. Employees shall refer to Santee Cooper policies for additional clothing requirements, including manufacturer recommendations for use and care.
- J. Santee Cooper consults the National Electrical Safety Code requirements and the NFPA 130.7(C) and OSHA 191.269 for information on clothing and arc-flash protection systems.

Clothing and Clothing Systems (cal per cm ²) for Voltages 50 V to 1000 V (ac) ¹ (NESC Rule 410)			
Equipment Type	Nominal Voltage Range and cal/cm ²		
	50 V to 250 V	251 V to 600 V	601 V to 1000 V
Self-contained meters/cabinets	4 ²	20 ⁴	30 ⁸
Pad-mounted transformers	4 ⁹	4 ⁹	6 ⁸
CT meters and control wiring	4 ²	4 ⁵	6 ⁸
Metal-clad switchgear/motor control centers	8 ³	40 ⁶	60 ⁸
Pedestals/pull boxes/hand holes	4 ²	8 ⁷	12 ⁸
Open air (includes lines)	4 ²	4 ⁷	6 ⁸
Network protectors	4 ¹⁰	_11	_11
Panel boards-single phase (all)/three phase (≤100A)	4 ²	8 ¹²	12 ⁸
Panel boards-three phase (≥100 A)	4 ²	_13	_13

¹This table was developed from fault testing based on equipment type and is independent of fault current unless otherwise noted. Calculations and test data are based on an 18 in. separation distance from the arc to the employee. See IEEE Std 1584-2002. Other methods are available to estimate arc exposure values and may yield slightly different but equally acceptable results. The use of the table in the selection of clothing is intended to reduce the amount or degree of injury but may not prevent all burns.

²Industry testing on this equipment by two separate major utilities and a research institute has demonstrated that voltages 50 V to 250 V will not sustain arcs for more than 2 cycles, thereby limiting exposure to less than 4 cal/cm². (See Ref [1].)

³Value based on IEEE 1584 formula for Motor Control Centers. (Gap = 1 in) (Xd = 1.641) (18 in distance) 51 kA (Based on a 208 V, 1000 kVA, 5.3% Z, served from a 500 MVA system) Maximum duration without circuit protective device operation from industry testing (see Ref [1]) is 10 cycles: 46.5 cal/s/cm² x 0.167 s = 7.8 cal/cm².

⁴Industry testing on 480 V equipment indicates exposures for self-contained meters do not exceed 20 cal/cm².

⁵Industry testing on 480 V equipment indicates exposures for CT meters and control wiring does not exceed 4 cal/cm².

⁶Value based on IEEE 1584 formula for Motor Control Centers. (Gap = 1 in) (Xd = 1.641) (18 in distance) 12.7 kA at 480 V (worst-case energy value from testing). (See Ref [2].) Maximum duration without circuit protective device operation from tests is 85 cycles: 26.2 cal/s/cm² x 1.42 s = 37 cal/cm².

⁷Incident analysis on this equipment indicates exposures do not exceed the values in the table.

⁸Engineering analysis indicates that applying a 150% multiplier to the 480 V exposure values provides a conservative value for equipment and open air lines operating at 601 V to 1000 V.

⁹Industry testing on 480 V equipment indicates exposures on pad-mounted transformers do not exceed 4 cal/cm². (See Ref [2].)

¹⁰Industry testing on 208 V network protectors indicates exposures do not exceed 4 cal/cm². (See Ref [1].)

¹¹Industry testing on 480 V network protectors indicates arcs will not self-extinguish and heat flux rates will exceed 60 cal/cm²/s at 24 in working distance. Perform arc hazard analysis. (See Ref [2].)

¹²Industry testing on 480 V panels with non-edge mounted bus bars indicates exposures do not exceed 8 cal/cm². (See Ref [2].)

¹³Industry testing on panelboards with edge-mounted, parallel bus bars indicate arcs will not self-extinguish and heat flux rates will exceed 60 cal/cm²/s at 18 in working distance. Perform arc hazard analysis. (See Ref [2].)

¹⁴IEEE 1584 original test data indicates there is no significant difference between heat flux rates for 400 V class equipment versus 600 V class equipment.

Clothing and Clothing Systems – Voltage, Fault Current, and Maximum Clearing Time for Voltages 1.1 kV to 46 kV ⁽¹⁾ ac (NESC Rule 410A3)		
Fault Current (kA)	4 cal system	8 cal system
	Max Clearing Time (Cycles)	Max Clearing Time (Cycles)
5	46.5	93.0
10	18.0	36.1
15	10.0	20.1
20	6.5	13.0
5	27.6	55.2
10	11.4	22.7
15	6.6	13.2
20	4.4	8.8
5	20.9	41.7
10	8.8	17.6
15	5.2	10.4
20	3.5	7.1
5	16.2	32.4
10	7.0	13.9
15	4.3	8.5
20	3.0	6.1

¹These calculations are based on open air phase-to-ground arc. This table is not intended for phase-to-phase arcs or enclosed arcs (arc in a box).
These calculations are based on a 15-in separation distance from the arc to the employee and arc gaps as follows: 1 kV to 15 kV = 2 in, 15.1 kV to 25 kV = 4 in, 25.1 kV to 36 kV = 6 in, 36.1 kV to 46 kV = 9 in. See IEEE Std 4-1995.
These calculations were derived using a commercially available computer software program. Other methods are available to estimate arc exposure values and may yield slightly different but equally acceptable results. The use of the table in the selection of clothing is intended to reduce the amount or degree of injury but may not prevent all burns.

Live-Line Tool Work Clothing and Clothing Systems – Voltage, Fault Current, and Maximum Clearing Time for Voltages 46.1 kV to 800 kV(1) ac (NESC Rule 410A3) (page 1 of 2)			
Fault Current (kA)	4 cal system	8 cal system	12 cal system
	Max Clearing Time (Cycles)	Max Clearing Time (Cycles)	Max Clearing Time (Cycles)
20	18.2	36.4	54.5
30	10.2	20.4	30.6
40	6.6	13.2	19.7
50	4.6	9.2	13.9
20	9.9	19.8	29.8
30	5.7	11.4	17.1
40	3.8	7.5	11.3
50	2.7	5.4	8.1
20	12.1	24.1	36.2
30	7.4	14.9	22.3
40	5.2	10.4	15.6
50	3.9	7.8	11.7
20	11.9	23.9	35.8
30	7.4	14.8	22.2
40	5.2	10.3	15.5
50	3.9	7.8	11.6
20	13.6	27.3	40.9
30	8.4	16.8	25.2
40	5.9	11.7	17.6
50	4.4	8.8	13.2
20	26.4	52.7	79.1
30	16.2	32.4	48.6
40	11.3	22.6	34.0
50	8.5	17.0	25.5

Live-Line Tool Work Clothing and Clothing Systems – Voltage, Fault Current, and Maximum Clearing Time for Voltages 46.1 kV to 800 kV ac (NESC Rule 410A3) (page 2 of 2)			
Fault Current (kA)	4 cal system	8 cal system	12 cal system
	Maximum Clearing Time (Cycles)	Maximum Clearing Time (Cycles)	Maximum Clearing Time (Cycles)
20	23.1	46.2	69.2
30	14.2	28.4	42.6
40	10.0	19.9	29.9
50	7.5	15.0	22.4
20	25.3	50.5	75.8
30	15.6	31.2	46.8
40	10.9	21.7	32.6
50	8.2	16.3	24.5

Arc gap—calculated by using the phase-to-ground voltage of the circuit and dividing by 10. The dielectric strength of air is taken at 10 kV per inch. See IEEE Std 4-1995.
Distance from arc—calculated by using the minimum approach distance from Table 444-1 Table 441-2, and subtracting two times the assumed arc gap length, and using the following T values: 72.6 kV to 362 kV = 3.0, 362.1 kV to 550 kV = 2.4, 550.1 kV to 800 kV = 2.0.
These calculations were derived using a commercially available computer software program. Other methods are available to estimate arc exposure values and may yield slightly different, but equally acceptable results.
The use of the table in the selection of clothing is intended to reduce the amount or degree of injury but may not prevent all burns.

2.1.2 Use and Care of Rubber Gloves

Note: Santee Cooper requires the use of rubber sleeves in addition to rubber gloves when operating between phases.

A. The use of rubber gloves shall be in accordance with the table below.

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.

B. Voltage shall be considered to be phase-to-phase voltage unless all conductors except the one being

C. 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.

D. Employees shall wear rubber gloves of the proper class when any of these situations are met:

1. Working on any pole or other structure on which energized lines or equipment are located.
2. Working on lines or equipment that could be energized, or that are located close to energized lines or equipment, where an employee could make contact
3. Before the employee ascends a pole or structure, or raises an aerial device off the ground or device's cradle
4. 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.
5. 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.
6. Required by supervision.
7. 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).

8. Performing tests on cables using approved testing devices.
9. Operating manually controlled air-break switches.
10. Opening and closing manually operated oil circuit breakers.
11. 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.
12. 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:
 - a. 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.
 - b. Workers handling the butt of the pole shall wear rubber gloves whether or not cant hooks, peaveys, or slings are used.
 - c. 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.
13. 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.
14. 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.
15. Rubber gloves shall be worn when energized primary cables are moved, handled, or protected.
16. Rubber gloves shall be worn when work is performed on energized secondaries and services.
17. Rubber gloves shall be worn when working on or contacting a neutral.

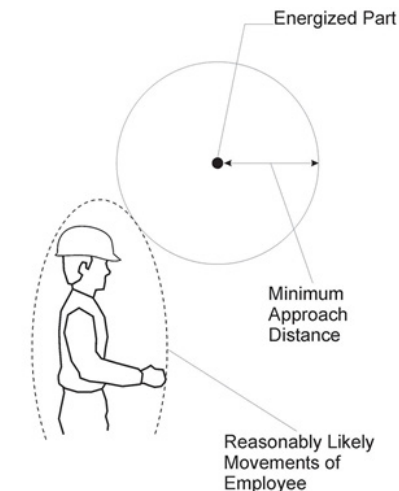
Note: Rubber gloves are not required when all of the following conditions are met:

- a) Using a dry insulated extension stick from the ground at a minimum of 20 feet.
- b) Utilizing the top 5 feet fiberglass-reinforced plastic (FRP) foam-filled tube section.
- c) The extension stick has been tested per manufacturer's recommendation.

18. 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.
19. Working on or near series street lighting circuits even though they are disconnected from the source of power.
20. Repairing series fixtures or attachments, the circuit of which is exposed to energized conductors, except where the fixtures are disconnected from the line.
21. Pulling in wires or handling other conducting materials near circuits,

- apparatus, or equipment that is or may become energized.
 - 22. 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.
 - 23. Rubber gloves with protectors shall be worn while working on the system common neutral.
- E. Santee Cooper requires rubber glove use to be ground to ground, cradle to cradle, and lock to lock in URD situations. The following are exceptions to this:
1. A rubber-glove(s) shall only be removed if it is absolutely necessary and only after notifying a co-worker by saying "Glove Off", that co-worker shall watch the employee to ensure the rubber-glove(s) are back on before beginning to work, and/or before entering the live-line work zone.
 2. Momentary removal of one glove to retrieve small items from down within the bucket and/or from a ditty bag is acceptable
 3. Momentary removal of both gloves is acceptable only after backing out of the live-line work zone, outside of extended reach minimum 10 feet.)
 4. Riser pole cable prep at the top of the pole (employees should drop below neutral before removing gloves to make up the terminators).
 5. During rental/street light repair (employees should de-energize circuitry before removing gloves).
 6. During CT installations.
 7. While operating a chainsaw.
 8. Nailing conduit straps to a pole.
 9. Installing, repairing, or climbing over "bird wire."
 10. Other situations as determined by a documented Risk Assessment.
- F. When using live-line tools that have been tested and are the primary protection, as a minimum requirement rubber gloves shall be put on before the employee comes within falling or reaching distance (based on the AC Live-Line Work Minimum Approach Distance) of unprotected energized circuits or equipment 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 equipment.

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



Maintaining the Minimum Approach Distance – OSHA 1910.269.

- G. 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. If rubber gloves are used without proper protector gloves, they may not be used at the gloves' original rated voltage until retested.
- H. Leather protectors shall not be worn except over rubber gloves. Their use shall conform to the following table.

Minimum Distance Between Protector Gauntlet and Cuff or Rubber Glove (Source: ASTM F496 Table 4)	
Class of Rubber Glove	Minimum Distance (inches)
0,0	1/2
0	
1	1
2	2
3	3
4	4

- I. 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.
- J. 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.
- K. 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.
- L. Rubber gloves shall be produced by a seamless process and will be marked with the appropriate class and type. The marking shall be nonconductive.

M. In addition to the requirements testing requirements in 8) above, rubber gloves shall be periodically tested according to Santee Cooper procedures outlined in the table below.

Rubber Insulating Equipment Test Intervals	
Rubber Insulating Equipment	When to Test
Rubber insulating line hose	Before first issue and every 6 months thereafter
Rubber insulating covers	Before first issue and every 6 months thereafter
Rubber insulating blankets	Before first issue and every 6 months thereafter
Rubber insulating gloves	Before first issue and every 2 months thereafter ¹
Rubber insulating sleeves	Before first issue and every 2 months thereafter ¹

¹If 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.

2.2 Work Zone Safety (Traffic Control)

2.2.1 General

- Work area protection is the adequate safeguarding or protecting of pedestrians, motorists, Santee Cooper 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.
- 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.
- 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.
- The possibility of accidents occurring is greatly minimized by proper planning, design, installation, operation, and maintenance, coupled with the use of common sense.
- Refer to Part VI of the most current edition of the Manual on Uniform Traffic Control Devices.

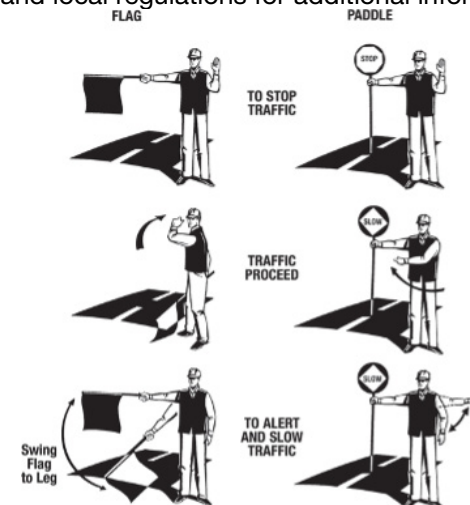
2.2.2 Equipment

- Only those signs, standards, barricades, flags, and cones that conform to state or local codes shall be used.
- All state and local traffic codes shall be followed when providing work area protection.
- 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.
- Warning devices and equipment shall be removed as soon as the hazard is eliminated.
- Warning devices and equipment not in use shall be stored in a proper manner or shall be removed from the work area.

2.2.3 Flagmen

- Flagmen or other appropriate traffic controls shall be used to supplement protection provided by signs, signals, and barricades whenever necessary.
- Flagger shall wear a minimum of a Class III vest, shirt or jacket consisting of a retro-reflective material. The retro-reflective material shall be orange, yellow, white-silver, yellow-green or a fluorescent version of these colors and shall be visible at a minimum distance of 300 m (1,000 ft). The retro-reflective clothing shall be designed to clearly identify the wearer as a person.
- 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:
 - Signal flags shall be red and at least 24 inches square.
 - Sign paddles (Stop and Slow) shall be on a 6 foot staff, and of the appropriate size and shape.
 - In periods of darkness or reduced visibility, red lights shall be used.
- Flagmen shall place themselves in a protected position to reduce possibility of injury from traffic.
- 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. All workers in highway or road construction work zones shall wear high visibility garments/vests.
- When flagmen are used at both ends of a jobsite, reliable communications or prearranged signals shall be used to ensure proper traffic flow.
- Flagmen shall face traffic when giving signals.
- Flagmen shall give positive, direct signals that leave no doubt as to their meaning.
- Refer to state and local regulations for additional information on flagmen procedures.



2.3 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 CPR shall be available. If an employee is exposed to an electric shock or other life-threatening or permanently disabling injury or illness, a four-minute response time is required.
- B. At least two qualified employees will be present while the following types of work are being performed:
 - 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 lift devices, 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.
- C. 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.
- D. 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. Two or more employees working at the same pole location can work on or contact different ungrounded phases only if they are working out of two separate aerial lift devices that are maintaining proper Minimum Approach Distance (MAD) including extended reach with tools, materials, and/or equipment.

Note: An employee undergoing on-the-job training and who is under the direct supervision of a qualified person; is considered to be a qualified person for the performance of those specific duties.

- E. No employee may approach or take any conductive object without an insulating handle closer to exposed energized parts than the minimum approach distances 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.
- F. 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.

- G. 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. Hazardous energy control precautions shall be followed when applicable.
- H. 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.
- I. 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.
- J. Electrical equipment and lines shall always be considered energized unless they are positively known to be dead by testing with a device designed to test voltage, and grounded. Before starting to work, preliminary inspection and 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.
- K. 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.
- L. Employees must evaluate existing conditions that relate to the safety of the work to be performed before work is started and be observed by another employee if available.
- M. When employees are working on or near an energized line, available methods shall be used to communicate that live-line work is being performed. Protective relay features such as Hot-Line Tag, Non-Reclosing, or Alternate Relay Settings, as appropriate and available, should be used on the line to protect workers and equipment.
- N. Lightning arrestors should be permanently connected or energized and tested with a live-line tool prior to making permanent connections.
- O. For Arc Flash protection boundaries, see Distribution and Transmission line specific incident energy checks.

2.4 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 including the system neutral (where applicable) while protecting themselves as they progress. The protective equipment shall extend beyond the reach of the employee's anticipated work position or extended reach distance including, but not limited to, equipment such as material handler jibs. 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.
- 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.

2.5 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.
- B. When an employee is climbing a pole and is exposed to a fall in excess of 4 feet the employee shall be protected by the use of fall arrest equipment. Santee Cooper requires 100% fall protection while climbing wood poles.
- C. If poles or structures may be unsafe for climbing, they shall not be climbed until made safe by guying, bracing, or other adequate means.
- D. 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.
- E. Workers shall not wear their climbing gaffs while driving or riding in vehicles or when working on the ground, on ladders (except hook ladders), or

on platforms. Climbing gaffs shall be put on at the base of the pole and removed at the base of the pole unless gaffs are covered with an approved gaff guard.

- F. Gaffs on climbing gaffs 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. Employee(s) climbing or changing location on poles, towers, or similar structures must use fall protection equipment unless the employer can demonstrate that climbing or changing location with fall protection is infeasible or creates a greater hazard than climbing or changing location without it.
- I. Metal hooks, chains, etc., for holding tools or tape shall not be attached to body belt, climbing belt, or harness. Leather or other non-conducting 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. Hand line shall be hung in secure location when working on a pole or in a bucket.

2.6 Working On Energized Lines with Live-Line Tools

- A. 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. Extreme caution should be used to avoid breaking the line.
- C. Planned work with live-line tools shall not be started during inclement weather.
- D. Before work with live-line maintenance tools is begun, DCC/ECC shall be notified. If during live-line tool work, an interruption to service occurs, DCC/ECC shall be notified immediately.
- E. Only tools approved by Santee Cooper 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. When employees are working on or near an energized line, available methods shall be used to communicate that live-line work is being performed, including placing of a Live-Line Tag/Card. Additionally, protective relay features such as Hot-Line Tag, Non- Reclosing, or Alternate Relay Settings, as appropriate and available, should be used on the line to protect workers and equipment. See Appendix D for examples.

2.7 De-energized Lines and Equipment

- A. All conductors and equipment shall be treated as energized until isolated and tested with a device designed to detect voltage, and grounded. 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.
- B. 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.

2.22 Digger Derricks- Line Trucks

- 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. Crane operators shall be certified or qualified where required. See OSHA 29 CFR 1926.1427 for more information.
- C. No person shall be permitted to ride the hook, sling, or load of any hoisting equipment.
- D. Load limits as specified by the manufacturer shall not be exceeded under any circumstances.
- E. Operating and maintenance procedures as specified by the manufacturer

shall be followed. If manufacturer procedures are unavailable, Santee Cooper must develop and ensure compliance with all procedures necessary for the safe operation of the equipment and attachments that meet the following criteria:

1. Procedures for operational controls must be developed by a qualified person.
 2. Procedures related to the capacity of the equipment must be developed and signed by a registered professional engineer familiar with the equipment.
- F. The following are the minimum checks which shall be made by a competent person each day the equipment will be used and must be completed before use. The inspection must consist of observation for apparent deficiencies. At a minimum the inspection must include all of the following:
 1. All control mechanisms for maladjustment interfering with proper operation.
 2. Control and drive mechanisms for apparent excessive wear of components and contamination by lubricants, water or other foreign matter.
 3. Air, hydraulic, and other pressurized lines for deterioration or leakage, particularly those which flex in normal operation.
 4. Hydraulic system for proper fluid level
 5. Hooks and latches for deformation, cracks, excessive wear, or damage such as from chemicals or heat.
 6. Wire rope reeving for compliance with the manufacturer's specifications, and in accordance with 1926.1413(a).
 7. Electrical apparatus for malfunctioning, signs of apparent excessive deterioration, dirt or moisture accumulation
 8. Tires for proper inflation and condition
 9. Ground conditions around the equipment for proper support.
 10. Equipment for level position within the tolerances of the equipment manufacturer's recommendation
 11. Safety devices and operational aids for proper operation.
 12. Fire extinguisher should be available.

Note: If any of the above-mentioned items are found to be deficient, an immediate determination must be made by the competent person as to whether the deficiency constitutes a safety hazard. If the deficiency is determined to constitute a safety hazard, the equipment must be taken out of service until it has been corrected.

- G. Inspections that took place (each shift), shall be documented and maintained by the employer that conducts the inspection, and must meet the following criteria:
 1. Contain items checked and the results of the inspection.
 2. Name and signature of the person who conducted the inspection and the date of inspection.
- H. Santee Cooper conducts annual/comprehensive inspections and are documented, maintained, and retained. The information contains at a minimum: items checked and results of the inspection, and the name and signature of the person who conducted the inspection and the date.
- I. Manufacturer's procedures regarding inspections that relate to safe

operations that is more comprehensive, or has a more frequent schedule of inspection than the requirements of this section must be followed

- J. 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.
- K. No load shall be lifted until its weight has been determined. For more information on maximum safe loads for wire ropes see OSHA Subpart H 1926.251.
- L. For the first lift of each day, the load shall be test lifted and the brakes checked (load lifted several inches, then tested).
- M. With every load, the slings and bindings shall be checked and shall be readjusted as necessary to ensure safety and stability.
- N. Signal person must be provided in each of the following situations:
 - 1. The point of operation, meaning the load travel or the area near or at load placement, is not in full view of the operator
 - 2. When equipment is traveling, the view in the direction of travel is obstructed.
 - 3. Due to site specific safety concerns where the operator or the person handling the load determines that it is necessary.
- O. Signals to the equipment operator shall be given by one person designated to perform this task and must be maintained throughout the operation between the operator and the signal person. If communication between the operator and signal person become interrupted during in tasks that require a signal person, the operator must stop operations until communication can be reestablished. The signal person shall be properly qualified. The operator shall, however, obey a "Stop" signal given by anyone. Other means to signal the operator can be used (i.e. hand, voice, or other audible means) in lieu of standard hand signals; however, the employer must demonstrate that the signals provide an equally effective means of communication or comply with national consensus standards that are equally as effective.
- P. When derricks are used near energized lines or equipment, the lifting device shall be:
 - 1. Properly grounded,
 - 2. Insulated,
 - 3. Isolated, or
 - 4. Considered as energized.
- Q. 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.
- R. Winch lines, ropes, or wire cables shall not be guided by hand when standing within reach of the drum or sheave.
- S. 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.
- T. 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 Cranes section The U bolt shall be applied so that the U section is in contact with the dead end of the rope.
- U. Operators shall not leave their position at the controls of derricks, or other lifting devices while the load is suspended except where all of the following conditions are met:

- 1. The operator remains adjacent to the equipment and is not engaged in any other duties.
 - 2. The load is to be held suspended for a period of time exceeding normal lifting operations.
 - 3. The competent person determines that it is safe to do so implements measures necessary to restrain the boom hoist and telescoping, load, swing, and outrigger or stabilizer functions.
 - 4. Barricades or caution lines, and notices, are erected to prevent all employees from entering the fall zone. No employees are permitted in the fall zone.
- V. Operators of derrick and other hoisting equipment shall exercise extreme caution when in proximity to energized lines or equipment
 - W. 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.

2.8 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 be considered conductive.

2.9 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 live- line tools while shorting and grounding terminals.
- 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.

2.10 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 protective relay of the energized circuit shall be set to Non-Reclosing. 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, tie-lines, 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.

2.11 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.
- 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 live-line tool.
- 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, is 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 ensure 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 of 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 live-line method.
- V. Reliable 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.

2.12 Grounding

2.12.1 General

- A. All previously energized conductors shall be considered energized until isolated and tested with a device designed to detect voltage and grounded. 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.
- B. Voltage Testing: De-energized conductors and equipment, which are to be grounded, shall first be tested for the presence of nominal voltage.
- C. 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.
- D. Grounding: Equipotential grounding is required whenever possible. When equipotential grounding is not possible, dual point grounding (bracket grounding) is acceptable.
 - 1. Equipotential 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.
- E. 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.
- F. 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.
- G. Grounding Tower: Grounding to tower shall be made with a tower clamp capable of conducting the anticipated fault current.
- H. 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.
- I. Lifting equipment, aerial lift device 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, aerial lift device and material handling trucks, digger/derricks line trucks, instead of bonding to the best available ground. In either case, the general public should be prevented 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.
- J. 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.

- K. 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.
- L. When work is performed on cable at a location remote from the cable terminal, the cable must be isolated at the terminal or equipotential grounded at the work location if there is a possibility of hazardous transfer of potential should a fault occur.

2.12.2 Equipotential 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 employee will place their 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 consider alternate grounding procedure.
- 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 line of sight.

2.12.3 Pole Storage - Temporary

- 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 should 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, except on pole trailers. See the Federal Motor Carrier Safety Administration Drivers Handbook on Cargo Securement for more information.
- F. Based on the limitations of the trailers (overhang), DEO can haul up to a 60' pole. Poles over 60 feet should be scheduled for delivery with the contract hauling crew.
- G. 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.
- H. Employees shall not ride pole dollies, trailers or any other equipment, unless specified by the manufacturer.
- I. The wheels of the transporting vehicle shall be chocked and securely braked prior to loading or unloading.
- J. US utility poles, no matter what material composes them, must meet specifications laid out by ANSI. ANSI O5.1 classifies wooden utility poles

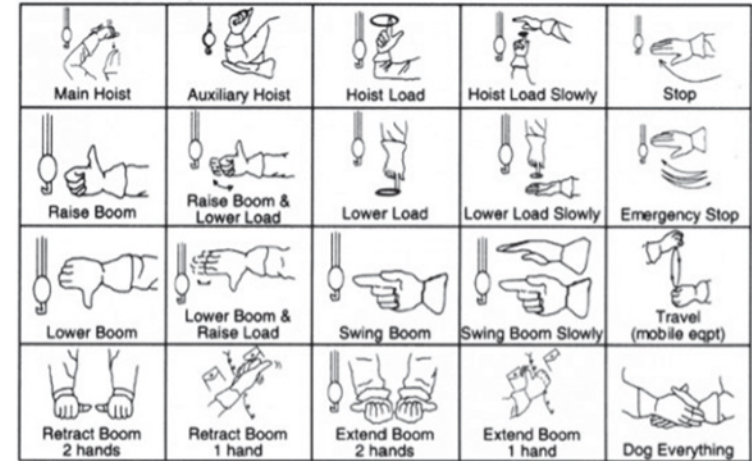
from H-6 to H-1 and 1 to 10, the “H” signifying those poles higher strength ratings. H-1 and H-2 poles are the lowest of the high-capacity poles; however, certain specifications distinguish them from each other.

2.12.4 Setting and Removing Poles

- A. Only those employees who are trained and qualified shall operate the hoisting equipment.
- B. If any holes are left unfilled at the end of the work period, they shall be protected with substantial coverings.
- C. All persons not engaged in pole-setting operations shall keep out of the work area
- D. No one shall be on a gin pole when it is being used to raise another pole.
- E. While setting or removing poles between or near conductors energized above 600 volts, observe the following:
 1. 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.
 2. Workers handling the butt of the pole shall wear rubber gloves whether or not cant hooks or slings are used.
 3. 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.
- F. When pikes are used to hold poles in place while holes are being backfilled, the pikes shall be firmly placed in the earth 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
- G. Employees shall not stand or pass under a suspended load or adjacent to, over, or under a loaded winch line.
- H. Employees engaged in handling or working on poles shall wear suitable gloves and shall wear a shirt or jacket with the sleeves rolled down.
- 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 ensure that the hoisting equipment is not overloaded due to the weight of the pole and its adhesion to the ground a hydraulic pole puller, if available, should be used.
- L. Hoisting equipment operators shall accept signals only from the employee specifically designated. The signal person shall be properly qualified to signal hoisting operations. 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.

Note: Chemical treatment of poles including Creosote and other tar- based substances can create a risk of exposure to employees. OSHA lists exposure regulations for coal tar pitch volatiles in Table Z-1 for air contaminants which includes creosote and its by-products. Utilities must dispose of poles appropriately, in accordance with environmental regulations. According to the U.S. Environmental Protection Agency, used poles may be recycled for residential use, or sent to a sanitary landfill; however, Santee Cooper follows state and local regulatory agencies for proper disposition. At no time should Santee Cooper utilize burning as a suitable means of disposal, as this can cause exposure to cancer causing agents.



2.13 Metering

- A. Appropriate clothing and PPE shall be worn when installing or removing meters from energized meter sockets and meter sockets equipped with bypass capabilities. For example, properly rated FR clothing, hard hat, rubber gloves, safety glasses and/or face shield, others as dictated by circumstance.
- 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 without 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 a portable meter pulling device.
 3. By disconnecting the source.
- 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 be performed only 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. If safety conditions dictate, employees shall turn off customer main switch prior to installing and removing socket type meters.
- M. Employees shall push socket-type meters into their socket. Employees shall never hit the meter with their hand or any device.

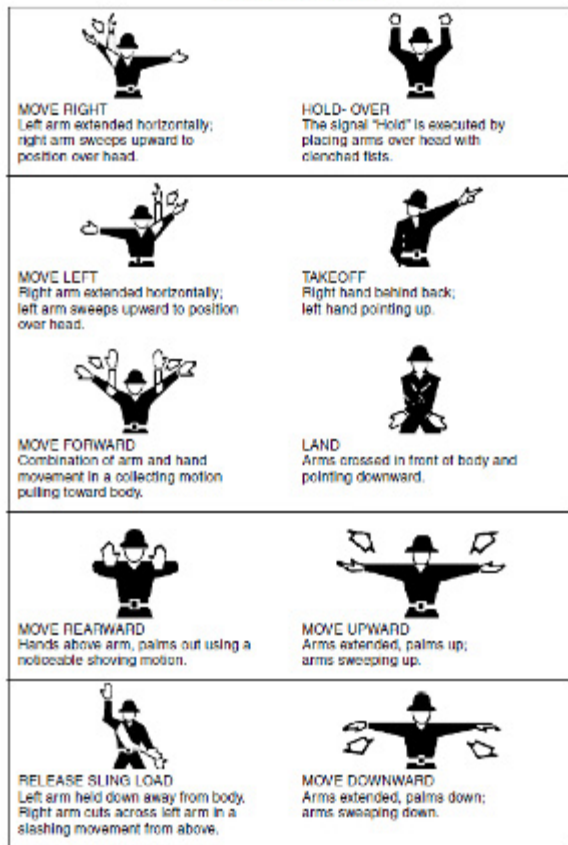
2.14 Helicopters

- A. Contact the pilot or groundman before entering landing zone.
- B. Briefing - Prior to each day's operation a briefing shall be conducted. This briefing shall set forth the plan of operation for the pilot and ground personnel.
- C. Vehicles entering and exiting the landing zone should be visible to pilot and far enough away to avoid possible collision.
- D. Slings and tag lines - Load shall be properly slung. Tag lines shall be of a length that will not permit their being drawn up into rotors. Pressed sleeve, swedged eyes, or equivalent means shall be used for all freely suspended loads to prevent hand splices from spinning open or cable clamps from loosening.
- E. Cargo hooks - All electrically operated cargo hooks shall have the electrical activating device so designed and installed as to prevent inadvertent operation. In addition, these cargo hooks shall be equipped with an emergency mechanical control for releasing the load. The hooks shall be tested prior to each day's operation to determine that the release functions properly, both electrically and mechanically.
- F. Personal protective equipment - (consider helicopter operator's recommendation)
 - 1. Personal protective equipment for employees receiving the load shall consist of complete eye protection and hard hats secured by chinstraps.
 - 2. Loose-fitting clothing likely to flap in the downwash, and thus be snagged on hoist line, shall not be worn.
- G. Loose gear and objects - Every practical precaution shall be taken to provide for the protection of the employees from flying objects in the rotor downwash. All loose gear within 100 feet of the place of lifting the load, depositing the load, and all other areas susceptible to rotor downwash shall be secured or removed.
- H. Housekeeping - Good housekeeping shall be maintained in all helicopter

loading and unloading areas.

- I. Operator responsibility - The helicopter operator shall be responsible for size, weight, and manner in which loads are connected to the helicopter. If, for any reason, the helicopter operator believes the lift cannot be made safely, the lift shall not be made.
- J. Hooking and unhooking loads - When employees are required to perform work under hovering craft, a safe means of access shall be provided for employees to reach the hoist line hook and engage or disengage cargo slings. Employees shall not perform work under hovering craft except when necessary to hook or unhook loads.
- K. Static charge - Static charge on the suspended load shall be dissipated with a grounding device before ground personnel touch the suspended load, or protective rubber gloves shall be worn by all ground personnel touching the suspended load.
- L. Weight limitation - The weight of an external load shall not exceed the manufacturer's rating.
- M. Ground lines - Hoist wires or other gear, except for pulling lines or conductors that are allowed to "pay out" from a container or roll off a reel, shall not be attached to any fixed ground structure, or allowed to foul on any fixed structure.
- N. Visibility - When visibility is reduced by dust or other conditions, ground personnel shall exercise special caution to keep clear of main and stabilizing rotors. Precautions shall also be taken by the employer to eliminate as far as practical reduced visibility.
- O. Approach distance - No unauthorized person shall be allowed to approach within 50 feet of the helicopter when the rotor blades are turning.
- P. Approaching helicopter - Whenever approaching or leaving a helicopter with blades rotating, all employees shall remain in full view of the pilot and keep in a crouched position. Approach only after the pilot's permission. Employees shall avoid the area from the cockpit or cabin rearward unless authorized by the helicopter operator to work there.
- Q. Personnel - Sufficient ground personnel shall be provided when required for safe helicopter loading and unloading operations.
- R. Communications - There shall be constant reliable communication between the pilot, and a designated employee of the ground crew who acts as a signalman during the period of loading and unloading. This signalman shall be distinctly recognizable from other ground personnel.
- S. Follow all directions from pilot after entering the helicopter.
- T. Fires - Open fires shall not be permitted in an area that could result in such fires being spread by the rotor downwash.
- U. No personnel should assist with maintenance of helicopter or aiding in emergency situations i.e. (cutting limbs to free saw).
- V. Signal systems - Signal systems between aircrew and ground personnel shall be understood and checked in advance of hoisting the load. This applies to either radio or hand signal systems. Hand signals shall be as shown:

HELICOPTER SIGNALS



2.15 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.
 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. PPE is provided and used as required.
 6. Signal, ground, and power cables are properly separated.

2.16 Tree Trimming

2.16.1 General

Workers engaging in tree trimming shall observe and take due precautions to recognize suspension strand tension and possible snap-back from conductors and guying, or other lines that may be under stress or strain

- A. Anyone involved in tree trimming or a line-clearance tree trimmer who is not a qualified employee shall also be trained and competent in:
1. The skills and techniques necessary to distinguish exposed live parts from other parts of electric 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 employee will be exposed and the skills and techniques to maintain those distances.
- B. Approved chain saw cut-resistant foot/leg protection shall be worn by employees while operating a chain saw during ground operations.
- 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 employees are 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 the trunk of the 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 the 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.

2.16.2 Tree Trimmers Working Near Energized Conductors

- A. The instructions below do not apply to electric power generation, transmission, and distribution employees.
- B. 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.
- C. Wires in proximity to tree trimming shall be considered as energized, unless proven to be dead and grounded.
- D. 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.
- E. 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.
- F. 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 minimum approach distance outlined in NESC Rule 441.
- 3. If roping is necessary to remove branches or limbs from energized conductors or apparatus at more than 750 volts.
- G. Line clearance tree trimmers shall maintain clearances from energized conductors as shown in NESC Rule 441.
- H. 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 NESC Rule 441. 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.
- I. Ladders, platforms, aerial lifts, tools, and equipment shall not be brought closer to an energized conductor or apparatus than the distances listed in NESC Rule 441.
- J. 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.
- K. 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.
- L. Broken or fallen wires shall not be handled except by persons experienced in such work.
- M. When working near wires, the employee shall have their climbing rope so secured that, in the event they slip or a limb break, they will swing free and clear of the wires.
- N. Tree limbs shall not be dropped on conductors.
- O. Ropes shall not be thrown over conductors or crossarms for the purpose of using the conductor or crossarm as a support or hitch.
- P. Dry ropes shall be used in trees through which energized conductors pass.

2.16.3 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 in each tree being felled unless the employer demonstrates that felling the particular tree without an undercut will not create a hazard for an employee. The undercut shall be of a size so that the tree will not split and will fall in the intended direction. A back or felling cut shall be made in each tree being felled and the backcut shall leave sufficient hinge wood to hold the tree to the stump during most of its fall so that the hinge is able to guide the tree's fall in the intended direction.
- D. The feller shall shut the saw off or throttle down and engage chain brake 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. When felling a tree from the ground, a mechanical advantage or two workers on the rope should be used, where applicable.

2.16.4 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 (12.7mm) and be constructed from a synthetic fiber, with a minimum breaking strength of 5,400 pounds when new. Arborists climbing lines shall be identified by the manufacturer as suitable for tree climbing.
- K. Ropes shall be kept dry. When ropes become wet, they shall be stored 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.

2.16.5 Powered Trimming Equipment

- A. Employees operating powered trimming equipment shall wear suitable eye/face protection (such as safety glasses, face shields are encouraged but not required), along with hearing protection.
- B. Chainsaw operators shall inspect the saw before each use to ensure that all handles and guards are in place and tight, that all controls function properly, and that the muffler is operational.

- C. Chainsaw operators shall follow manufacturer's instructions on operation and maintenance.
- D. Power saws weighing more than 15 lbs that are used in trees shall be supported by a separate line, unless the work is performed from an aerial lift device or no supporting limbs are available.
- E. When starting a chainsaw, it shall be placed on or against a solid support and the area cleared of all co-workers.
- F. The operator shall grip the chainsaw with both hands during the entire cutting operation.
- G. The saw bumper shall be against tree or limb before starting a cut.
- H. 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.
- I. All chainsaws shall be equipped with "deadman" controls, so the control cannot lock in "on" position.
- J. 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.
- K. 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.
- L. 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.
- M. Employees shall not approach a chainsaw operator within the reach of the saw while the saw is in operation.
- N. An employee shall never hand a pneumatic or hydraulic pruner or saw to another employee unless it is disconnected.
- O. Powered tools shall not be left unattended if connected to a power source.
- P. Powered tools shall not be adjusted or repaired while connected to power source.
- Q. 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.
- R. 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.

2.16.6 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 the chipper.
- D. Employees operating chippers shall wear suitable eye/face protection (such as safety glasses, face shields are encouraged but not required), along with hearing protection. Read and follow manufacturer's recommendations on safe operations.
- E. An employee shall never place hands or another part of their body into brush hopper while the 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 the chipper is left unattended.
- H. Only wrist-length (non-gauntlet) gloves shall be used by employees feeding a chipper.
- I. Trailer chippers detached from trucks shall have their wheels chocked.
- J. Brush chippers shall be equipped with a locking device in the ignition system.

2.16.7 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 any heavy equipment used in land clearing.
- C. Heavy equipment operators shall wear seat belts, if equipped.
- D. Employees shall not anchor equipment to railroad tracks, fences, or any other structures.
- E. When emerging from the right-of-way, prior to road travel, employees shall test brakes.

2.17 Underground Lines and Equipment

2.17.1 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:

- A. 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.
- B. Where permissible and practicable, the truck shall also be placed to guard the work area against oncoming traffic.
- C. A blow torch or other open flame shall never be used to melt ice around a manhole or vault cover.
- D. Manhole, vault, and service box covers shall always be removed and replaced by means of approved hooks or hoists.

2.17.2 Entering Underground Structures

- A. 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.
4. Contains any other recognized serious safety or health hazard.
- B. Determine if the space to be entered is a permit-required confined space and enter accordingly.
- C. Before an employee enters a street opening, such as a manhole or vault, it shall be promptly protected with a barrier, temporary cover, or other suitable guard.
- D. When work is to be performed in a manhole or 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.
- E. 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 Confined Spaces, for additional confined or enclosed space requirements.
- F. 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.
- G. 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.
- H. 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.
- I. 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.

2.17.3 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 part C. below):
 1. Installation, repair or removal of de-energized cables if an employee is exposed to contact with other parts energized at more than 600 volts.
 2. Installation, repair or removal of cables 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 lift devices, 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 cables or parts of equipment.
- C. Only qualified employees may work in areas containing unguarded, uninsulated energized cables or parts of equipment operating at 50 volts or more. When two or more employees are working on the same cable section, they shall only work on or contact the same conductor at one time.
- D. No employee may approach or take any conductive object without an insulating handle closer to exposed energized parts than the clearances set forth in NESC Rule 441 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 work.

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.

Only qualified employees and trainees working under their direct supervision may work on or with exposed energized cables or parts of equipment or access enclosures, or in areas containing unguarded, uninsulated energized cables or parts of equipment operating at 50 volts or more. When employees are performing work on or associated with exposed cables or equipment energized at 50 volts or more, persons trained in first aid and 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 cables 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 cables, 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 insulated rubber mat, insulated stools, or rated dielectric overshoes while cutting into and removing sheathing or sleeves and while testing an energized cable.
- K. All employees working on or in the vicinity of cables or equipment exposed to voltages higher than those guarded against by the safety protective equipment provided shall assure themselves that the equipment or cables 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, spiked, or severed at the work location with a tool designed for this purpose. Proper PPE shall be worn.
- 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. Air monitoring during the splicing of lead-jacketed electrical cables 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

- P. All Santee Cooper 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.

2.17.4 Work on Energized Equipment

- A. Proper PPE shall be worn when work is performed on any energized URD cable or apparatus.
- B. 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.
- C. When working with energized conductors of 50 V or greater, employees shall wear rubber gloves of the appropriate class rating.
- D. 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.
- E. A primary or secondary system neutral on any energized circuit shall not be opened under any circumstances.
- F. 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. Elbows shall be installed and removed using the proper live-line tools. Proper PPE shall be used.
- G. 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.
- H. 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.
- I. 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.
- J. 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.

2.17.5 Work on De-energized Cables

- A. When cables and apparatus are taken out of service to be worked on, the procedure outlined in De-energized Lines and Equipment, shall be followed.
- B. Before making an opening in or removing a part of the sheath or sleeve of a cable, the cable shall be grounded at the first possible grounding point on each side of the work location.
- C. When a high voltage cable of more than 600 volts is to be cut, a short section of the shielding, if any, completely around the cable shall be removed and tests made with approved testing device(s) 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 or spike through the joint or splice in the high voltage cable 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 voltage 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 cables 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.
- G. All Santee Cooper 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.

2.18 Opening and Closing Circuits

- A. Santee Cooper switching procedures, including Hold Carding and tagging practices, shall be followed when sectionalizing URD systems.
- B. When a URD circuit has become de-energized due to the operation of a protective device, the route of the circuit shall be patrolled for obvious hazards before the circuit is reclosed.
- C. Approved live-line 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.

2.18.1 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 isolated or equipotential grounded 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.

2.19 Directional Boring Operations

- A. Employees shall read operators manual and comply with all manufacturers' 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.
- G. Employees shall follow proper Work Zone Safety (Traffic Control) procedures.
- H. 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, that utility shall be contacted.
- I. 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.

- J. 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.
- K. One or more of the following boring methods shall be used when operations are within 10 feet of a utility; when practical, all three should be used:
 - 1. Expose the Utility along the bore path by careful hand digging or soft excavating.
 - 2. 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.
 - 3. Use a steerable, tracked boring system and electrical strike system.
- L. 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.

2.19.1 Transportation:

- A. 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.
- B. 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.

2.19.2 Setup:

- A. 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.
- B. Consideration shall be given to existing underground utilities or other obstructions when stacking the boring machine.
- C. All boring equipment shall be properly barricaded, as required, to keep spectators away.
- D. Pressurizing the drill string shall be preceded by a check that all connections are tight and all hoses and pipes are in good condition.
- E. Employees shall know telephone numbers of and have means to communicate with local emergency medical facilities.
- F. 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.

2.19.3 Bore Operations:

- A. Supervisors shall review jobsite hazards, safety and emergency procedures, and individual responsibilities with all personnel before work begins.
- B. Employees shall know the right-of-way and depth tolerances and take into account the backreamer diameter when planning the bore path.
- C. 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.
- D. The drill string shall never be rotated when a wrench is attached to the pipe. Automated wrenches shall be used when possible.
- E. When backreaming and pulling in product, employees shall use extreme caution to keep loose clothing from becoming entangled.
- F. 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.
- G. 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.
- H. Employees shall lubricate drill pipe threads and keep threads free of dirt and debris.
- I. Employees shall inspect drill pipe for signs of damage, wear, or fatigue, and replace damaged or worn pipe before a break occurs.
- J. 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.
- K. Cold weather has an effect on boring machinery and electronics. Employees shall follow manufacturer's requirements when boring in cold conditions.
- L. Employees operating the boring machine shall stop and investigate any sudden change in boring rate or anything that not going as expected.

2.19.4 Electrical Strike Protection:

- A. As an added precaution, the locator shall stand 10 feet to the side of the bore path while the bore is progressing.
- B. 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.
- C. 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.
- D. 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.
- E. 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.

- F. Sledgehammers shall not be used to install ground rods or voltage stakes; approved rod drivers shall be used.
- G. 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.
- H. Electronic strike sensing systems shall be tested prior to each use.
- I. All portions of the boring system shall be electrically bonded to reduce the likelihood of their damage from high voltage differentials.

2.19.5 Procedure in Event of an Electrical Strike:

- A. A strike sensing system that has both test and reset capabilities should be used. 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.
- B. The operator shall warn the locator and bystanders to stay away.
- C. For directional boring machines with both test and reset capabilities, the following procedures shall be used:
 1. Do not step off the machine or grid mats and do not allow anyone to approach the work area.
 2. Move the drill head or backreamer away from the contact in hopes of disengaging it from the power source.
 3. 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
 4. 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.
 5. If the alarms continue after resetting, the drill string probably remains in contact with the power cable
 6. Verify the Utility's automatic breaker settings. Wait 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. Employees shall not resume work without the power company's permission.
 7. If one cannot be sure the boring unit is no longer energized, have a person outside of the work area contact the proper Utility to shut off the line before anyone moves from their position.

2.19.6 Procedure in the Event of a Gas Line Strike:

- A. 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 indicates that it is safe to return.

2.19.7 Procedure in the Event of a Fiber-Optic Strike:

- A. Warn people nearby that a strike has occurred.
- B. Contact emergency personnel.
- C. Contact the Utility.
- D. Do not look into the ends of fiber-optic or unidentified cable. Vision damage can occur.
- E. Do not resume work until given permission by the Utility.

2.18.12 Pulling Cables

- A. Employees shall not handle pull wires or pulling lines within reaching distance of blocks, sheaves, winch drums, and take-up 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.

2.18.13 Moving Energized Cables

- A. Energized cables should be moved only when all other methods of movement (such as de-energizing) have been eliminated. Special care shall be taken when moving cables operating at voltages greater than 600 volts. 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 which have been moved shall be inspected for defects after movement.

2.18.14 Fuses

- A. 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 appropriate PPE, visually inspect the apparatus for cracks and tracking, and stand clear of the exhaust path of the fuse barrel.

2.18.15 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 have a minimum ½ inch diameter and a breaking strength of 5,400 lbs.

2.19 Substations

This section is applicable to generating stations and substations, including their associated generator, storage battery, transformer, and switchgear rooms or enclosures, but does not include facilities such as pad mounted equipment.

2.19.1 General

- A. Only authorized personnel may enter a substation. The system operator shall be notified when unlocking the gate and entering a substation for any reason. In addition, the following requirements should be observed for the entrances to all buildings, rooms, or enclosures containing exposed live parts or exposed conductors operating at over 600 volts.
- B. Entrances shall be kept locked unless they are under the observation of a qualified person at all times.
- C. Permanent and clear warning signs shall be provided, displaying the phrase: “Danger – High Voltage – Keep Out.”
- D. New employees and those not familiar with the hazardous conditions inherent in a substation shall be given special instructions before they are permitted to enter.
- E. When employees are working in energized substations, gates shall be kept closed to ensure that unauthorized persons cannot access the facility.
- F. Substation keys shall be issued only to authorized persons.
- G. No parking shall be allowed within the substation unless required for work purposes.
- H. Vehicles shall not be driven over wire troughs, unless designed for vehicular traffic.
- I. Before driving a vehicle into a substation, employees shall check clearances between protruding parts of the vehicle and the substation equipment.
- J. Precautions should be taken to protect against induced charge on all equipment and vehicles.
- K. Caution shall be exercised to maintain a minimum clear working space in the direction of access to live parts of electric equipment. Distances shall be measured from the live parts, if they are exposed, or from the enclosure front or opening, if they are enclosed.
- L. No materials or equipment shall be stored under energized buses, lines or near energized equipment
- M. When leaving a substation, employees shall lock all doors, control houses and outside gates and check to be sure everything is secure and in proper order. System Operator shall be notified.
- N. Proper PPE shall be worn when working in a substation.
- O. When substation fences are expanded or a section is removed, grounding continuity shall be maintained, and bonding shall be used to prevent electrical discontinuity.
- P. When a substation fence must be extended or removed for construction

purposes, a temporary fence affording comparable protection shall be erected. A fence may not be less than 2.13 m (7.0 ft) in height or a combination of 1.80 m (6.0 ft) or more of fence fabric and a 305 mm (1 ft) or more extension utilizing three or more strands of barbed wire or equivalent. 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.

- Q. Movement of vehicles, gin poles, cranes, and other hoisting or mechanized equipment shall be controlled by signalmen or flagmen when required.
- R. 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.
- S. Sufficient access and working space shall be provided and maintained around electric equipment to permit ready and safe operation and maintenance of such equipment.
- T. Under normal conditions, outdoor lighting is not required at unattended stations. Permanent or portable lighting may be used during such times that personnel perform work in the station at night.
- U. When working in a substation, job briefings will be conducted.

2.19.2 Working in an Energized Substation

- A. When work is to be performed in an energized substation, the person in charge shall determine:
 - 1. That all persons entering the substation are qualified.
 - 2. What equipment and lines are energized.
 - 3. What protective equipment and precautions are necessary for the safety of the employees.
 - 4. The precautions that should be exercised in the handling of materials and equipment in the vicinity of energized lines and equipment.
- B. All lines and equipment shall be considered and treated as energized unless they have been tested for voltage and grounded.
- C. If all lines and equipment have been tested for voltage, grounded, tagged out, and there are two visible open points on the line or equipment, leather gloves may be worn while performing the task. Caution shall be exercised to guard against induced voltage.
- D. Proper fall protection equipment shall be worn at all times when working at or above elevations 6 feet or greater.
- E. The following guidelines regarding requirements and exemptions for two employees shall be followed:
 - 1. At least two employees shall be present while the following types of work are being performed:
 - a. Installation, removal, or repair of lines or equipment (such as transformers, capacitors, and regulators) that are energized at more than 600 volts.
 - b. Installation, removal, or repair of de-energized lines or equipment if an employee is exposed to contact with other parts energized at more than 600 volts.
 - c. Work using mechanical equipment, other than insulated aerial lift devices, near parts energized at more than 600 volts.
 - d. Other work exposing an employee to electrical hazards greater than or equal to those posed by operations that are specifically

listed above.

2. The following are exemptions to the above guidelines for when at least two employees shall be present:
 - a. Routine circuit switching, if the employer can demonstrate that conditions at the site allow this work to be performed safely.
 - b. Work performed with live-line tools if the employee is neither within reach of nor otherwise exposed to contact with energized parts.
 - c. Emergency repairs to the extent necessary to safeguard the general public.
- F. Before employees climb ladders, scaffolds, steel structures, or other elevated structures, a thorough inspection shall be made to determine if they are safe. When there is doubt, they shall not be climbed until they are made safe.
- G. Tools or materials shall not be thrown up to or down from structures or elevated work areas.
- H. All energized conductors and equipment within reaching distance shall be protected by appropriate cover up.
- I. Employees shall not reach beyond the protective equipment.
- J. Employees shall insulate themselves from equipment, conductors, or attachments that may be at ground potential.
- K. Employees working on energized conductors or equipment shall work from below the energized parts whenever possible.
- L. When two or more employees are working within the same area, they shall never work simultaneously on different energized phases or items of different potential.
- M. Parts and equipment energized at between 600 volts and 15,000 volts phase to phase shall be worked from an insulated platform or approved fiberglass ladder with 17,000 volt rubber gloves or approved live-line tools.
- N. Parts and equipment energized at over 15,000 volts phase-to- phase shall be worked with approved live-line tools.
- O. The employee in charge shall closely supervise the work and keep the employees advised as to any changes made that could affect their personal safety.
- P. When draw out type circuit breakers are removed or inserted, the breaker shall be in the open position, and the control circuit shall also be rendered inoperable, if the design of the equipment permits.
- Q. Portable metal ladders and other portable conductive ladders may not be used near exposed energized lines or equipment. However, in specialized high-voltage work, conductive ladders shall be used where the employer can demonstrate that nonconductive ladders would present a greater hazard than conductive ladders.

Note: A greater electrical hazard would be static electricity such as might be found in extra high-voltage substations.

- R. Ground de-energized bus and switches, when repair work is being performed.
- S. When working within reaching distance of the bushings on a breaker and the breaker is opened both; lineside and loadside switches for that breaker will be opened so as to totally isolate the breaker

- T. Rubber gloves shall be worn when operating gang switches with a metal operating handle.
- U. 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
- V. 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
- W. 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
- X. No material or equipment shall be stored under an energized bus or line or near energized equipment.
- Y. Employees shall wear appropriate PPE for the work being performed.

2.19.3 Hazardous Energy Control (Lockout/Tagout)

- A. 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
- B. Supervisor or designated qualified employee in charge shall request DCC/ECC to have the particular section of line or equipment de-energized. The designated employee becomes the employee in charge and is responsible for the clearance. Except in emergency situations, a Switching Order must be requested and received for a line, line section or piece of equipment to be de-energized.
 1. 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 de-energized 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.
 2. Automatically and remotely controlled switches that could cause the opened disconnecting means to close shall also be tagged at the point of control. The automatic or remote-control feature shall be rendered inoperable, unless its design does not so permit.
 3. Tags shall prohibit operation of the disconnecting means and shall indicate that employees are at work.
 4. The employee in charge of the work will be given a clearance by DCC/ECC, the lines and equipment to be worked shall be tested to ensure that they are de-energized.
 5. Protective grounds shall be installed.
 6. After these steps are followed, the lines and equipment involved may be worked as de-energized.
 7. In order for two or more crews to work within the same station, each crew obtains a separate clearance, unless the crews are reporting to one supervisor at that site.
 8. To transfer the clearance, the employee in charge (or, if the employee in charge is forced to leave the worksite due to illness or other emergency, the employee's supervisor) shall inform DCC/ECC;

employees in the crew shall be informed of the transfer; and the new employee in charge shall be responsible for the clearance.

9. To release a clearance, the employee in charge shall:
 - a. Notify employees under his or her direction that the clearance is to be released.
 - b. Determine that all employees in the crew are clear of the lines and equipment
 - c. Determine that all protective grounds installed by the crew have been removed; and
 - d. Report this information to DCC/ECC and release the clearance.
10. The person releasing a clearance shall be the same person that requested the clearance, unless responsibility has been transferred.
11. Tags may not be removed unless the associated clearance has been released.

Note: If clearance has not been properly transferred, the clearance may be released by that person's supervisor who is familiar with the work and has jurisdiction over the circuit or piece of equipment. The supervisor is responsible for informing the person who held the clearance that it was released. Santee Cooper has a procedure to ensure proper transfer of clearance during times when the clearance holder is unavailable.

12. Only after all protective grounds have been removed, after all crews working on the lines or equipment have released their clearances, after all employees are clear of the lines and equipment, and after all protective tags have been removed from a given point of disconnection, may action be initiated to re-energize the lines or equipment at that point of disconnection.

C. For additional information, refer to Santee Cooper's Corporate Switching Manual.

2.19.4 Batteries

- A. For additional information refer to manufacturer's product information and SDS.
- B. Adequate ventilation shall be provided in battery and battery- charging areas. Where natural ventilation does not constantly change the air, forced ventilation shall be used.
- C. Approved signs shall be posted and observed in all battery areas, such as "Danger-No Smoking, Open Flames, or Ignition Sources."
- D. Employees shall wear appropriate clothing and PPE when handling or repairing batteries, such as appropriate gloves, apron, eyewear, face shield, etc.
- E. Care shall be exercised to prevent short-circuiting, generating a spark or ignition source when working on or near the battery or when cleaning or making repairs.
- F. When working on or near a battery, nonconductive tools are recommended. Tools used for tightening connector bolts, etc., should have insulated handles.
- G. If mixing acid and water, employees shall always pour the acid slowly in to the water, not water into the acid. The wrong procedure can cause an explosion.
- H. Precaution shall be used when handling electrolyte and other chemicals.

- I. If electrolyte is spilled on clothing, the contaminated clothing shall be removed, and the skin washed with water as soon as possible.
- J. Open flames, tools that can cause sparks, and other sources of ignition shall be kept clear of the immediate area where batteries are located.
- K. When it is necessary to work in battery rooms where sources of ignition exist, the room shall be adequately ventilated.
- L. When charging batteries, vent caps shall be kept in place. Care shall be exercised to ensure that vent caps are functioning properly. Battery component covers shall be opened to dissipate heat and vapors.
- M. In the case of a NiCad cell care shall be exercised to prevent grounding as the case is part of an electrical circuit.
- N. When using a hydrometer to check batteries, care shall be taken to prevent splashing battery acid.
- O. Rooms and areas housing exposed electrical parts above 50 volts shall be locked and access limited to authorized personnel.
- P. Batteries shall be properly disposed of in an environmentally safe manner.
- Q. De-energized batteries awaiting disposal shall be safely stored in a ventilated area away from ignition sources.

2.19.5 Circuit Breaker Maintenance and Repair

- A. Proper hazardous energy control shall be exercised, and clearance shall be obtained to test or make repairs to circuit breakers. Refer to Santee Cooper Corporate Switching Manual.
- B. All parties concerned shall be instructed during the job briefing as to the work plan that will be followed.
- C. When switching the breaker out for maintenance, if the circuit breaker control switch is remote from the circuit breaker, the employee shall follow proper hazardous energy control procedures. See Santee Cooper Corporate Switching Manual.
- D. A check shall be made to determine that all disconnects or air- break switches are in the OPEN position.
- E. On breakers where the energized side of the disconnects will be within minimum approach distance while standing close to the circuit breaker (CB) bushings, employees shall not climb up on top to connect the leads used for test purposes. This work shall be done from a ladder below the energized zone.
- F. The case of all test transformers shall be grounded when in use, providing such cases are made of metal.
- G. When a CB is being operated electrically or by spring, employees shall keep hands clear of the mechanical closing mechanism.
- H. The secondary side of an energized current transformer shall not be opened.
- I. When working on an oil circuit breaker, before entering the tank to make repairs or adjustments, the following precautions shall be carried out:
 1. All AC/DC control power shall be disconnected.
 2. Entry into tanks and vessels shall be in compliance with the Permit-Required Confined Spaces Program.
 3. The main control valve shall be OFF.
 4. Operating mechanism shall be the relaxed position or blocked to prevent movement.
- J. When employees are working inside the tank, the breaker shall not be closed electrically or by spring.

- K. A ladder of the proper length shall be used when climbing up on a CB or other equipment, so that the ladder does not reach energized conductors. When working on top of a CB proper PPE shall be used.
- L. After all work has been completed, a careful check shall be made to see that all tools and materials have been removed.

2.20 Working in Transformer Tanks and Vessels

- A. Entry into tanks and vessels shall be in compliance with the Permit-Required Confined Spaces Program.
- B. When electrically operated tools are used, a ground fault interrupter shall be used with 120 volt tools or lights. Lights shall be shielded.
- C. When it is necessary to remove a manhole cover or inspection plate from a transformer, any pressure or vacuum shall be relieved prior to removing any stud or bolt.
- D. Transformer tanks shall be ventilated while employees are working within them.
- E. When pulling a vacuum on a transformer, no one shall be on top of the transformer.

2.21 Work in Manholes and Vaults

- A. Employees shall follow the procedures outlined in the Permit- Required Confined Spaces Program, as well as the specific entry procedures for the location involved when working in an area that meets these requirements.
- B. When covers are removed from enclosed spaces, the opening shall be promptly guarded by railing, temporary cover, or other barrier intended to prevent an accidental fall through the opening and to protect employees working in the spaces from objects entering the space.
- C. Manhole covers shall be removed with an approved tool.
- D. Where possible, the manhole cover shall be removed parallel with the flow of traffic and placed on the side away from approaching traffic. Adequate signs, traffic cones, flagmen, etc., as may be needed shall guard all obstructions to traffic.
- E. Manhole ladders, tools, and materials shall be placed so as not to constitute a hazard.
- F. When work is to be done in a manhole or a vault, proper work area protection shall be installed.
- G. Before an employee enters a manhole or vault, the internal atmosphere shall be tested at all levels for oxygen deficiency and for flammable or toxic gases and vapors with a direct-reading meter or similar instrument, capable of collection and immediate analysis of data samples without the need for offsite evaluation. Monitoring instrumentation must be calibrated
- H. If flammable or toxic gases or vapors, or 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.
- I. Open flames or smoking shall not be permitted in manholes or vaults.
- J. Whenever an employee enters, or is working in, an enclosed space, manhole or vault, another qualified employee with the proper equipment readily available shall be stationed outside the door or hatch to assist in case or an emergency, this requirement shall not preclude this employee from performing other duties.
- K. If in an emergency it is necessary to enter a manhole or a vault where

gas may be present, employees shall use an approved self- contained breathing apparatus, body harness, and lifeline monitored by a properly trained attendant.

- L. This section does not preclude a qualified employee, working alone, from entering, for brief periods of time, a non-permit required 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.
- M. A ladder shall always be used when entering or leaving the manhole or a vault. A cable shall not be used to assist in climbing into or out of a manhole except in an emergency
- N. Tools or materials shall not be thrown in or out of the manholes or vaults.
- O. Materials shall not be lowered into the vault until definite instructions to do so have been given by an employee in the hole.
- P. Clearances shall be obtained in accordance with approved switching and tagging procedures as appropriate.
- Q. When working in a vault which contains energized equipment, all doors, points of access, or exits shall be unlocked.
- R. Manhole covers shall be properly seated when replaced.

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Section 3 Generation

3.1 Generation

- A. Visitors or unqualified workers shall be accompanied by a qualified employee in stations and around Santee Cooper 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 Working on or Near Exposed Energized Lines and Equipment.
- 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 behind 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 bi-color, 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. 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 Santee Cooper's (Confined Space Procedure), 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 Clearance Tag.
 - 2. Soot blower, steam, or air supply valves shall be closed, physically rendered inoperative, and a Clearance Tag placed on each valve.
 - 3. Clearance Tag 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 Generation's (Lockout/Tagout) policy and procedure.

- 4. Clearance Tags 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. 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 location, for example), all employees at the work location shall be trained.

3.2 Clearances (LOTO)

The clearance procedure is to provide protection for Santee Cooper employees, and all other personnel from the danger of moving equipment, electrically energized equipment, other sources of hazardous energy, hazardous material, and/or toxic material.

- A. All employees working at the job site shall follow the Generation's Clearance Procedure (LOTO) and any site-specific practices. This includes employees from other work groups, contractors, visitors and all non-employees. All employees shall become familiar with the clearance procedure at the job site before starting any work.
- B. The clearance tag is used to positively identify a specific energy source to be isolated. Removing a clearance tag or operating cleared equipment without proper authorization is strictly prohibited. Refer to Generation's (Lockout/Tagout) policy and procedure.

3.3 Ash Handling and Storage

Approved safety devices and equipment shall be used when entering a fly ash storage bin. (Refer Santee Cooper's Confined Spaces Procedure, for additional requirements.)

3.4 Boilers

- 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 fails, or some similar serious leak develop (depending on severity, as determined by the supervisor), 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 Clearance Tag shall be attached to the blowdown valves and the valves physically

- rendered inoperative from all boilers. These Clearance Tags shall not be removed until the valves of the boiler being worked on have been reclosed. Refer Generation's (Lockout/Tagout) Policy and Procedures.
- 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. If the leak cannot be separated, or isolated from the pressure source, consideration shall be made to stop the pump, compressor, or engine.
 - 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 Generation's (Lockout/Tagout) Policy and Procedures.
 - 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.
 - 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 Clearance Tags 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 appropriate PPE.
- 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.

3.5 Boilers 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 Santee Cooper policy and the SDS 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.

3.6 Car Shakers and Dumpers

- A. Only tools approved by the Santee Cooper 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. Before operation, a visual inspection of the hoist shall be performed.
- D. Employees shall be trained prior to operating equipment.
- E. Employees engaged in car shaker operations shall use suitable eye protection, hearing protection, and respiratory equipment as prevailing conditions dictate.

- F. Only authorized equipment shall be permitted on the car dumper and car shaker tracks.

3.7 Coal Handling and Storage

- A. Employees shall stay clear of stopped conveyors unless a clearance has been obtained.
- B. Employees shall not ride conveyor belts or buckets.
- C. Employees shall first obtain a proper clearance before attempting to clear a blocked conveyor or crusher or to loosen any material.
- D. Employees shall not clean conveyor rollers or supports while a belt is in motion.
- E. Coal dust shall be removed in a manner that shall not create a dangerous atmosphere. Use of compressed air is prohibited. In the event of water wash-down, extreme care shall be used to prevent the wetting of electrical boxes, motors and lighting fixtures. All potential slipping hazards shall be barricaded.
- F. Employees shall obtain a clearance for the associated mill feeder before entering the bunker for maintenance. (Refer to, Santee Cooper's Confined Spaces and Permit-Required Confined Spaces Policy and Procedure, for additional requirements.)
- G. Smoking is permitted only in designated areas.
- H. Employees working in coal-handling and coal-storage areas shall refer to the Hot Work requirements in Section 1.18.

3.8 Conveyors

- A. Conveyor equipment shall be used to convey only the specified materials within the rated capacity and the rated speed.
- B. The performance of maintenance on conveyor systems shall employ the following:
 - 1. Qualified personnel performing maintenance and service.
 - 2. No maintenance or service being performed when a conveyor is in operation except as provided in this section.
 - 3. When a conveyor is stopped for maintenance or service, the starting device, prime movers, or powered accessories shall be tagged out in accordance with the clearance procedure. Personnel shall be alerted to the hazard of stored energy, which may exist after the power source is out. The emergency stop cable shall not be used in lieu of clearance procedure.
- C. All safety devices and guards shall be replaced before starting equipment for normal operation
- D. When adjustment, lubrication, or maintenance must be done while the equipment is in operation, only qualified personnel who are aware of the hazard of the conveyor in motion shall perform these activities. An alternative, documented control needs to be implemented.
- E. Grease fittings shall be extended through guards.
- F. When belts, cables, chains, and similar means support counterweights, they shall be confined in an enclosure to prevent the presence of personnel beneath the counterweight.
- G. All exposed moving machinery parts that present a hazard to personnel shall be mechanically or electrically guarded or guarded by location or position.
- H. Spill guards, pan guards, or equivalent shall be provided if material and/or

lubricants may fall off the conveyor and endanger personnel.

- I. Control stations shall be clearly marked or labeled to indicate the function controlled.
- J. A conveyor that would cause injury when started shall not be started until personnel in the area are alerted by a signal or by a designated person that the conveyor is about to start.
- K. When a conveyor that would cause injury when started is automatically controlled or must be controlled from a remote location, an audible device or devices shall be provided that can be clearly heard at all hazardous points along the conveyor where personnel may be present.
- L. A flashing light or similar visual warning may be used in remotely and automatically controlled conveyors, and conveyors where operator stations are not manned or are beyond voice or visual contact from drive areas, loading areas, transfer points, and other potentially hazardous locations on the conveyor path not guarded by location, position, or guards, shall be furnished with emergency stop buttons, pull cords, limit switches, or similar emergency stop devices must meet the following:
 - 1. All such emergency devices shall be easily identifiable in the immediate vicinity of such locations.
 - 2. The emergency stop device shall act directly on the control of the conveyor concerned and shall not depend on the stopping of any other equipment. The emergency stop devices shall be installed so they cannot be overridden from other locations.
- M. Only a trained person shall be permitted to operate a conveyor.
- N. Where safety is dependent upon stopping devices or starting devices or both, they shall be kept free of obstructions to permit ready access.
- O. No person shall ride on a conveyor.
- P. Employees may not cross over a conveyor belt, except at walkways, unless the conveyor's energy source has been deenergized and properly tagged out.
- Q. Personnel working on or near a conveyor shall be instructed as to the location and operation of stopping devices.
- R. Routine inspections and corrective maintenance measures shall be conducted to ensure that all guards and safety features are retained and function properly.
- S. Personnel shall be alerted to the potential hazard of entanglement in conveyors caused by items such as long hair, loose clothing, and jewelry.
- T. All openings to hoppers and chutes shall be guarded to prevent personnel from accidentally falling or stepping into them or allowing any part of their body to make contact with conveyors below them.
- U. Where coal-handling operations may produce a combustible atmosphere from fuel sources or from flammable gases or dust, sources of ignition shall be eliminated or safely controlled to prevent ignition of the combustible atmosphere. Locations that are hazardous because of the presence of combustible dust are classified as Class II hazardous locations.

3.10 Cooling Towers

All individuals entering or working on the interior of an operating cooling tower or conducting work on fill material or structural members of a non-operating tower shall wear suitable respirator equipment if there is evidence of any algae growth. This includes cleaning up (washing down) tower basins or structures and other circulating water system equipment that could create airborne particles.

Waterborne bacteria (such as Legionella) may be hazardous when inhaled, and it can be filtered by a half-mask respirator with a P-100 cartridge

3.11 Diving

- A. Dive Supervisors or dive foremen shall maintain full responsibility for safe diving operations and the safety of dive team members.
 - 1. Prior to the commencement of diving activities, Diving Contractors shall meet or exceed the requirements set forth in CFR 1910, Subpart T and must be a current revision (updated in the last three years).
- B. Use of divers at any site requires assignment of a Diving Contract Coordinator.
- C. The Diving Contractor Coordinator will be the person in charge for customer interface during the performance of diving operations on a project.
- D. Diving Contractor Coordinators have the authority to stop any dive operation if, in their judgment, personnel safety is at risk or eminent hazards exist.
- E. The Diving Contractor Coordinator serves as a liaison between Santee Cooper and the diving contractor and:
 - 1. Reviews the scope of work and submits clearance requests.
 - 2. Serves as the point of contact for the diving contractor on all issues related to clearances, safe work practices, and Santee Cooper policies and procedures.
 - 3. Ensures communication with site operations as necessary to inform Operations of the status of the dive, when divers are in and out of the water, etc.
- F. Site Operations personnel shall work closely with the Dive Contractor Coordinator to ensure the scope of work is thoroughly understood and an adequate clearance is in place in accordance with Generation's LOTO Procedure and specific business unit clearance procedures.
- G. Site Operations may permit or deny diving operations based on plant needs or concern for safety.
- H. The Dive Contractor is responsible for safe diving operations and adherence to all applicable regulations, policies, and procedures.
- I. The Dive Contractor shall perform pre-dive planning and inspections.
- J. To the extent possible, the dive area shall be free of unnecessary personnel. Only those listed in the dive plan and personnel necessary to fulfill the requirements of this section shall be allowed in the dive area.

3.12 Electrical Systems

- A. Added precautions are needed when work is to be performed on special types of electrical equipment located within a generating plant. Such cases include:
 - 1. Electrical equipment connected to a mechanical device where a motive force could be exerted from the mechanical unit.
 - 2. More than one type of electrical source connected within close proximity.
 - 3. Switchgear with cross-tie feeders.
 - 4. AC and DC motor drives to a common mechanical equipment unit.
 - 5. Electrical switches operated by steam, oil, water, air or gas systems.
- B. Only an authorized qualified person will perform switching operations in Generation switchyards.

3.13 General Electrical Safety Principles for Energized Conditions

Basic electrical safety principles should be followed anytime an energized electrical condition exists.

- A. De-energize whenever possible.
- B. Plan every job.
 - 1. The approach and step-by-step procedures to complete the work at hand must be discussed and agreed upon between all involved employees before beginning.
- C. Identify the hazards.
 - 1. Conduct a job hazard analysis. Identify steps that could create electric shock or arc-flash hazards.
- D. Minimize the hazards.
 - 1. De-energize any equipment, and insulate, or isolate exposed live parts so contact cannot be made. If this is impossible, obtain and wear proper personal protective equipment (PPE) and tools.
- E. Anticipate problems.
 - 1. If it can go wrong, it might. Make sure the proper PPE and tools are immediately available and worn by employees.
- F. Obtain training.
 - 1. Make sure all involved employees are qualified electrical workers with appropriate training for the job.

3.14 Portable Electrical Equipment and Extension Cords

- A. The following requirements apply to the use of cord-and-plug-connected equipment and flexible cord sets (extension cords):
 - 1. Extension cords may only be used to provide temporary power.
 - 2. Portable cord and plug connected equipment and extension cords must be visually inspected before use on any shift for external defects such as loose parts, deformed and missing pins, or damage to outer jacket or insulation, and for possible internal damage such as pinched or crushed outer jacket. Any defective cord or cord-and-plug-connected equipment must be removed from service.
 - 3. Extension cords must be of the three-wire type. Extension cords and flexible cords must be designed for hard or extra hard usage (for example, types S, ST, and SO). The rating or approval must be visible.
 - 4. Personnel performing work on renovation or construction sites using extension cords or where work is performed in damp or wet locations must be provided, and use, a ground-fault circuit interrupter (GFCI).
 - 5. Portable equipment must be handled in a manner that will not cause damage. Flexible electric cords connected to equipment may not be used for raising or lowering the equipment.
 - 6. Extension cords must be protected from damage. Sharp corners must be avoided. Flexible cords may not be run through windows or doors unless protected from damage, and then only on a temporary basis. Flexible cords may not be run above ceilings or inside or through walls, ceilings, or floors, and may not be fastened with staples or otherwise hung in such a fashion as to damage the outer jacket or insulation.
 - 7. Cords must be covered by a cord protector or tape when they extend into a walkway or other path of travel to avoid creating a trip hazard.
 - 8. Extension cords used with grounding type equipment must contain an

equipment- grounding conductor (i.e., the cord must accept a three-prong, or grounded plug).

9. Attachment plugs and receptacles may not be connected or altered in any way that would interrupt the continuity of the equipment grounding conductor. Additionally, these devices may not be altered to allow the grounding pole to be inserted into current connector slots. Clipping the grounding prong from an electrical plug is prohibited.
10. Flexible cords may only be plugged into grounded receptacles. The continuity of the ground in a two-prong outlet must be verified before use. It is recommended that the receptacle be replaced with a three-prong outlet. Adapters that interrupt the continuity of the equipment grounding connection may not be used.
11. All portable electric equipment and flexible cords used in highly conductive work locations, such as those with water or other conductive liquids, or in places where employees are likely to contact water or conductive liquids, must be approved for those locations.
12. Employee's hands must be dry when plugging and unplugging flexible cords if energized equipment is involved.
13. If the connection could provide a conducting path to employee's hands (for example, if a cord connector is wet from being immersed in water), the energized plug and receptacle connections must be handled only with insulating protective equipment.
14. Locking type connectors must be properly locked into the connector.
15. Lamps for general illumination must be protected from breakage, and metal shell sockets must be grounded.
16. Temporary lights must not be suspended by their cords unless they have been designed for this purpose.
17. Portable lighting used in wet or conductive locations, such as tanks or boilers, must be operated at no more than 12 volts or must be protected by GFCI's.
18. Extension cords are considered to be temporary wiring and must also comply with the section on "Requirements for Temporary Wiring" in this manual.

3.15 Requirements for Temporary Wiring

- A. Temporary electrical power and lighting installations 600 volts or less, including flexible cords, cables, and extension cords, may only be used during and for renovation, maintenance, repair, or experimental work. The duration for temporary wiring used for decorative lighting for special events and similar purposes may not exceed 90 days. The following additional requirements apply:
 1. Ground-fault protection (e.g., ground-fault circuit interrupters, or GFCI) must be provided on all temporary-wiring circuits, including extension cords, used on construction sites.
 2. In general, all equipment and tools connected by cord and plug must be grounded. Listed or labeled double insulated tools and appliances need not be grounded.
 3. Feeders must originate in an approved distribution center, such as a panel board, that is rated for the voltages and currents the system is expected to carry.
 4. Branch circuits must originate in an approved power outlet or panel

board.

5. Neither bare conductors nor earth returns may be used for the wiring of any temporary circuit.
6. Receptacles must be of the grounding type. Unless installed in a complete metallic raceway, each branch circuit must contain a separate equipment-grounding conductor, and all receptacles must be electrically connected to the grounding conductor.
7. Flexible cords and cables must be of an approved type and suitable for the location and intended use. They may only be used for pendants, wiring of fixtures, connection of portable lamps or appliances, elevators, hoists, connection of stationary equipment where frequently interchanged, prevention of transmission of noise or vibration, data processing cables, or where needed to permit maintenance or repair. They may not be used as a substitute for the fixed wiring, where run through holes in walls, ceilings or floors, where run through doorways, windows or similar openings, where attached to building surfaces, or where concealed behind building walls, ceilings or floors.
8. Suitable disconnecting switches or plug connects must be installed to permit the disconnection of all ungrounded conductors of each temporary circuit.
9. Lamps for general illumination must be protected from accidental contact or damage, either by elevating the fixture or by providing a suitable guard. Hand lamps supplied by flexible cord must be equipped with a handle of molded composition or other approved material and must be equipped with a substantial bulb guard.

3.16 Wet or Damp Locations

- A. Work in wet or damp work locations (i.e., areas surrounded or near water or other liquids) should not be performed unless it is absolutely critical. Electrical work should be postponed until the liquid can be cleaned up. The following special precautions must be incorporated while performing work in damp locations:
 1. Only use electrical cords that have Ground Fault Circuit Interrupters (GFCIs).
 2. Remove standing water before beginning work.
 3. Work is prohibited in areas where there is standing water.
 4. Place a dry barrier over any wet or damp work surface.
 5. Do not use electrical extension cords in wet or damp locations.
 6. Keep electrical cords away from standing water.

3.17 Working on De-energized Equipment (Electrically Safe Conditions)

- A. The most important principle of electrical safety is to assume all electric circuits are energized unless each involved worker ensures they are not. Every circuit and conductor must be tested every time work is done on them. Proper PPE must be worn until the equipment is proven to be de-energized.
 1. Voltage rated gloves and leather protectors must be worn
 2. Approved insulating mats
 3. Electrically insulated shoes should be worn
 4. Safety glasses must be worn
 5. The required Arc Flash PPE must also be worn

- B. The National Fire Protection Association (NFPA) lists six steps to ensure conditions for electrically safe work.
1. Identify all sources of power to the equipment. Check applicable up-to-date drawings, diagrams, and identification tags.
 2. Remove the load current, and then open the disconnecting devices for each power source.
 3. Where possible, visually verify that blades of disconnecting devices are fully open or that drawout-type circuit breakers are fully withdrawn.
 4. Apply lockout/tagout devices in accordance with Generation's LOTO policy.
 5. Test each phase conductor or circuit part with an adequately rated voltage detector to verify that the equipment is de-energized. Test each phase conductor or circuit part both phase-to-phase and phase-to-ground. Check the voltage detector before and after each test to be sure it is working.
 6. Properly ground all possible sources of induced voltage and stored electric energy (such as, capacitors) before touching. If conductors or circuit parts that are being de-energized could contact other exposed conductors or circuit parts, apply ground-connecting devices rated for the available fault current.

3.18 Working on or Near Energized Equipment

- A. Working on live circuits means actually touching energized parts. Working near live circuits means working close enough to energized parts to pose a risk even though work is on de-energized parts. Common tasks where there may be a need to work on or near live circuits include:
1. Taking voltage measurements
 2. Opening and closing disconnects and breakers
 3. Racking breakers on and off the bus
 4. Removing panels and dead fronts
 5. Opening electric equipment doors for inspection

3.18.1 Shock Protection Boundary

- A. Safe approach distances to live parts can be determined by referring to NFPA 70E.
1. The limited approach boundary is the distance from an exposed live part within which a shock hazard exists.
 2. The restricted approach boundary is the closest distance to exposed live parts a qualified person can approach with proper PPE and tools. Inside this boundary, accidental movement can put a part of the body or conductive tools in contact with live parts or inside the prohibited approach boundary. To cross the restricted approach boundary, the qualified person must:
 - a. Have an energized work permit that is approved by the supervisor.
 - b. Use PPE suitable for working near exposed live parts and rated for the voltage and energy level involved.
 - c. Be certain that no part of the body enters the prohibited space.
 - d. Minimize the risk from unintended movement, by keeping as much of the body as possible out of the restricted space; body parts in the restricted space should be protected.

3. The prohibited approach boundary is the minimum approach distance to exposed live parts to prevent flashover or arcing. Approaching any closer is comparable to making direct contact with a live part. To cross the prohibited approach boundary, the qualified person must:
 - a. Have specified training to work on exposed live parts.
 - b. Have a permit with proper written work procedures and justifying the need to work that close.
 - c. Conduct a risk analysis.
 - d. Have (a) and (b) approved by the appropriate supervisor.
 - e. Use PPE appropriate for working near exposed live parts and rated for the voltage and energy level involved.
4. The flash protection boundary is the approach limit at a distance from exposed live parts within which a person could receive a second degree burn if an electrical arc flash were to occur.
5. Use PPE appropriate for working near exposed live parts and rated for the voltage and energy level involved and when working on de-energized the parts, but still inside the flash protection boundary or nearby live exposed parts.
6. If the parts cannot be de-energized, barriers such as insulated blankets must be used to protect against accidental contact or PPE must be worn.
7. Employees shall not reach blindly into areas that might contain exposed live parts.
8. Employees shall not enter spaces containing live parts unless illumination is provided that allows the work to be performed safely.
9. Conductive articles of jewelry and clothing (such as watchbands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, metal headgear, or metal frame glasses) shall not be worn where they present an electrical contact hazard with exposed live parts.
10. Conductive materials, tools, and equipment that are in contact with any part of an employee's body shall be handled in a manner that prevents accidental contact with live parts. Such materials and equipment include but are not limited to long conductive objects such as ducts, pipes, tubes, conductive hose and rope, metal-lined rules and scales, steel tapes, pulling lines, metal scaffold parts, structural members, and chains.
11. When an employee works in a confined space or enclosed spaces (such as a manhole or vault) that contains exposed live parts, the employee shall use protective shields, barriers or insulating materials as necessary to avoid contact with these parts. Doors, hinged panels, and the like shall be secured to prevent them from swinging into employees.
12. Flexible cords and cables must be protected from accidental damage. Sharp corners and projections are to be avoided. Flexible cords and cables must be protected from damage when they pass through doorways or other pinch points.

3.19 Explosives and Blasting

- A. The Blasting Contractor Supervisor shall:
1. Be responsible for all explosives handling, blasting operations, and adhering to the requirements of NFPA 495, Explosives Material

Code.

- B. A person of proven experience and ability in blasting operations shall direct the transportation, handling, storage, and use of explosives and blasting agents.
- C. The driver of any vehicle used to transport explosives and helper assigned shall be physically fit, and able to read English and understand instructions.
- D. No person shall be allowed to handle or use explosives while under the influence of alcohol, narcotics, or other substances that may impair judgment.
- E. Security surveillance and theft prevention procedures shall be maintained. Santee Cooper Management shall be notified in advance of bringing any explosive and/or blasting agents onto any Santee Cooper property.
- F. All blasting storage, handling, operations and use shall comply with NFPA 495, Explosives Material Code.
- G. A holder of a permit to blast shall keep a daily record of all explosive materials received and fired or otherwise disposed of and shall be:
 - 1. Retained for 5 years.
 - 2. Made available to Santee Cooper management.
- H. The loss, theft, or unlawful removal of explosive materials shall be reported immediately to all of the following:
 - 1. US Department of Justice, Bureau of Alcohol, Tobacco, Firearms, and Explosives.
 - 2. Santee Cooper Management.
- I. Two receiving and dispensing logs shall be maintained at all times for explosives stored on the project.
 - 1. One log shall be kept in the magazine.
 - 2. The other in the office of the Blasting Supervisor.
- J. These logs will be subject to unannounced inspection by Santee Cooper Management and Corporate Safety.
- K. A Risk Assessment shall be developed for each blasting operation.
- L. The blasting contractor shall determine the method and location for removing personnel and equipment to a safe area.
- M. The blasting record log shall be initiated and kept up to date.

3.20 Eyewash Stations and Emergency Showers

- A. Emergency showers, eyewash, or other deluge systems shall be provided in areas where acid, caustic, or other hazardous chemicals are used, stored, or handled and the possibility of spillage exists.
- B. Supply piping shall not be routed through corrosive or otherwise potentially damaging areas.
- C. Self-contained portable eyewash units are recommended for use in most areas due to the lower testing, maintenance, and cost. The minimum size is a 6-gallon, 15-minute unit. Post signs in areas that the portable unit must be present prior to beginning work involving potential contact with the chemical.
- D. Install and maintain emergency shower or eyewash units in accordance with OSHA regulations. The specified hazardous locations below will have the following distances established:
 - 1. Within 10 seconds or 55 feet for units installed of a recognized hazard
 - 2. Within 25 feet of battery charging/service stations

- 3. In certain situations, such as exposure to highly corrosive chemicals, flushing units may be required immediately adjacent (less than 10 ft.) to the specified hazard. Consult Occupational safety for additional guidance.
- E. Keep eyewashes and emergency showers free from any obstructions and accessible from at least two directions.
- F. Maintain a clear and unobstructed 45-inch radius around units at all times.
- G. Locate units where the water spray will not contact electrical apparatus or power outlets.
- H. Mark units with highly visible identification signs.
- I. Actuating valves shall be easily accessible and manipulated.
- J. Flow rates for permanent units shall be approximately 20 gallons per minute for emergency showers and 3 gallons per minute for the eyewash units.
- K. Eyewash units shall provide twin curtains of aerated water that cover the face area.
- L. Use deionized water for the fixed water supply in building areas where potable water is not available.
- M. Water temperature of units should be "tepid" (60 to 100 degrees F).
- N. Protect self-contained portable units and the supply lines of permanently installed eyewash units from freezing and excessive heat. Heat tracing is permitted.
- O. Test operating valves on all permanently installed units quarterly. Maintain a record of the test
- P. Inspect, prior to work operations, all portable units, units at battery charging/maintenance locations, and units at locations where highly hazardous chemicals are stored or used.
- Q. When maintenance on building water systems requires any units be inoperative, the supervisor(s) of employees working in the affected area shall be notified prior to the outage. Immediately after service is interrupted, each eyewash/shower shall be placarded "Out of Service." An adequate number of portable units shall be located in the work area and marked until water supply is restored.

3.21 Fixed Fire Protection- General

- A. A clearance shall be taken on the fire protective system before doing maintenance work in the area protected by a fixed system. Fixed systems include, but are not limited to, carbon dioxide, dry chemicals, halon, and steam systems built into generating equipment, such as gas turbines, hydroelectric generators, and storage tanks.

3.23 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 Commercial US 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, penstocks and other confined or deep spaces.
- K. Deep and confined spaces shall be ventilated with fans or blowers before entering.

3.24 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 CO₂ 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 CO₂ before hydrogen gas is admitted.
- D. Any generator or other vessel containing hydrogen shall be purged before entering, first with CO₂, 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 Section 201, Confined or Enclosed Spaces, 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 non-sparking tools shall be used in hydrogen areas.

3.26 Mobile Coal-Handling Equipment

- A. Only certified employees shall operate coal-handling equipment.
- B. Only authorized employees are allowed in areas where coal-handling equipment is being operated.

3.27 Pressurized Systems

3.27.1 Steam Lines

- A. Employees shall remove all condensate from steam lines before and during the time the line is being pressurized. Pressurize steam lines slowly to prevent shock to the line from rapid temperature changes.
- B. Before a water column or gauge glass is repaired or adjusted, the upper and lower shut-off valves shall be closed, and the drain shall be opened. Before placing a water column or gauge glass in service, all employees

shall protect themselves from steam discharge should the glass rupture.

3.27.2 Steam Leaks

- A. An employee shall not, in any instance, use any part of his body to check for steam leaks.
- B. Employees shall not, without specific approval, work on leaky manhole covers, handhole plates or bolted steam flanges that are under pressure.
- C. All employees shall stay clear of high-pressure steam leaks or ruptures. The area shall be barricaded until the problem is isolated or repaired.
- D. Employees who need to check for steam leaks shall use a device that shall ensure their protection from contact with leaking steam. Examples of such a device include a wooden dowel with a cloth attached, a mirror or a piece of metal.

3.27.3 Fuel and Air Lines

- A. An employee shall not attempt to stop or slow an air or fuel leak with any part of his body.
- B. In case of a fuel leak, the area shall be vacated and barricaded until the system is repaired, cleaned and ventilated.
- C. Before welding on a fuel system, the system shall be purged and pressurized with an inert gas or other precautions shall be taken to prevent fires.

3.27.4 Maintenance and Pressurized Systems

- A. Pressure shall be relieved, and equipment shall be adequately drained before dismantling valves, flanges, and similar items associated with boilers, pressure vessels, and pressure piping. Drains should be left open when possible.

3.27.5 Chemical Systems

- A. Refer to the SDS for required protective clothing before working on the piping of a chemical system. Available eyewash and safety showers shall be tested and operational before starting work.
- B. A chemical system will be drained and flushed, when possible, with water before maintenance. See the plant procedures and clearance requirements for draining and flushing any chemical system.

3.29 Railway Operations

- A. The primary safety considerations when railcars are moving are:
 1. Check the route and ensure it is clear.
 2. Check the switch points and align them correctly for the intended movement.
 3. Protect the shoving movement. - Ensure railcars are not fouling other tracks.
 4. Plan the stopping movement.
 5. Properly apply hand brakes when movement is complete.
 6. Ensure grass, weeds, and debris are not graded or moved into the track area.
 7. Avoid debris or excess material cleanouts near tracks.
 8. Monitor materials being unloaded near tracks to ensure they aren't inadvertently blocked during the unloading process.
 9. Maintain constant awareness and vigilance of your surroundings to

ensure movements are safe and there is time to respond if conditions change.

10. Spillage/wheel contamination can sometimes occur when loading/unloading products. Spillage can reduce braking effectiveness along the rail route and during train switching operations.
11. Contamination to railcar wheels caused by spillage must be cleaned prior to being released for movement.

B. Track Maintenance and Inspection

1. Inspect tracks, switches and signals to ensure there are no damaged or degraded safe performance

C. Safe Opening and Use of Plug Doors

1. Prior to operating any rail door, inspect it thoroughly to ensure the door hinges are secure in the track, top, and bottom, before opening.
2. If operated improperly or not properly inspected prior to use, the gear mechanism on plug doors can cause the handle to spin suddenly and violently, result in a possible injury.
3. Plug doors must be securely closed whenever the car is being moved.

D. Closed Covered Hopper Cars — Bottom Gates

1. Prior to operating bottom gates, inspect to ensure the gate locks (except those equipped with self-locking locks) are released prior to opening gate. This will ensure the gate shaft and opening mechanisms are not bent and/or damaged.
2. The gate opening device must be well into the capstan prior to opening gate to prevent damage to the capstan such as rounding of the square drive socket.
3. After unloading the hoppers, an inspection must be made to ensure the gate is securely closed and properly locked. An open gate can fall between the rails while in transit and result in damage to property or a derailment. When loading hoppers ensure the gates are securely closed and locked to prevent any product spillage.

E. Safe Clearance Distances

1. No temporary structure, material or equipment shall be permitted closer than 12 feet to the nearest rail without prior approval

F. Railway Equipment Considerations

1. Railcars should only be moved by qualified personnel with proven knowledge of how to safely move, control speed, stop and secure rail equipment.
2. Railcars should NEVER be moved while hand brakes are fully applied. A hand brake can apply sufficient force against the wheels of a railcar so that the wheels do not turn when the car is pushed or pulled. This results in a wheel skidding along the rail. Skidding a wheel as little as 6 inches can cause small cracks on the tread of the wheel. These small cracks lead to shelling, where little pieces of the tread fall out, and to cracking deeper into the structure of the wheel. This structural damage can go undetected until the wheel, under the weight and stress of train operations, suddenly breaks apart.
3. It is very dangerous to leave hand brakes partially applied. If this condition is not corrected before railcars are moved, excessive heating could damage the wheel.

G. Moving Railcars - Key Requirements

1. Conduct a Job Briefing.
2. Hand brakes must not be released until it is clearly identified how the movement will be controlled and stopped.
3. Procedures must ensure that no car can be moved while people are working in or around that equipment. These procedures should also include the requirement to walk around and inspect for the removal of all dock plates, loading/unloading equipment, connecting hoses, cables or obstructions of any kind.
4. Procedures must clearly indicate the method of controlling and signaling that will be used during car movement activities.
5. Before coupling to any car, the couplers must be observed to ensure they line up.
6. Before moving or leaving a string of cars, it must be confirmed they are all coupled together.
7. Someone must always be in a position to observe the leading end of the movement and relay signals to the equipment operator.
8. Railcars must never be moved that will foul the main track, sidings or other tracks.
9. All railcars must be left at least 100 feet from a derail.
10. Cars must not be moved with the brakes fully applied or wheels skidding.
11. Do not push or pull on the car by the handrail, ladder or any other part of the car not designed for that purpose.
12. Always leave cars with sufficient hand brakes applied.
13. Follow all CSX procedures on brake testing.
14. Equipment (i.e., trackmobiles) must not operate within 25 feet of the nearest rail of any CSX main track or siding without the presence of a CSX flag person.

H. Using a Trackmobile/ Car mover

1. Conduct a Job Briefing.
2. Ensure the track is clear of obstructions for the distance of the car to be moved.
3. Ensure all hand brakes have been released to prevent skidding wheels.
4. Ensure all personnel are clear of moving equipment.
5. Advise everyone in the area of the intended movement.
6. Job briefing must cover the intended move with all personnel involved.
7. Couple or connect the trackmobile to the car to be moved.
8. Release the hand brake.

I. Crossing Tracks

1. When crossing railway tracks, watch for movement in both directions prior to crossing.
2. Do not stand or walk between the rails of any track.
3. Never stand on a rail while crossing tracks.
4. Watch for pinch points at switch locations.
5. When walking around the end of a car or locomotive, keep at least 25 feet of clearance from the equipment to protect yourself from sudden movement.
6. To cross tracks, look both ways, and if the tracks are clear, walk single file at a right angle to them.

J. Crossing Over Standing Equipment

1. In some cases, you may have to cross over cars. The best precaution is to walk around. However, if you have to walk over or apply or release a hand brake, use extreme caution, and consider the following:
 - a. Always use safety appliances such as ladders, handholds and crossover platforms when crossing equipment.
 - b. Never cross over moving cars.
 - c. Never cross under a car or cross over equipment while putting your feet on moveable components such as couplers, sliding sills or uncoupling levers.
 - d. While crossing over equipment always maintain a “three point contact” with the equipment and safety appliances.

K. Train Movements and Working Near Tracks

1. Be alert and know the plan for train movement.
2. Expect the movement of trains, engines, cars, or other equipment at any time, on any track, and in either direction, even cars on sidings that appear to be stationary or in storage.
3. Stay at least 25 feet away from the ends of stationary cars when crossing the track, and never climb on, under or between cars.
4. Never rely on others to protect you from train or car movement.
5. Do not stand on the track in front of an approaching engine, car or other equipment.
6. Be aware of the location of structures or obstructions where clearances are close.
7. Never stand or walk on railway tracks, either between the rails or on the ends of ties, unless absolutely necessary.
8. Stay clear of tracks whenever possible. Trains can approach with little or no warning. You may not be able to hear them due to atmospheric conditions, terrain, noisy work equipment, or passing trains in multiple track territory.

L. Protection of Railway Traffic and Property

1. Signs, signals and flags necessary for the safe operation of the railway shall not be obstructed, removed, relocated, or altered in any way without proper written authorization.
2. Blue flag protection on tracks signifies railway mechanical employees are on, under or between rolling equipment. Blue flags are important safety devices and must not be touched or obstructed

3.29.1 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. Work (except testing procedures) shall not be performed on locomotives while they are moving.
- H. Locomotives shall not be operated at unsafe speeds. The train shall be kept under control at all times.
- I. 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.
- J. Locomotive operators shall follow all signals carefully. If signals are not fully understood, operators shall not move the train until clarification has been made.
- K. Employees engaged in switching or dumping cars shall not line up drawheads with their feet
- L. Drawheads or knuckles shall not be shifted while locomotives or cars are in motion.
- M. Flying switches shall not be made.
- N. Employees shall not jump from one car to another while either is in motion.
- O. Cars shall not be spotted where they will foul another track.
- P. When shoving cars, the operator shall protect the front end of the train.
- Q. Employees shall not go between cars or board or leave locomotive cranes or cars while such equipment is in motion.
- R. 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.
- S. Cars and equipment marked with a blue flag shall not be moved.
- T. When a string of cars has been separated at a crossing or walkway, it shall not be recoupled unless the switch person is at the crossing.
- U. Employees shall not walk, stand, or sit on tracks except when necessary for the proper performance of duty.
- V. Employees shall cross or walk on tracks at a safe distance from cars or locomotives.
- W. Trains, engines, and cars shall be expected to move at any time, on any track, in either direction.
- X. Approved car movers shall be used for moving cars by hand
- Y. Companionways and catwalks must be kept free of tools and materials.
- Z. 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.
- AA. When thawing operations are in progress by use of oil-fired torches, adequate face protection and ear protection shall be used.
- BB. Fire protection and first aid equipment shall be available in open flame thawing areas.
- CC. When dusty coal conditions exist, dust respirators shall be used.
- DD. Emergency safety key switches and pull ropes should be checked frequently and maintained in good condition.
- EE. Pulley drives, gearing, motor couplings, and idlers at sealing strips shall be adequately guarded.
- FF. When a railroad car is stopped for unloading, the car shall be secured from displacement that could endanger employees.
- GG. An emergency means of stopping dump operations shall be provided at railcar dumps.

3.31 Shop Safety

- A. Ensure operators are qualified before operating shop tools and equipment.
- B. Inspect machines before use. Wear the appropriate PPE.
- C. Immediately remove defective machines from service and do not use them until repaired.
- D. Manufacturer's instructions are available for review by the user.
- E. Do not operate equipment beyond Manufacturer's/Engineering's specifications.
- F. Before operating equipment, ensure machine guards are in place to protect operator and personnel.
- G. Take actions to protect personnel from flying chips.
- H. When operating or around shop machinery, ensure gloves, ties and loose clothing do not become entangled. Button or properly roll up long sleeves, tuck in shirttails, remove or tuck in ties. Additionally, do not wear loose jewelry outside of clothing.
- I. Do not wear loose clothing including sleeves, gloves, lanyards, and hoods when performing lathe work (and other work with rotating shop equipment) including contaminated lathe work.
- J. Unnecessary personnel must stay clear of operating machinery.
- K. When removing chips and shavings from operating machinery, use a chip removal tool that will keep hands clear of the chips.
- L. When handling coolants, lubricants, solvents, or cutting fluids, refer to SDS (Safety Data Sheet) and Hazardous Materials Permit for personal protective equipment requirements.
- M. Do not use hands in place of the appropriate securing device such as C-clamps or vices.
- N. Avoid placing hands in the operating area of the machine until the machine comes to a complete stop.
- O. Clean machines after use.
- P. Tools are designed to do specific jobs and shall only be used for the intended purpose.
- Q. Tools shall be kept sharp, clean, oiled, or dressed.
- R. To avoid tipping of toolboxes/storage cabinets, close and lock covers, and drawers before moving and USE DISCRETION when opening multiple drawers during use.
- S. Fire hazards consisting of oil, rags, and hot chips are readily observable. Operators shall practice good housekeeping and know the nearest fire extinguisher's location.
- T. Replacement parts shall meet specifications (e.g., grinder wheels and metal drill bits must be approved for maximum rpm of the machine, wood cutting bits must be appropriate for the woodwork, blades must have proper arbor shape, etc.).
- U. Hose connections using Chicago fittings shall be pinned prior to pressurization.
- V. Hose connections with Chicago fittings or other styles of fittings shall be either banded, factory crimped, or Swagelock style insert connectors on any hose to be subjected to pressure. Radiator style hose clamps are prohibited from use as connectors for hose couplings that are subject to pressure.

3.33 Turbine Generators

- A. Turbine generators shall be started and stopped in accordance with approved station operating instructions.
- B. When employees are 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.
- C. Work area protection shall be provided, or the danger area shall be barricaded when gratings are removed.
- D. 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 Clearance Tag(s) attached. Also, all equipment that can cause motion to the turbine such as turning gear shall be physically rendered inoperative and Clearance Tag(s) attached if/when it poses any danger or safety concern.
- E. 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 Clearance Tag(s) attached before the brushes are changed.

Section 4
Chemical and Physical Hazard Control

4.1 Acids and Caustics

4.1.1 Storage

- A. Acids, in any quantity, shall be kept in a container compatible with the chemical stored within and appropriately 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. Acids and caustics shall not be stored together.
- F. Storage areas for acids and caustics shall be posted with appropriate warning signs.

4.1.2 Handling

- A. Only 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, acid proof 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. Before lifting a chemical container, it shall be examined carefully to see that it is not damaged or leaking and properly sealed. All movements shall be made slowly to avoid excessive agitation of the acid.
- F. If acids or caustics are spilled, they shall be appropriately contained and disposed of.
- G. Employees handling acids, caustics, or other corrosive, toxic chemicals shall wear chemical resistant gloves, aprons, eye and face protection and shall take precautions to prevent personal injury, as directed by the SDS.
- H. The use and toxic quality of new materials shall be investigated thoroughly, and personnel shall be advised of any hazards involved.
- I. Chemical pumps shall be washed externally before repacking or performing maintenance work.
- 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. 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.
- M. 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.
- N. Only approved methods, tools, and equipment shall be used to extract acids and caustics from a container.

- O. 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.

4.1.3 Acids and Caustics- General

- A. When acid or caustic are mixed with water, the acid or caustic shall be poured into the water, not the water into the acid or caustic.
- B. When necessary to enter a tank, vessel, or similar structure, appropriate equipment and confined space procedures shall be used to minimize employee exposure to chemical hazards.
- C. Hydrazine and morpholine are highly toxic and caustic and 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. Chemical containers, 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. Spark-proof tools shall always be used where there is a danger of accumulated hydrogen.
- F. Use of liquid chlorine bleach:
 - 1. Only personnel who are properly trained and equipped with the necessary personal protective equipment shall handle liquid chlorine bleach.
 - 2. First and foremost, all appropriate personnel who will be handling and/or be exposed to liquid bleach, shall refer to the specific SDS sheet for all pertinent handling, storage, and protective equipment information.
 - 3. Every precaution shall be taken to prevent accidental release of liquid bleach and appropriate clean-up material shall be readily available for use in an emergency.
 - 4. Report spills or releases to your supervisor.

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

4.2 Anhydrous Ammonia

- A. All employees, including Operations, Maintenance, and Results Lab employees, working on or near the anhydrous ammonia system, are required to be trained to safely perform their job duties. This is also true of contract employees working on these systems.
- B. Refer to the Generation maintained Risk Management Program and Process Safety Management Manual (RMP/PSM).

4.3 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 or suspected to be that asbestos is in a facility, it is strongly recommended that an EPA-approved contractor be consulted prior to work that may cause asbestos disturbance.

- A. Only those employees who have been properly trained and equipped with the necessary personal protective equipment shall handle asbestos. All Santee Cooper employees involved in the possible disturbance of asbestos

containing materials as a part of regular work activities should have, at a minimum, asbestos awareness training.

- 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:
 - 1. Proper protective equipment, including clothing, must be worn when working in an area where there is a significant amount of airborne asbestos fibers.
- F. Respirators:
 - 1. 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 Santee Cooper's Respiratory Protection Program for additional information.
- G. Special Clothing:
 - 1. 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.
- H. 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.

4.5 Crystalline Silica

- A. Crystalline silica is a mineral dust, mainly quartz, cristobalite, and/or tridymite created through mining and processing of mined minerals, and construction activities. It is commonly found in concrete work, refractory, coal dust, railroad maintenance, etc.
- B. When applicable, it is the duty of Santee Cooper to conduct sampling of the workplace to determine presence of airborne crystalline silica.
- C. This section applies when sampling or other relevant data indicates potential employee exposure to airborne crystalline silica above the OSHA time weighted average (TWA) indicated in Table Z-3 of OSHA 29 CFR 1910.1000.
- D. When an area is discovered with airborne concentrations of crystalline

silica, the area shall be designated as a regulated location, signs erected to notify employees, and access to the location must be limited to qualified employees.

- E. Santee Cooper shall utilize a hierarchy of controls to limit the generation of silica and exposure to employees.
- F. Hierarchy of controls shall include elimination of the silica or process that caused its generation; engineering controls to limit airborne dusts; policies, practices, and protective equipment that control exposure.
- G. Santee Cooper shall develop a housekeeping program in areas where crystalline silica is present to control fugitive dusts.
- H. Housekeeping policies should not allow dry- sweeping, brushing, or compressed air to be used that could result in airborne dusts.
- I. HEPA vacuuming and wet methods of dust control should be used whenever feasible.
- J. Santee Cooper shall create a written program that dictates methods of controlling exposure.
- K. Santee Cooper shall develop a medical surveillance program when employees are exposed to levels above ½ of their OSHA TWA for more than 30 calendar days per year.

Note: Discussion of mandatory provisions of a medical surveillance program are outside the scope of this manual, for more information, please see OSHA 29 CFR 1910.1053 (i) Medical Surveillance.

- L. Santee Cooper shall maintain, and make available, records including:
 - 1. Air sampling results
 - 2. Medical surveillance
 - 3. Objective data used in determination of risk

4.7 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:
 - 1. Method and equipment for transporting explosives and detonators.
 - 2. Type and location of storage facilities.

3. Type and quantity of explosives and detonators.
 4. Primer assembly procedure and location.
 5. Employee training programs.
 6. Provisions for protecting persons, structures, and private and public property.
 7. Provisions for developing and distributing a daily blasting plan covering hole diameter, spacing, loading, and delay patterns.
 8. 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 Santee Cooper 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 non-sparking 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 always 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 Santee Cooper employees using 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.
- Note: In addition to the above, all local, state, and federal laws covering the transportation and use of explosives shall be observed.

4.8 Fuels and Lubricants

- A. Fuels shall be stored in accordance with Section 110, Housekeeping.
- 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.

4.9 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 Safety Data Sheets (SDS) and container labeling. Employees shall refer to the Santee Cooper 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 SDS 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 SDS for all hazardous materials known to be in their work areas.
- F. SDS shall be made available to contractors working on Santee Cooper 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 Santee Cooper'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 Section 110, Housekeeping.

4.10 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 and 29 CFR 1926.62 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.
- G. All Santee Cooper 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.

4.11 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.

- D. 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.
- E. Employees should avoid twisting or excessive bending when lifting or setting downloads.
- F. When moving a load horizontally, employees should push the load rather than pull it.
- G. 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.
- H. 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.
- I. 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.
 - 3. Materials stored near energized lines or equipment must meet the spacing requirements of OSHA Standard 29 CFR 1910.269 (k).

4.12 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. It is recommended to administer a hearing conservation program when noise exposures equal or exceed an 8-hour time-weighted average (TWA) sound level of 85 dBA. (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: earmuffs, 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.

Table 501-1. Permissible Noise Exposure (Source: OSHA Standard 29 CFR 1910.95 Table G-16)	
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.

4.13 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. Santee Cooper employees should use PPE as noted in SDS.
- 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. The OSHA Permissible Exposure Limit (PEL) and the ACGIH Threshold Limit Value (TLV) for employees is 1mg/m³ for PCBs with 42% chlorine. The OSHA PEL and ACGIH TLV for PCBs with 54% chlorine is 0.5mg/m³.
- E. All materials such as rags, solvents, dirt, etc., contaminated by PCBs shall be disposed of according to Santee Cooper procedures and federal, state, and local regulations.

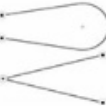

4.14 Herbicides and Other Chemicals

- A. Before using any pesticide/herbicide or other chemical, employees shall read the label carefully and follow the directions and precautions listed.
- B. Employees shall avoid skin contact with, or breathing mist of, spray material.
- C. When employees are working with toxic materials, proper respirator protection must be used.
- D. Spray equipment shall be cleansed daily when using oil solutions.
- E. Spraying/application of herbicides, pesticides and/or other chemicals shall not be done during windy conditions.

- F. When spraying near power lines, employees shall maintain Minimum Approach Distance (MAD), including distance of spray from 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.

Table and Charts


Table 1
Rated Load For Grade 80 Alloy Steel Chain Slings Vertical And Bridle Hitches

Nominal Chain Size	Single Leg Slings		Double Leg Bridle Slings Single Basket Slings		Triple and Quadruple Leg Bridle Slings Double Basket Slings		
							
	Horizontal Angle [Note 1]						
	90°	60°	45°	30°	60°	45°	30°
In	lb	lb	lb	lb	lb	lb	lb
mm							
5.5	2,100	3,600	3,000	2,100	5,500	4,400	3,200
7	3,500	6,100	4,900	3,500	9,100	7,400	5,200
8	4,500	7,800	6,400	4,500	11,700	9,500	6,800
10	7,100	12,300	10,000	7,100	18,400	15,100	10,600
13	12,000	20,800	17,000	12,000	31,200	25,500	18,000
16	18,100	31,300	25,600	18,100	47,000	38,400	27,100
20	28,300	49,000	40,000	28,300	73,500	60,000	42,400
22	34,200	59,200	48,400	34,200	88,900	72,500	51,300
26	47,700	82,600	67,400	47,700	123,900	101,200	71,500
32	72,300	125,200	102,200	72,300	187,800	153,400	108,400

NOTES:

(1) The horizontal angle is the angle formed between the inclined leg and the horizontal plane [see figure 1(d)].

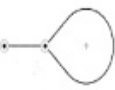
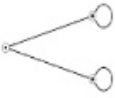
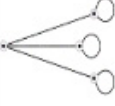
Table 2
Rated Load For Grade 100 Alloy Steel Chain Slings Vertical And Bridle Hitches

Nominal Chain Size	Single Leg Slings		Double Leg Bridle Slings Single Basket Slings		Triple and Quadruple Leg Bridle Slings Double Basket Slings		
							
	Horizontal Angle [Note 1]						
	90°	60°	45°	30°	60°	45°	30°
In	lb	lb	lb	lb	lb	lb	lb
mm							
5.5	2,700	4,700	3,800	2,700	7,000	5,700	4,000
7	4,300	7,400	6,100	4,300	11,200	9,100	6,400
8	5,700	9,800	8,100	5,700	14,800	12,100	8,500
10	8,800	15,200	12,400	8,800	22,800	18,700	13,200
13	15,000	26,000	21,200	15,000	39,000	31,800	22,500
16	22,600	39,100	32,000	22,600	58,700	47,900	33,900
20	35,300	61,100	49,800	35,300	91,700	74,900	53,000
22	42,700	74,000	60,400	42,700	110,900	90,600	64,000

NOTES:

(1) The horizontal angle is the angle formed between the inclined leg and the horizontal plane [see figure 1(d)].

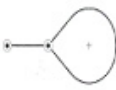
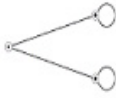
TABLE 3
RATED LOAD FOR GRADE 80 ALLOY STEEL CHAIN SLINGS CHOKER HITCHES [Note 2]

Nominal Chain Size	Single Leg Slings		Double Leg Bridle Slings Single Basket Slings		Triple and Quadruple Leg Bridle Slings Double Basket Slings		
							
	Horizontal Angle [Note 1]						
	90°	60°	45°	30°	60°	45°	30°
in	lb	lb	lb	lb	lb	lb	lb
7/32	1,700	2,900	2,400	1,700	4,400	3,500	2,600
9/32	2,800	5,000	3,900	2,800	7,300	5,900	4,200
5/16	3,600	6,200	5,100	3,600	9,300	7,600	5,400
3/8	5,700	9,800	8,000	5,700	14,700	12,100	8,500
1/2	9,600	16,600	13,600	9,600	25,000	20,400	14,400
3/4	14,500	25,000	20,500	14,500	37,600	30,700	21,700
1	22,600	39,200	32,000	22,600	56,800	48,000	33,900
1 1/4	27,400	47,400	38,700	27,400	71,100	58,000	41,000
1 1/2	38,200	66,100	53,900	38,200	99,100	81,000	57,200
2	57,800	100,200	81,800	57,800	150,200	122,700	86,700

NOTES:

- (1) The horizontal angle is the angle formed between the inclined leg and the horizontal plane [see figure 1(d)].
- (2) Rated loads are for angles of choke greater than 120 degrees.

Table 4
Rated Load For Grade 100 Alloy Steel Chain Slings Choker Hitches [Note 2]

Nominal Chain Size	Single Leg Slings		Double Leg Bridle Slings Single Basket Slings		Triple and Quadruple Leg Bridle Slings Double Basket Slings		
							
	Horizontal Angle [Note 1]						
	90°	60°	45°	30°	60°	45°	30°
in	lb	lb	lb	lb	lb	lb	lb
7/32	2,100	3,600	3,000	2,100	5,500	4,400	3,200
9/32	3,500	6,100	4,900	3,500	9,100	7,400	5,200
5/16	4,500	7,800	6,400	4,500	11,700	9,500	6,800
3/8	7,100	12,300	10,000	7,100	18,400	15,100	10,600
1/2	12,000	20,800	17,000	12,000	31,200	25,500	18,000
3/4	18,100	31,300	25,600	18,100	47,000	38,400	27,100
1	28,300	49,000	40,000	28,300	73,500	60,000	42,400
1 1/4	34,200	59,200	48,400	34,200	88,900	72,500	51,300

NOTES:

- (1) The horizontal angle is the angle formed between the inclined leg and the horizontal plane [see figure 1(d)].
- (2) Rated loads are for angles of choke greater than 120 degrees.

Table 5
Effect of Elevated Temperature on Rated Load of Alloy Steel Chain

Temperature		Grade of Chain			
		Grade 80		Grade 100	
(°F)	(°C)	Temporary Reduction of Rated Load WHILE AT Temperature	Permanent Reduction of Rated Load AFTER EXPOSURE to Temperature	Temporary Reduction of Rated Load WHILE AT Temperature	Permanent Reduction of Rated Load AFTER EXPOSURE to Temperature
Below 400	Below 204	NONE	NONE	NONE	NONE
400	204	10%	None	15%	None
500	260	15%	None	25%	5%
600	316	20%	5%	30%	15%
700	371	30%	10%	40%	20%
800	427	40%	15%	50%	25%
900	482	50%	20%	60%	30%
1000	538	60%	25%	70%	35%
Over 1000	Over 538	REMOVE FROM SERVICE			

Table 6
Minimum Allowable Thickness at Any Point on a Link

Nominal Chain or Coupling Link Size		Minimum Allowable Thickness at Any Point on The Link	
In	Mm	In	mm
7/32	5.5	0.189	4.80
9/32	7	0.239	6.07
5/16	8	0.273	6.93
3/8	10	0.342	8.69
1/2	13	0.443	11.26
5/8	16	0.546	13.87
3/4	20	0.687	17.45
7/8	22	0.750	19.05
1	26	0.887	22.53
1 1/4	32	1.091	22.71

Table 7
 Rated Load for Single- and Two-Leg Slings 6x19 or 6x36 Classification Extra Improved Plow Steel (EIPS) Grade Fiber Core (FC) Wire Rope Based on Design Factor = 5 and Rated Loads Expressed in Tons (2,000 lb)

Rope Diameter, in.	Single-Leg			Two-Leg Bridle						Choker						
	Vertical	Vertical Basket			Horizontal Angle			Horizontal Angle								
		Choker	HT	MS	S	HT	MS	S	HT		MS	HT	MS	HT	MS	HT&MS
1/4	0.54	0.66	0.60	0.42	1.1	1.1	1.1	1.1	0.94	0.97	0.77	0.79	0.54	0.56	0.73	0.42
5/16	0.83	0.87	0.84	0.66	1.7	1.7	1.7	1.7	1.4	1.5	1.2	1.2	0.83	0.87	1.1	0.66
3/8	1.2	1.2	1.3	0.94	2.4	2.5	2.5	2.5	2.0	2.2	1.7	1.8	1.2	1.2	1.6	0.94
7/16	1.6	1.7	1.8	1.3	3.2	3.4	3.4	3.4	2.7	2.9	2.2	2.4	1.6	1.7	2.2	1.3
1/2	2.0	2.2	2.4	1.6	4.0	4.4	4.4	4.4	3.5	3.8	2.9	3.1	2.0	2.2	2.9	1.6
9/16	2.5	2.7	3.0	2.1	5.0	5.5	5.5	5.5	4.4	4.8	3.6	3.9	2.5	2.7	3.6	2.1
5/8	3.1	3.4	3.7	2.6	6.2	6.8	6.8	6.8	5.3	5.9	4.4	4.8	3.1	3.4	4.5	2.6
3/4	4.3	4.8	5.2	3.7	8.6	9.7	9.7	9.7	7.4	8.4	6.1	6.8	4.3	4.8	6.3	3.7
7/8	5.7	6.6	7.1	5.0	11	13	13	13	9.8	11	8.0	9.3	5.7	6.6	8.6	5.0
1	7.4	8.3	9.2	6.4	15	17	17	17	13	14	10	12	7.4	8.3	11	6.4
1 1/8	9.3	10	12	8.1	19	21	21	21	16	18	13	15	9.3	10	14	8.1
1 1/4	11	13	14	9.9	23	26	26	26	20	22	16	18	11	13	17	9.9

GENERAL NOTES:

HT = hand-tucked splice

MS = mechanical splice

S = swaged or poured socket

Rated loads based on minimum D/d ratio of 25/1.

(e) Rated load based on pin diameter no larger than natural eye width or less than the normal sling diameter.

(f) For choker hitch, the angle of choke is 120 deg or greater.

Table 8

Rated Load for Three- and Four-Leg Slings 6x19 or 6x36 Classification Extra Improved Plow Steel (EIPS) Grade Fiber Core (FC) Wire Rope Based on Design Factor = 5 and Rated Loads Expressed in Tons (2,000 lb)

Rope Diameter, in.	Three-Leg			Four-Leg													
	Vertical	Horizontal Angle			Vertical	Horizontal Angle			30 deg	45 deg	60 deg	MS	HT	MS	HT	MS	HT
		60 deg	HT	MS		HT	MS	HT									
1/4	1.6	1.7	1.4	1.4	1.2	1.2	1.2	0.81	0.84	2.2	2.2	1.9	1.9	1.5	1.6	1.1	1.1
5/16	2.5	2.6	2.2	2.3	1.8	1.8	1.8	1.3	1.3	3.3	3.5	2.9	3.0	2.4	2.5	1.7	1.7
3/8	3.5	3.7	3.1	3.2	2.5	2.6	2.6	1.8	1.9	4.7	5.0	4.1	4.3	3.3	3.5	2.4	2.5
7/16	4.7	5.0	4.1	4.4	3.4	3.6	3.6	2.4	2.5	6.3	6.7	5.5	5.8	4.5	4.8	3.2	3.4
1/2	6.1	6.5	5.3	5.7	4.3	4.6	4.6	3.0	3.3	8.1	8.7	7.0	7.5	5.7	6.2	4.0	4.4
9/16	7.6	8.2	6.6	7.1	5.4	5.8	5.8	3.8	4.1	10	11	8.7	9.5	7.1	7.8	5.0	5.5
5/8	9.8	10	8.0	8.8	6.5	7.2	7.2	4.6	5.1	12	14	11	12	8.7	9.6	6.2	6.8
3/4	13	15	11	13	9.1	10	10	6.4	7.3	17	19	15	17	12	14	8.5	9.7
7/8	17	20	15	17	12	14	14	8.5	9.8	23	26	20	23	16	19	11	13
1	22	25	19	22	16	18	18	11	12	29	33	25	29	21	23	15	17
1 1/8	28	31	24	27	20	22	22	14	16	37	42	32	36	26	29	19	21
1 1/4	34	38	30	33	24	27	27	17	19	45	51	39	44	32	36	23	26

GENERAL NOTES:

HT = hand-tucked splice

MS = mechanical splice

Rated loads based on minimum D/d ratio of 25/1.

Rated load based on pin diameter no larger than natural eye width or less than the normal sling diameter.

Table 9
 Rated Load for Single- and Two-Leg Slings 6x19 or 6x36 Classification Extra Improved Plow Steel (EIPS) Grade Independent Wire Rope Core (IWRC) Wire Rope Based on Design Factor = 5 and Rated Loads Expressed in Tons (2,000 lb)

Hitch Type	Single-Leg			Two-Leg Bridle or Basket						Choker											
	Vertical	Vertical Basket			Horizontal Angle						Horizontal Angle										
		HT	MS	S	HT	MS	S	HT	MS	HT	MS	HT	MS								
Rope Diameter, in.	HT	MS	S	HT	MS	S	HT	MS	HT	MS	HT	MS	HT	MS							
¼	0.54	0.65	0.66	0.42	0.48	1.1	1.3	1.1	1.3	1.3	0.94	1.1	0.77	0.91	0.54	0.65	1.0	1.1	1.3	0.66	0.74
5/16	0.83	1.0	1.1	0.66	0.74	1.7	2.0	1.9	2.0	1.9	1.4	1.7	1.2	1.4	0.83	1.0	1.4	1.6	1.8	0.94	1.1
¾	1.2	1.4	1.5	0.94	1.1	2.4	2.9	2.8	2.4	2.9	2.8	2.0	2.5	1.7	2.0	1.2	1.4	1.6	1.8	0.94	1.1
7/16	1.6	1.9	2.0	1.3	1.4	3.2	3.9	3.8	3.2	3.9	3.8	2.7	3.4	2.2	2.7	1.6	1.9	2.2	2.5	1.3	1.4
1	2.0	2.5	2.7	1.6	1.9	4.0	5.1	4.9	4.0	5.1	4.9	3.5	4.4	2.9	3.6	2.0	2.5	2.9	3.2	1.6	1.9
9/16	2.5	3.2	3.4	2.1	2.4	5.0	6.4	6.2	5.0	6.4	6.2	4.4	5.5	3.6	4.5	2.5	3.2	3.6	4.1	2.1	2.4
1 ¼	3.1	3.9	4.1	2.6	2.9	6.2	7.8	7.6	6.2	7.8	7.6	5.3	6.8	4.4	5.5	3.1	3.9	4.5	5.0	2.6	2.9
1 ½	4.3	5.6	5.9	3.7	4.1	8.6	11	11	8.6	11	11	7.4	9.7	6.1	7.9	4.3	5.6	6.3	7.1	3.7	4.1
2	5.7	7.6	8.0	5.0	5.6	11	15	15	11	15	15	9.8	13	8.0	11	5.7	7.6	8.6	9.7	5.0	5.6
1	7.4	9.8	10	6.4	7.2	15	20	19	15	20	19	13	17	10	14	7.4	9.8	11	13	6.4	7.2
1 ¼	9.3	12	13	8.1	9.1	19	24	24	19	24	24	16	21	13	17	9.3	12	14	16	8.1	9.1
1 ½	11	15	16	9.9	11	23	30	30	23	30	30	20	26	16	21	11	15	17	19	9.9	11
2	14	18	19	12	13	27	36	36	27	36	36	24	31	19	25	14	18	21	23	12	13
1 ¼	16	21	23	14	16	32	42	42	32	42	42	28	37	23	30	16	21	25	28	14	16
1 ½	19	24	26	16	18	38	49	49	38	49	49	33	42	27	35	19	24	29	32	16	18
2	22	28	31	19	21	44	57	57	44	57	57	38	49	31	40	22	28	33	37	19	21
1 ¼	25	32	35	22	24	50	64	64	50	64	64	43	56	35	46	25	32	38	42	22	24
1 ½	28	37	40	25	28	56	73	73	56	73	73	49	63	40	52	28	37	43	48	25	28

GENERAL NOTES:

HT = hand-tucked splice

MS = mechanical splice

S = swaged or poured socket

Rated loads based on minimum *D/d* ratio of 25/1.

(e) Rated load based on pin diameter no larger than natural eye width or less than the normal sling diameter.

(f) For choker hitch, the angle of choke is 120 deg or greater.

Table 10
 Rated Load for Three- and Four-Leg Slings 6x19 or 6x36 Classification Extra Improved Plow Steel (EIPS) Grade Independent Wire Rope Core (IWRC) Wire Rope Based on Design Factor = 5 and Rated Loads Expressed in Tons (2,000 lb)

Hitch Type	Three-Leg			Four-Leg												
	Vertical	Horizontal Angle			Horizontal Angle											
		HT	MS	S	HT	MS	S	HT	MS	HT	MS	HT	MS			
Rope Diameter, in.	HT	MS	S	HT	MS	S	HT	MS	HT	MS	HT	MS				
¼	1.6	1.9	1.4	1.7	1.2	1.4	0.81	0.97	2.2	2.6	1.9	2.2	1.5	1.8	1.1	1.3
5/16	2.5	3.0	2.2	2.6	1.8	2.1	1.3	1.5	3.3	4.0	2.9	3.5	2.4	2.8	1.7	2.0
¾	3.5	4.3	3.1	3.7	2.5	3.0	1.8	2.2	4.7	5.7	4.1	5.0	3.3	4.1	2.4	2.9
7/16	4.7	5.8	4.1	5.0	3.4	4.1	2.4	2.9	6.3	7.8	5.5	6.7	4.5	5.5	3.2	3.9
1	6.1	7.6	5.3	6.6	4.3	5.4	3.0	3.8	8.1	10	7.0	8.8	5.7	7.1	4.0	5.1
9/16	7.6	9.6	6.6	8.3	5.4	6.8	3.8	4.8	10	13	8.7	11	7.1	9.0	5.0	6.4
1 ¼	9.3	12	8.0	10	6.5	8.3	4.6	5.9	12	16	11	14	8.7	11	6.2	7.8
1 ½	13	17	11	15	9.1	12	6.4	8.4	17	22	15	19	12	16	8.6	11
2	17	23	15	20	12	16	8.5	11	23	30	20	26	16	21	11	15
1 ¼	22	29	19	26	16	21	11	15	29	39	25	34	21	28	15	20
1 ½	28	36	24	31	20	26	14	18	37	48	32	42	26	34	19	24
2	34	44	30	38	24	31	17	22	45	59	39	51	32	42	23	30
1 ¼	41	53	36	45	29	38	21	27	55	71	47	62	39	50	27	36
1 ½	49	63	42	55	34	45	24	32	65	84	56	73	46	60	32	42
2	56	73	49	63	40	52	28	37	75	98	65	85	53	69	38	49
1 ¼	65	85	57	74	46	60	33	42	87	113	76	98	62	80	44	57
1 ½	74	97	64	84	53	68	37	48	99	129	86	112	70	91	50	64
2	84	110	73	95	60	78	42	55	113	147	98	127	80	104	56	73

GENERAL NOTES:

HT = hand-tucked splice

MS = mechanical splice

Rated loads based on minimum *D/d* ratio of 25/1.

Rated load based on pin diameter no larger than natural eye width or less than the normal sling diameter.

Table 11
 Rated Load for Single- and Two-Leg Slings 6×19 or 6×36 Classification Extra Extra Improved Plow Steel (EEIPS) Grade Independent Wire Rope Core (IWRC) Wire Rope Based on Design Factor = 5 and Rated Loads Expressed in Tons (2,000 lb)

Rope Diameter, in.	Hitch Type			Single-Leg						Two-Leg Bridle						Choker													
	Vertical			Choker			Vertical Basket			Vertical			60°			45°			30°			60°			30°				
	HT	MS	S	HT	MS	S	HT	MS	S	HT	MS	HT	MS	HT	MS	HT	MS	HT	MS	HT	MS	HT	MS	HT	MS	HT	MS		
1/4	0.60	0.71	0.74	0.46	0.52	1.2	1.4	1.4	1.2	1.4	1.0	1.2	0.84	1.0	0.60	0.71	0.80	0.90	0.46	0.52	1.2	1.4	1.4	1.2	0.84	1.0	0.60	0.71	
5/16	0.92	1.1	1.2	0.72	0.81	1.8	2.2	2.1	1.8	2.2	1.6	1.9	1.3	1.6	0.92	1.1	1.2	1.4	0.72	0.81	1.8	2.2	2.1	1.8	2.2	1.6	1.9	1.3	
3/8	1.3	1.6	1.7	1.0	1.2	2.6	3.2	3.1	2.6	3.2	2.3	2.7	1.8	2.2	1.3	1.6	1.7	2.1	1.0	1.2	2.6	3.2	3.1	2.6	3.2	2.3	2.7	1.8	2.2
7/16	1.7	2.1	2.2	1.4	1.6	3.5	4.3	4.1	3.5	4.3	3.0	3.7	2.5	3.0	1.7	2.1	2.2	2.4	1.4	1.6	3.5	4.3	4.1	3.5	4.3	3.0	3.7	2.5	3.0
1/2	2.2	2.8	2.9	1.8	2.0	4.5	5.5	5.4	4.5	5.5	3.9	4.8	3.1	3.9	2.2	2.8	2.9	3.1	1.8	2.0	4.5	5.5	5.4	4.5	5.5	3.9	4.8	3.1	3.9
5/16	2.8	3.5	3.7	2.3	2.6	5.6	7.0	6.8	5.6	7.0	4.8	6.1	3.9	5.0	2.8	3.5	3.7	4.0	2.3	2.6	5.6	7.0	6.8	5.6	7.0	4.8	6.1	3.9	5.0
3/4	3.4	4.3	4.5	2.8	3.2	6.8	8.6	8.4	6.8	8.6	5.9	7.5	4.8	6.1	3.4	4.3	4.5	4.9	2.8	3.2	6.8	8.6	8.4	6.8	8.6	5.9	7.5	4.8	6.1
7/8	4.7	6.2	6.5	4.0	4.5	9.4	12	12	9.4	12	8.2	11	6.7	8.7	4.7	6.2	6.5	7.0	4.0	4.5	9.4	12	12	9.4	12	8.2	11	6.7	8.7
1	6.2	8.3	8.8	5.5	6.1	12	17	16	12	17	11	14	8.8	12	6.2	8.3	8.8	9.4	5.5	6.1	12	17	16	12	17	11	14	8.8	12
1 1/8	8.1	11	11	7.1	8.0	16	22	21	16	22	14	19	11	15	8.1	11	11	12	7.1	8.0	16	22	21	16	22	14	19	11	15
1 1/4	10	14	14	8.8	10	20	26	26	20	26	18	23	14	18	10	14	14	15	8.8	10	20	26	26	20	26	18	23	14	18
1 1/2	13	18	18	11	12	25	33	33	25	33	22	28	18	23	13	18	18	19	11	12	25	33	33	25	33	22	28	18	23
1 3/8	15	21	21	13	14	30	39	39	30	39	26	33	21	27	15	21	21	23	13	14	30	39	39	30	39	26	33	21	27
1 1/2	18	25	25	16	17	36	46	46	36	46	31	39	25	31	18	25	25	27	16	17	36	46	46	36	46	31	39	25	31
1 5/8	21	29	29	18	20	41	54	54	41	54	36	44	29	36	21	29	29	31	18	20	41	54	54	41	54	36	44	29	36
1 3/4	24	34	34	21	23	48	63	63	48	63	42	51	34	42	24	34	34	36	21	23	48	63	63	48	63	42	51	34	42
1 7/8	27	38	38	24	26	55	71	71	55	71	47	57	39	47	27	38	38	41	24	26	55	71	71	55	71	47	57	39	47
2	31	43	43	27	30	62	80	80	62	80	54	66	44	54	31	43	43	47	27	30	62	80	80	62	80	54	66	44	54

GENERAL NOTES:

HT = hand-tucked splice

MS = mechanical splice

S = swaged or poured socket

Rated loads based on minimum D/d ratio of 25/1.

(e) Rated load based on pin diameter no larger than natural eye width or less than the normal sling diameter.

(f) For choker hitch, the angle of choke is 120 deg or greater.

Table 12
 Rated Load for Three- and Four-Leg Slings 6×19 or 6×36 Classification Extra Extra Improved Plow Steel (EEIPS) Grade Independent Wire Rope Core (IWRC) Wire Rope Based on Design Factor = 5 and Rated Loads Expressed in Tons (2,000 lb)

Rope Diameter, in.	Three-Leg			Four-Leg												
	Vertical			Horizontal Angle			Vertical			Horizontal Angle						
	HT	MS	S	60 deg	45 deg	30 deg	HT	MS	S	Vertical	60 deg	45 deg	30 deg			
1/4	1.8	2.1	1.6	1.6	1.3	1.5	0.90	1.1	2.4	2.8	2.1	2.4	1.7	2.0	1.2	1.4
5/16	2.8	3.3	2.4	2.9	1.9	2.3	1.4	1.7	3.7	4.4	3.2	3.8	2.6	3.1	1.8	2.2
3/8	3.9	4.7	3.4	4.1	2.8	3.3	1.9	2.4	5.2	6.3	4.5	5.5	3.7	4.5	2.6	3.2
7/16	5.2	6.4	4.5	5.5	3.7	4.5	2.6	3.2	7.0	8.5	6.0	7.4	4.9	6.0	3.5	4.3
1/2	6.7	8.3	5.8	7.2	4.7	5.9	3.3	4.2	8.9	11	7.7	9.6	6.3	7.8	4.5	5.5
5/16	8.3	11	7.2	9.1	5.9	7.5	4.2	5.3	11	14	9.6	12	7.9	9.9	5.6	7.0
3/4	10	13	8.8	11	7.2	9.1	5.1	6.5	14	17	12	15	9.6	12	6.8	8.6
7/8	14	18	12	16	10	13	7.1	9.2	19	25	16	21	13	17	9.4	12
1	19	25	16	22	13	18	9.4	12	25	33	22	29	18	24	12	17
1 1/8	24	32	21	28	17	23	12	16	32	43	28	37	23	31	16	22
1 1/4	31	41	26	35	22	30	15	20	41	54	35	45	29	38	20	27
1 1/2	38	50	32	43	27	36	19	25	50	66	43	56	35	46	25	33
1 3/8	45	60	39	51	32	42	23	30	60	80	52	68	43	56	30	40
1 1/2	53	71	46	60	38	50	27	35	71	94	62	81	50	66	36	48
1 5/8	62	83	54	71	44	58	31	40	83	110	72	93	59	77	41	54
1 3/4	72	96	62	81	51	68	36	46	96	128	83	109	68	90	48	63
1 7/8	82	109	71	91	58	77	41	52	109	144	95	124	77	101	55	72
2	93	124	80	101	66	87	46	58	124	163	107	139	88	115	62	82

GENERAL NOTES:









HT = hand-tucked splice

MS = mechanical splice

Rated loads based on minimum D/d ratio of 25/1.

Rated load based on pin diameter no larger than natural eye width or less than the normal sling diameter.









Table 13
 Rated Load for Cable-Laid Wire Rope Single- and Two-Leg Slings Mechanical Splice Only Based on Design Factor = 5 and Rated Loads Expressed in Tons (2,000 lb)

Rope Diameter, in.	Single-Leg			Two-Leg Bridle			Two-Leg Choker		
									
	Hitch Type			Horizontal Angle			Horizontal Angle		
	Vertical	Choker	Vertical Basket	Vertical	60°	45°	30°	60°	30°
7X7X7 Construction									
¼	0.50	0.35	1.0	1.0	0.87	0.71	0.50	0.61	0.35
½	1.1	0.8	2.2	2.2	1.9	1.5	1.1	1.3	0.76
¾	1.9	1.3	3.7	3.7	3.2	2.6	1.9	2.2	1.3
1	2.8	1.9	5.5	5.5	4.8	3.9	2.8	3.4	1.9
1 ¼	3.8	2.7	7.6	7.6	6.6	5.4	3.8	4.6	2.7
1 ½	5.0	3.5	10	10	8.7	7.1	5.0	6.1	3.5
1 ¾	6.4	4.5	13	13	11	9.1	6.4	7.8	4.5
7X7X19 Construction									
¼	1.9	1.3	3.8	3.8	3.3	2.7	1.9	2.3	1.3
½	2.9	2.0	5.8	5.8	5.0	4.1	2.9	3.5	2.0
¾	4.1	2.8	8.1	8.1	7.0	5.8	4.1	4.9	2.8
1	5.4	3.8	11	11	9.3	7.6	5.4	6.5	3.8
1 ¼	6.0	4.8	14	14	12	9.7	6.9	8.3	4.8
1 ½	8.3	5.8	17	17	14	12	8.3	10	5.8
1 ¾	9.9	6.9	20	20	17	14	9.9	12	6.9
7X6X19 or 7X6X36 IWRC Classification									
¼	3.8	2.7	7.6	7.6	6.6	5.4	3.8	4.6	2.7
½	5.0	3.5	10	10	8.7	7.1	5.0	6.1	3.5
¾	6.4	4.5	13	13	11	9.1	6.4	7.8	4.5
1	7.7	5.4	15	15	13	11	7.7	9.3	5.4
1 ¼	9.3	6.5	19	19	16	13	9.3	11	6.5
1 ½	11	7.6	22	22	19	15	11	13	7.6
1 ¾	13	9.0	26	26	22	18	13	16	9.0
2	15	10	30	30	26	21	15	18	10

GENERAL NOTES:

- (a) 7x7x7 = galvanized specialty cable.
- (b) 7x7x19 = galvanized specialty cable.
- (c) Rated loads based on minimum D/d ratio of 10/1
- (d) Rated loads based on pin diameter no larger than natural eye width or less than the normal sling diameter.
- (e) For choker hitch, the angle of choke is 120 deg or greater.

Table 14
 Rated Load for Six-Part Braided Single- and Two-leg Slings 6x19 or 6x36 Classification Extra Improved Plow Steel (EIPS) Independent Wire Rope Core (IWRC) Wire Rope Based on Design Factor = 5 and Rated Loads Expressed in Tons (2,000 lb)

Rope Diameter, in.	Single-Leg			Two-Leg Bridle			Two-Leg Choker		
									
	Hitch Type			Horizontal Angle			Horizontal Angle		
	Vertical	Choker	Vertical Basket	Vertical	60°	45°	30°	60°	30°
HT&MS									
3/16	1.6	1.4	3.2	3.2	2.8	2.3	1.6	2.4	1.4
¼	2.9	2.5	5.7	5.7	4.9	4.0	2.9	4.3	2.5
5/16	4.4	3.9	8.9	8.9	7.7	6.3	4.4	6.7	3.9
¾	6.3	5.5	13	13	11	9.0	6.3	9.6	5.5
7/16	8.6	7.5	17	17	15	12	8.6	13	7.5
1	11	9.8	22	22	19	16	11	17	9.8
9/16	14	12	28	28	24	20	14	21	12
1 ¼	17	15	35	35	30	24	17	26	15
1 ½	25	22	49	49	43	35	25	37	22
1 ¾	33	29	67	67	58	47	33	51	29
2	43	38	87	87	75	61	43	66	38
1 ¼	55	48	109	109	95	77	55	83	48
1 ½	67	59	134	134	116	95	67	102	59
1 ¾	87	71	161	161	140	114	81	122	71
2	96	84	192	192	166	135	96	145	84
1 ¼	111	97	222	222	192	157	111	168	97
1 ½	129	112	257	257	223	182	129	195	112
1 ¾	146	128	292	292	253	207	146	222	128
2	166	146	333	333	288	235	166	252	146

GENERAL NOTES:

- (a) HT = hand-tucked splice.
- (b) MT = mechanical splice.
- (c) Rated loads based on minimum D/d ratio of 25 times the component rope diameter.
- (d) Rated loads based on pin diameter no larger than natural eye width or less than the normal sling diameter.
- (e) For choker hitch, the angle of choke is 120 deg or greater.

Table 15

Rated Load for Eight-Part Braided Single- and Two-Leg Classification Extra Improved Plow Steel (EIPS) Independent Wire Rope Core (IWRC) Wire Rope Based on Design Factor = 5 and Rated Loads Expressed in Tons (2,000 lb)

Rope Diameter, in.	Single-Leg			Two-Leg Bridle				Two-Leg Choker	
	Hitch Type			Horizontal Angle				Horizontal Angle	
	Vertical	Choker	Vertical Basket	Vertical	60°	45°	30°	60°	30°
	HT&MS	HT&MS	HT&MS	HT&MS	HT&MS	HT&MS	HT&MS	HT&MS	HT&MS
3/16	2.2	1.9	4.3	4.3	3.7	3.0	2.2	3.3	1.9
1/4	3.8	3.3	7.6	7.6	6.6	5.4	3.8	5.8	3.3
5/16	5.9	5.2	12	12	10	8.3	5.9	8.9	5.2
3/8	8.5	7.4	17	17	15	12	8.5	13	7.4
7/16	11	10	23	23	20	16	11	17	10
1/2	15	13	30	30	26	21	15	23	13
9/16	19	16	38	38	33	27	19	29	16
5/8	23	20	46	46	40	33	23	35	20
3/4	33	29	66	66	57	47	33	50	29
7/8	45	39	89	89	77	63	45	68	39
1	58	51	116	116	100	82	58	88	51
1 1/4	73	64	146	146	126	103	73	110	64
1 1/2	89	78	179	179	155	127	89	136	78
1 3/4	108	94	215	215	186	152	108	163	94
1 7/8	128	112	255	255	221	181	128	194	112
2	148	129	296	296	256	209	148	224	129
2 1/4	171	150	343	343	297	242	171	260	150
2 1/2	195	171	390	390	338	276	195	295	171
2 3/4	222	194	444	444	384	314	222	336	194

GENERAL NOTES:

- (a) HT = hand-tucked splice.
- (b) MT = mechanical splice.
- (c) Rated loads based on minimum D/d ratio of 25 times the component rope diameter.
- (d) Rated loads based on pin diameter no larger than natural eye width or less than the normal sling diameter.
- (e) For choker hitch, the angle of choke is 120 deg or greater.

Table 16
Fabric Construction (Metal Mesh Slings)

	Heavy Duty	Medium Duty	Light Duty
Nominal spiral turns per foot mesh width	35	43	59
Approx. spiral wire size	10 gage	12 gage	14 gage
Equivalent decimal size	0.135 in.	0.105 in.	0.080 in.
Nominal cross rods per foot of fabric length	21	30	38
Approx. size of cross rods	8 gage	10 gage	14 gage
Equivalent decimal size	0.162 in.	0.135 in.	0.080 in.
Nominal fabric thickness	1/2 in.	3/8 in.	5/16 in.

Table 17
Rated Load for Metal Mesh Slings Based on Design Factor = 5

Hitch Type	Effect of Angle on Rated Capacities in Basket Hitch				
	Vertical or Choker	Vertical Basket	60°	45°	30°
Width, in.					
Heavy Duty - 10 gage [Rated Loads in Pounds (lb)]					
2	1,800	3,200	2,770	2,260	1,800
3	3,000	6,000	5,200	4,240	3,000
4	4,400	8,800	7,620	6,220	4,400
6	6,600	13,200	11,430	9,330	6,600
8	8,800	17,800	15,240	12,440	8,800
10	11,000	22,000	19,050	15,550	11,000
12	13,200	26,400	22,860	18,660	13,200
14	15,400	30,800	26,670	21,770	15,400
16	17,800	35,200	30,480	24,880	17,800
18	19,800	39,600	34,290	28,000	19,800
20	22,000	44,000	38,100	31,100	22,000
Medium Duty - 12 gage [Rated Loads in Pounds (lb)]					
2	1,450	2,900	2,510	2,050	1,450
3	2,170	4,350	3,770	3,070	2,170
4	2,900	5,800	5,020	4,100	2,900
6	4,800	9,600	8,310	6,780	4,800
8	6,400	12,800	11,080	9,050	6,400
10	8,000	16,000	13,850	11,310	8,000
12	9,600	19,200	16,620	13,570	9,600
14	11,200	22,400	19,400	15,830	11,200
16	12,800	25,600	22,170	18,100	12,800
18	13,800	27,000	23,380	19,090	13,500
20	15,000	30,000	25,980	21,210	15,000
Light Duty - 14 gage [Rated Loads in Pounds (lb)]					
2	900	1,800	1,560	1,270	900
3	1,400	2,800	2,420	1,980	1,400
4	2,000	4,000	4,150	3,390	2,000
6	3,000	6,000	5,190	4,240	3,000
8	4,000	8,000	6,920	5,650	4,000
10	5,000	10,000	8,660	7,070	5,000
12	6,000	12,000	10,390	8,480	6,000
14	7,000	14,000	12,120	9,890	7,000
16	8,000	16,000	13,850	11,310	8,000
18	9,000	18,000	15,580	12,720	9,000
20	10,000	20,000	17,320	14,140	10,000

GENERAL NOTE: For choker hitch, the angle of choke is 120 deg or greater.

Table 18
Nylon Rope Slings Based on Design Factor = 5 and Rated Loads Expressed in pounds (lb)

Rope Diameter, in.	Eye-and-Eye Sling - Hitch Type						Endless Sling - Hitch Type					
	Vertical	Choker	Two-Leg Bridle or Basket			Basket	Vertical	Choker	Basket			
			Horizontal Angle, deg						Horizontal Angle, deg			
			90°	60°	45°				90°	60°	45°	30°
1/2	1,100	830	1,100	1,900	1,600	1,100	2,000	1,500	4,000	3,500	2,800	2,000
9/16	1,400	1,100	1,400	2,400	2,000	1,400	2,600	2,000	5,200	4,500	3,700	2,600
5/8	1,800	1,400	1,800	3,100	2,500	1,800	3,200	2,400	6,400	5,500	4,500	3,200
3/4	2,600	2,000	2,600	4,500	3,700	2,600	4,600	3,500	9,200	8,000	6,500	4,600
7/8	3,500	2,600	3,500	6,100	4,900	3,500	6,200	4,700	12,400	10,700	8,800	6,200
1	4,400	3,300	4,400	7,600	6,200	4,400	7,900	5,900	15,800	13,700	11,200	7,900
1 1/4	5,700	4,300	5,700	9,900	8,100	5,700	10,100	7,600	20,200	17,500	14,300	10,100
1 1/2	7,000	5,300	7,000	12,100	9,900	7,000	12,400	9,300	24,800	21,500	17,500	12,400
1 5/8	7,700	5,800	7,700	13,300	10,900	7,700	13,700	10,300	27,400	23,700	19,400	13,700
1 3/4	9,700	7,300	9,700	16,800	13,700	9,700	17,400	13,100	34,800	30,100	24,600	17,400
1 7/8	11,500	8,600	11,500	19,900	16,300	11,500	20,500	15,400	41,000	35,500	29,000	20,500
2	13,200	9,900	13,200	22,900	18,700	13,200	23,600	17,700	47,200	40,900	33,400	23,600
2 1/4	16,900	12,700	16,900	29,300	23,900	16,900	30,200	22,700	60,400	52,300	42,700	30,200
2 1/2	19,100	14,300	19,100	33,100	27,000	19,100	34,100	25,600	68,200	59,100	48,200	34,100
2 3/4	21,400	16,100	21,400	37,100	30,300	21,400	38,300	28,700	76,600	66,300	54,200	38,300
2 7/8	26,300	19,700	26,300	45,600	37,200	26,300	46,900	35,200	93,800	81,200	66,300	46,900
3	28,800	21,600	28,800	49,900	40,700	28,800	51,400	38,600	102,800	89,000	72,700	51,400
3 1/2	37,100	27,800	37,100	64,300	52,500	37,100	66,200	49,700	132,400	114,700	93,600	66,200

GENERAL NOTES:

- (a) See Fig. 8 for sling types, Fig. 5 for hitch types, and Fig. 3 for sling angle descriptions. For D/d considerations see note in Fig. 5.
- (b) For choker hitch, the angle of choke is 120 deg or greater.

Table 19
Polyester Rope Slings Based on Design Factor = 5 and Rated Loads Expressed in pounds (lb)

Rope Diameter, in.	Eye-and-Eye Sling - Hitch Type					Endless Sling - Hitch Type						
	Vertical	Choker	Two-Leg Bridle or Basket			Vertical	Choker	Basket				
			90°	45°	30°			90°	60°	45°	30°	
1/2	1,000	750	2,000	1,700	1,400	1,000	1,800	1,400	3,600	3,100	2,500	1,800
9/16	1,300	980	2,600	2,300	1,800	1,300	2,300	1,700	4,600	4,000	3,300	2,300
5/8	1,600	1,200	3,200	2,800	2,300	1,600	2,800	2,100	5,600	4,800	4,000	2,800
3/4	2,200	1,700	4,400	3,800	3,100	2,200	4,000	3,000	8,000	6,900	5,700	4,000
7/8	3,000	2,300	6,000	5,200	4,200	3,000	5,400	4,100	10,800	9,400	7,600	5,400
1	4,000	3,000	8,000	6,900	5,700	4,000	7,100	5,300	14,200	12,300	10,000	7,100
1 1/8	5,000	3,800	10,000	8,700	7,100	5,000	8,900	6,700	17,800	15,400	12,600	8,900
1 1/4	6,000	4,500	12,000	10,400	8,500	6,000	10,600	8,000	21,200	18,400	15,000	10,600
1 5/16	6,500	4,900	13,000	11,300	9,200	6,500	11,600	8,700	23,200	20,100	16,400	11,600
1 3/8	8,400	6,300	16,800	14,500	11,900	8,400	15,100	11,300	30,200	26,200	21,400	15,100
1 1/2	9,900	7,400	19,800	17,100	14,000	9,900	17,600	13,200	35,200	30,500	24,900	17,600
1 5/8	11,400	8,600	22,800	19,700	16,100	11,400	20,400	15,300	40,800	35,300	28,800	20,400
2	14,400	10,800	28,800	24,900	20,400	14,400	25,700	19,300	51,400	44,500	36,300	25,700
2 1/8	16,200	12,200	32,400	28,100	22,900	16,200	28,900	21,700	57,800	50,100	40,900	28,900
2 1/4	18,100	13,600	36,200	31,300	25,600	18,100	32,300	24,200	64,600	55,900	45,700	32,300
2 1/2	22,000	16,500	44,000	38,100	31,100	22,000	39,300	29,500	78,600	68,100	55,600	39,300
2 3/4	24,200	18,200	48,400	41,900	34,200	24,200	43,200	32,400	86,400	74,800	61,100	43,200
3	31,200	23,400	62,400	54,000	44,100	31,200	55,700	41,800	111,400	96,500	78,800	55,700

GENERAL NOTES:

- (a) See Fig. 8 for sling types, Fig. 5 for hitch types, and Fig. 3 for sling angle descriptions. For D/d considerations see note in Fig. 5.
 (b) For choker hitch, the angle of choke is 120 deg or greater.

Table 20
Polypropylene Rope Slings Based on Design Factor = 5 and Rated Loads Expressed in pounds (lb)

Rope Diameter, in.	Eye-and-Eye Sling - Hitch Type					Endless Sling - Hitch Type						
	Vertical	Choker	Two-Leg Bridle or Basket			Vertical	Choker	Basket				
			90°	45°	30°			90°	60°	45°	30°	
1/2	760	570	1,500	1,300	1,100	750	1,400	1,100	2,800	2,400	2,000	1,400
9/16	920	690	1,800	1,600	1,300	900	1,600	1,200	3,200	2,800	2,300	1,699
5/8	1,100	830	2,200	1,900	1,600	1,100	2,000	1,500	4,000	3,500	2,800	2,000
3/4	1,500	1,100	3,000	2,600	2,100	1,500	2,700	2,000	5,400	4,700	3,800	2,700
7/8	2,100	1,600	4,200	3,600	3,000	2,100	3,700	2,800	7,400	6,400	5,200	3,700
1	2,600	2,000	5,200	4,500	3,700	2,600	4,600	3,500	9,200	8,000	6,500	4,600
1 1/8	3,200	2,400	6,400	5,500	4,500	3,200	5,700	4,300	11,400	9,900	8,100	5,700
1 1/4	3,900	2,900	7,800	6,800	5,500	3,900	6,900	5,200	13,800	12,000	9,800	6,900
1 5/16	4,200	3,200	8,400	7,300	5,900	4,200	7,600	5,700	15,200	13,200	10,700	7,600
1 3/8	5,500	4,100	11,000	9,500	7,800	5,500	9,800	7,400	19,600	17,000	13,900	9,800
1 1/2	6,400	4,800	12,800	11,100	9,000	6,400	11,400	8,600	22,800	19,700	16,100	11,400
1 5/8	7,400	5,600	14,800	12,800	10,500	7,400	13,200	9,900	26,400	22,900	18,700	13,200
2	9,400	7,100	18,800	16,300	13,300	9,400	16,700	12,500	33,400	28,900	23,600	16,700
2 1/8	10,500	7,900	21,000	18,200	14,800	10,500	18,800	14,100	37,600	32,600	26,600	18,800
2 1/4	11,900	8,900	23,800	20,600	16,800	11,900	21,200	15,900	42,400	36,700	30,000	21,200
2 1/2	14,400	10,800	28,800	24,900	20,400	14,400	25,700	19,300	51,400	44,500	36,300	25,700
2 3/4	16,100	12,100	32,200	27,900	22,800	16,100	28,800	21,600	57,600	49,900	40,700	28,800
3	20,500	15,400	41,000	35,500	29,000	20,500	36,600	27,500	73,200	63,400	51,800	36,600

GENERAL NOTES:

- (a) See Fig. 8 for sling types, Fig. 5 for hitch types, and Fig. 3 for sling angle descriptions. For D/d considerations see note in Fig. 5.
 (b) For choker hitch, the angle of choke is 120 deg or greater.

Table 21
 Rated Load for One-ply, Class 5 Synthetic Webbing Slings Expressed in Pounds

		Types I, II, III, and IV				Type V		
		Single-Leg - Hitch Type		Two Leg - Horizontal Angles				
Width, in.	Vertical	Choker	Vertical Basket	Vertical	60°	45°	30°	Endless Vertical
1	1,100	880	2,200	2,200	1,900	1,600	1,100	2,200
1 ½	1,600	1,280	3,200	3,200	2,800	2,300	1,600	3,200
1 ¾	1,900	1,520	3,800	3,800	3,300	2,700	1,900	3,800
2	2,200	1,760	4,400	4,400	3,800	3,100	2,200	4,400
3	3,300	2,640	6,600	6,600	5,700	4,700	3,300	6,600
4	4,400	3,520	8,800	8,800	7,600	6,200	4,400	8,800
5	5,500	4,400	11,000	11,000	9,500	7,800	5,500	11,000
6	6,600	5,280	13,200	13,200	11,400	9,300	6,600	13,200

GENERAL NOTES:

- (a) The rated loads are based on stuffer weave construction webbing with a minimum certified tensile strength of 6,800 pounds per inch of width of the webbing.
- (b) Rated loads for Types III and IV slings apply to both tapered and nontapered eye constructions. Rated loads for Type V slings are based on nontapered webbing.
- (c) For Type VI slings, consult the manufacturer for rated loads.
- (d) For choker hitch, the angle of choke is 120 deg or greater.

Table 22
 Rated Load for Two-Ply, Class 5 Synthetic Webbing Slings Expressed in Pounds

		Types I, II, III, and IV				Type V		
		Single-Leg - Hitch Type		Two Leg - Horizontal Angles				
Width, in.	Vertical	Choker	Vertical Basket	Vertical	60°	45°	30°	Endless Verti
2,200	1,760	4,400	4,400	4,400	3,800	3,100	2,200	4,400
3,300	2,640	6,600	6,600	6,600	5,700	4,700	3,300	6,600
3,800	3,040	7,600	7,600	7,600	6,600	5,400	3,800	7,600
4,400	3,520	8,800	8,800	8,800	7,600	6,200	4,400	8,800
6,600	5,280	13,200	13,200	13,200	11,400	9,300	6,600	13,200
8,200	6,560	16,400	16,400	16,400	14,200	11,600	8,200	16,400
10,200	8,160	20,400	20,400	20,400	17,700	14,400	10,200	20,400
12,300	9,840	24,600	24,600	24,600	21,300	17,400	12,300	24,600

NOTES:

- (a) Rated loads are based on stuffer weave construction webbing with a minimum certified tensile strength of 6,800 pounds per inch of width of the webbing.
- (b) Rated loads for Types III and IV slings apply to both tapered and nontapered eye constructions. Rated loads for Type V slings are based on nontapered webbing.
- (c) For Type VI slings, consult the manufacturer for rated loads.
- (d) For choker hitch, the angle of choke is 120 deg or greater.

Table 23
Rated Load for One-Ply, Class 7 Synthetic Webbing Slings Expressed in Pounds

		Types I, II, III, and IV			Types I, II, III, and IV			Type V
		Single-Leg - Hitch Types			Two Leg - Horizontal Angles			
Sling Width, in.	Vertical	Choker	Vertical Basket	Vertical Basket.	60°	45°	30°	Endless Vertical
1	1,600	1,280	3,200	3,200	2,800	2,300	1,600	3,200
1 ½	2,300	1,840	4,600	4,600	4,000	3,300	2,300	4,600
1 ¾	2,700	2,160	5,400	5,400	4,700	3,800	2,700	5,400
2	3,100	2,480	6,200	6,200	5,400	4,400	3,100	6,200
3	4,700	3,760	9,400	9,400	8,100	6,600	4,700	9,400
4	6,200	4,960	12,400	12,400	10,700	8,800	6,200	12,400
5	7,800	6,240	15,600	15,600	13,500	11,000	7,800	15,600
6	9,300	7,440	18,600	18,600	16,100	13,200	9,300	18,600
8	11,750	9,440	21,150	23,600	18,300	15,000	11,750	21,150
10	14,700	11,760	26,450	29,400	22,900	18,700	14,700	26,450
12	17,650	14,120	31,750	35,200	31,750	22,400	17,650	31,750

GENERAL NOTES:

- (a) The rated loads are based on stuffer weave construction webbing with a minimum certified tensile strength of 9,800 pounds per inch of width of the webbing.
- (b) Rated loads for Types III and IV slings apply to both tapered and nontapered eye constructions. Rated loads for Type V slings are based on nontapered webbing.
- (c) For Type VI slings, consult the manufacturer for rated loads.
- (d) For choker hitch, the angle of choke is 120 deg or greater.

Table 24
Rated Loads for Two-Ply, Class 7 Synthetic Webbing Slings Expressed in Pounds

		Types I, II, III, and IV			Types I, II, III, and IV			Type V
		Single-Leg - Hitch Types			Two Leg - Horizontal Angles			
Sling Width, in.	Vertical	Choker	Vertical Basket	Vertical Basket.	60°	45°	30°	Endless Vertical
1	3,100	2,480	6,200	6,200	5,400	4,400	3,100	6,200
1 ½	4,700	3,760	9,400	9,400	8,100	6,600	4,700	9,400
1 ¾	5,400	4,320	10,800	10,800	9,400	7,600	5,400	10,800
2	6,200	4,960	12,400	12,400	10,700	8,800	6,200	12,400
3	8,800	7,040	17,600	17,600	15,200	12,400	8,800	17,600
4	11,000	8,800	22,000	22,000	19,100	15,600	11,000	22,000
5	13,700	10,960	27,400	27,400	23,700	19,400	13,700	27,400
6	16,500	13,200	33,000	33,000	28,600	23,000	16,500	33,000
8	22,750	18,200	42,350	45,400	36,700	29,900	22,750	42,350
10	28,400	22,720	52,900	56,800	45,800	37,400	28,400	52,900
12	34,100	27,280	63,500	68,200	55,000	44,900	34,100	63,500

GENERAL NOTES:

- (a) The rated loads are based on stuffer weave construction webbing with a minimum certified tensile strength of 9,800 pounds per inch of width of the webbing.
- (b) Rated loads for Types III and IV slings apply to both tapered and nontapered eye constructions. Rated loads for Type V slings are based on nontapered webbing.
- (c) For Type VI slings, consult the manufacturer for rated loads.
- (d) For choker hitch, the angle of choke is 120 deg or greater.

Table 25
 Rated Load for Four-Ply, Class 7 Synthetic Webbing Slings Expressed in Pounds

Types I, II, III, and IV

Sling Width, in.	Single-Leg - Hitch Types			Two Leg - Horizontal Angles			
	Vertical	Choker	Vertical Basket	Vertical Basket	60°	45°	30°
1	5,500	4,400	11,000	11,000	9,500	7,800	5,500
2	11,000	8,800	22,000	22,000	19,000	15,600	11,000
3	16,450	13,160	32,900	32,800	28,500	23,300	16,450
4	20,400	16,320	40,800	40,800	35,300	28,800	20,400
5	25,500	20,400	51,000	51,000	44,200	36,100	25,500
6	30,600	24,480	61,200	61,200	53,000	43,300	30,600

GENERAL NOTES:

- (a) The rated loads are based on stuffer weave construction webbing with a minimum certified tensile strength of 9,800 pounds per inch of width of the webbing.
- (b) Rated loads for Types III and IV slings apply to both tapered and nontapered eye constructions. Rated loads for Type V slings are based on nontapered webbing.
- (c) For Type VI slings, consult the manufacturer for rated loads.
- (d) For choker hitch, the angle of choke is 120 deg or greater.

Table 26
 Rated Load for Single-Leg Polyester Roundslings: Endless and Eye-and-Eye Type Expressed in Pounds

Size	Hitch Type			Horizontal Angle, deg		
	Vertical	Choker	Vertical Basket	60°	45°	30°
1	2,600	2,100	5,200	4,500	3,700	2,600
2	5,300	4,200	10,600	9,200	7,500	5,300
3	8,400	6,700	16,800	14,500	11,900	8,400
4	10,600	8,500	21,200	18,400	15,000	10,600
5	13,200	10,600	26,400	22,900	18,700	13,200
6	16,800	13,400	33,600	29,100	23,800	16,800
7	21,200	17,000	42,400	36,700	30,000	21,200
8	25,000	20,000	50,000	43,300	35,400	25,000
9	31,000	24,800	62,000	53,700	43,800	31,000
10	40,000	32,000	80,000	69,300	56,600	40,000
11	53,000	42,400	106,000	91,800	74,900	53,000
12	66,000	52,800	132,000	114,300	93,300	66,000
13	90,000	72,000	180,000	155,900	127,300	90,000

GENERAL NOTES:

- (a) Roundslings are identified by the vertical rated load shown on the sling identification. The size numbers in the first column have been adopted by the Web Sling & Tie Down Association to describe certain polyester roundslings. They are included for references only. Other polyester roundslings may have different vertical rated loads.
- (b) Color guidelines for polyester roundslings covers are widely used to indicate the vertical rated load of roundslings; however, this is not followed by some manufacturers. Always select and use roundslings by the rated load as shown on the sling identification; never by color.
- (c) For choker hitch, the angle of choke is 120 deg or greater.

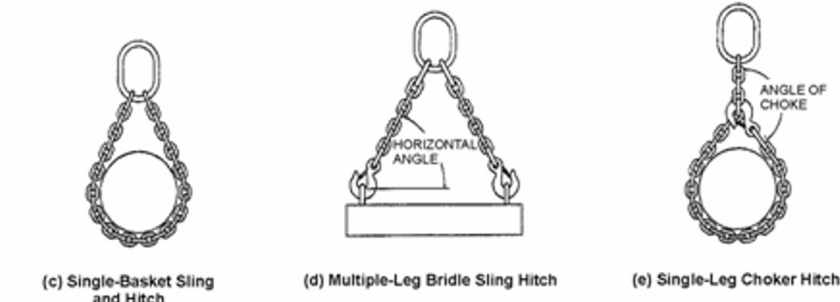
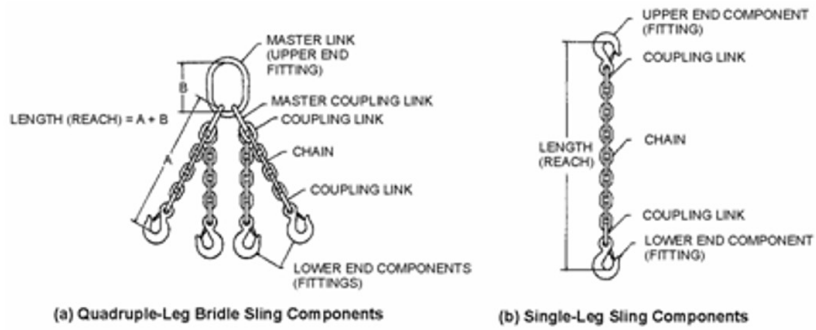


Fig. 1 Alloy Steel Chain Slings: Configurations, Components, and Hitches

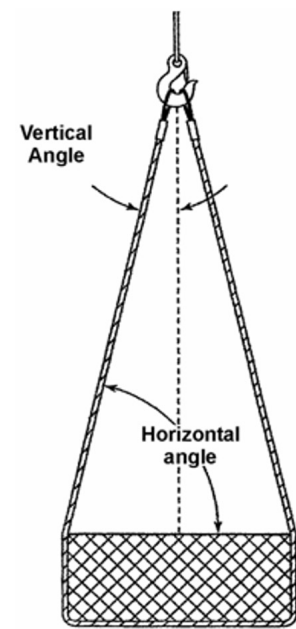
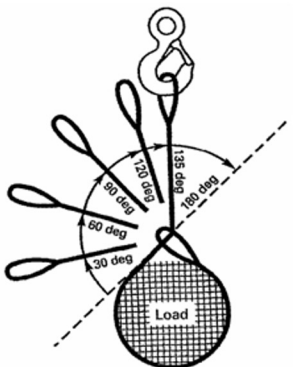


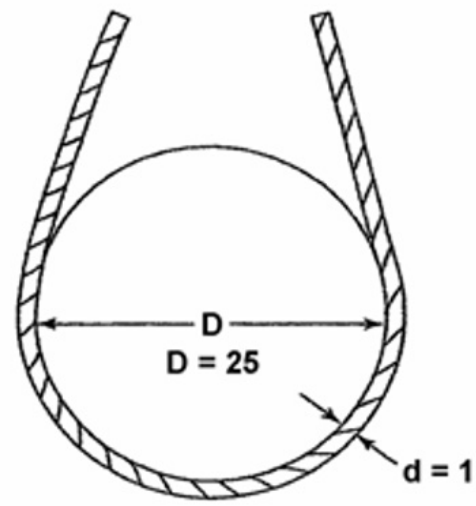
Fig. 3 Angle of Loading



Angle of choke, deg	Rated Capacity, % [Note (1)]
Over 120	100
90-120	87
60-89	74
30-59	62
0-29	49

NOTE:
 (1) Percent of sling rated capacity in a choker hitch.

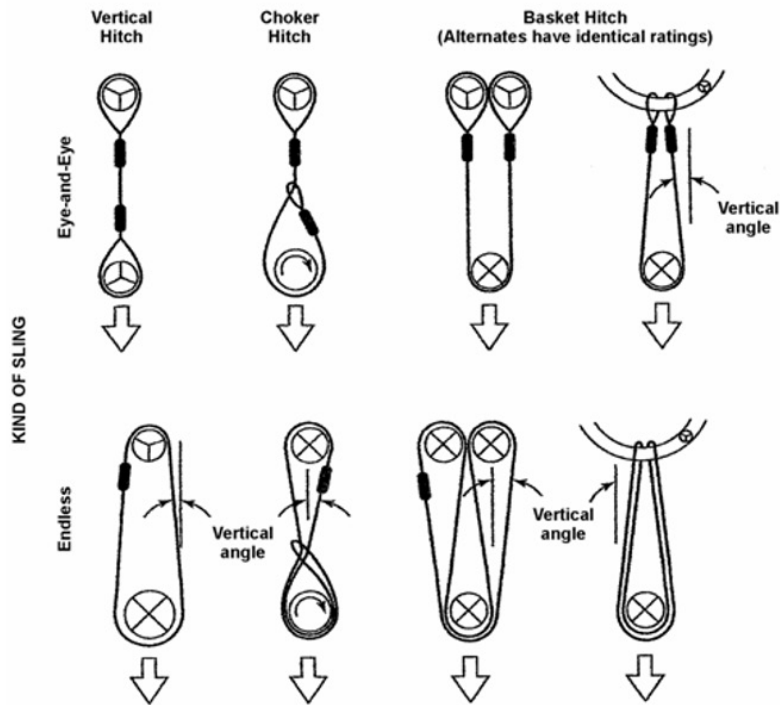
Fig. 2 Angle of Choke



GENERAL NOTE: When D is 25 times the component rope diameter (d), the D/d ratio is expressed as 25/1.

Fig. 4 D/d Ratio

FORM OF HITCH

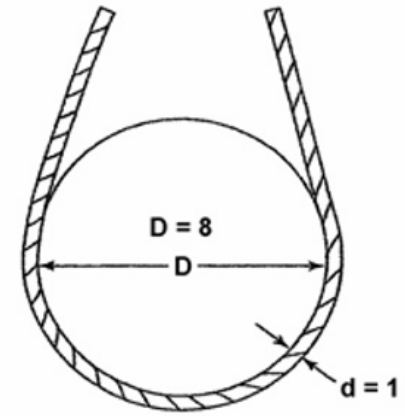


The symbols below represent load or support surfaces in contact with the rope sling. The contact surface diameter divided by the rope diameter is designated D/d ratio as described in Fig. 6. Tables 18, 19, and 20 are based on the D/d ratios indicated below.

	Represents a contact surface which has a diameter of curvature at least double the diameter of the rope from which the sling is made.
	Represents a contact surface which has a diameter of curvature at least 8 times the diameter of the rope.
	Represents a load in choker hitch and illustrates the rotary force on the load and/or the slippage of the rope in contact with the load. Diameter of curvature of load surface is at least double the diameter of the rope.

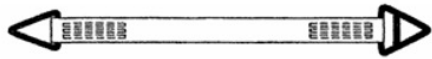
General Note: Legs 5 deg or less from vertical may be considered vertical. For slings more than 5 deg vertical, the actual angle shall be used.

Fig. 5 Hitch Types for Synthetic Rope Slings



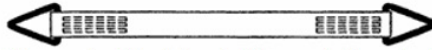
GENERAL NOTE: When D is 8 times the component rope diameter (d), the D/d is expressed as 8/1.

Fig. 6 D/d Ratio



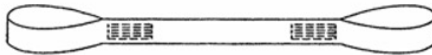
Sling made with a triangle fitting on one end and a slotted triangle choker fitting on the other end. It can be used in a vertical, basket, or choker hitch.

Type I



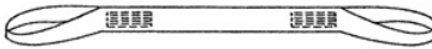
Sling made with a triangle fitting on both ends. It can be used in a vertical or basket hitch only.

Type II



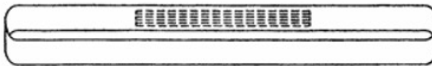
Sling made with flat loop eye on each end with loop eye opening on same plane as sling body. This type of sling is sometimes called a flat eye-and-eye, eye-and-eye, or double-eye sling.

Type III



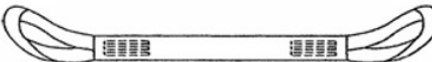
Sling made with both loop eyes formed as in Type III, except that the loop eyes are turned to form a loop eye which is at a right angle to the plane of the sling body. This type of sling is commonly referred to as a twisted-eye sling.

Type IV



Endless sling, sometimes referred to as a grommet. It is a continuous loop formed by joining the ends of the webbing together.

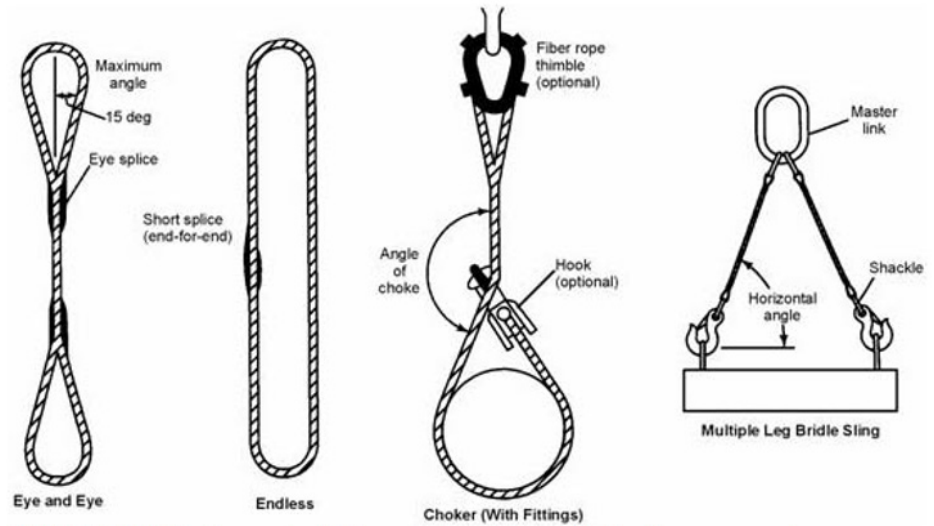
Type V



Return-eye (reversed-eye) sling is formed by using multiple widths of webbing held edge-to-edge. A wear pad is attached on one or both sides of the sling body and on one or both sides of the loop eyes to form a loop eye at each end which is at a right angle to the plane of the sling body.

Type VI

Fig 7 Synthetic Webbing Slings



GENERAL NOTE: Ensure that fittings designed for synthetic slings are used.

Fig. 8 Synthetic Fiber Rope Slings

GOOD AND BAD RIGGING PRACTICES

Use of Chokers

Good – No cutting action on running lines

Bad – Bolt on running line can work loose

Bad – Because of cutting action of eye splice on running line

Hoisting Structural Steel

Good – Sharp corners padded

Bad – Steel can cut rope

Hook Slings

Good – Hooks are turned out

Bad – Hook openings are turned in

Double slings shall be used when hoisting two or more pieces of material over 12 ft long

Right – Load over 12 ft long

Wrong – Load over 12 ft long

Eyebolts

Good practice—vertical lift on eyebolt

Bad practice – lifting on eyebolts from an angle reduces safe loads as much as 90%

Hoisting Structural Steel

Good – Use space blocks and pad corners

Bad – Can bend flanges and cut rope

Eye Splices

Good practice – Note use of thimble in eye splice

Good practice – Use of thimble in eye splice

Bad practice – Wire rope knot with clip. Efficiency 50% or less

Bad practice – Thimble should be used to increase strength of eye and reduce wear on rope

STRENGTH OF STANDARD SLING HOOKS

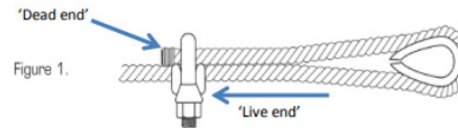


Standard Hook Number	Inside diameter of Eye A (in.)	Throat Opening B (in.)	Rated capacity (tons)
22	3/4	1	0.5
23	7/8	1 1/16	0.6
24	1	1 1/8	0.7
25	1 1/8	1 1/4	1.2
26	1 1/4	1 3/8	1.7
27	1 3/8	1 1/2	2.1
28	1 1/2	1 3/4	2.5
29	1 5/8	1 7/8	3.0
30	1 3/4	2 1/16	4.0
31	2	2 1/4	4.7
32	2 3/8	2 1/2	5.5
33	2 1/2	3	6.8
34	3 1/8	3 3/8	8.0
34 ^a	3 1/4	3 5/8	10.0
35	3 1/2	4	11.0
36	4	4 1/2	20.0
38	4 1/2	5	30.0

NOTES:

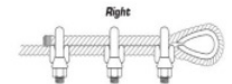
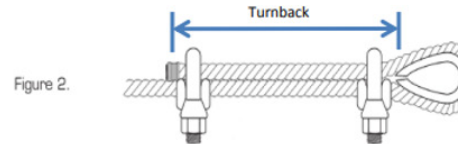
- a. The above values are for "Vulcan" and similarly designed standard hooks.
- b. The capacity can be found by the diameter of the hole in the eye of the hook. If the throat opening of any hook exceeds the dimension given above the corresponding diameter of the eye, the hook has been over strained and must not be used.

It is important to ensure wire rope clips are installed properly. Incorrect installation can reduce the working load limit by 40%. Below are general guidelines for installing wire rope clips.

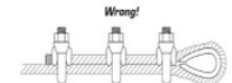
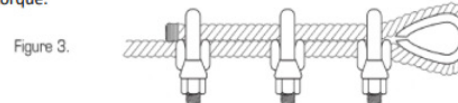


- Wire Rope Clips should be inspected to ensure that:
- the wire rope clips are free from nicks, cracks and or gouges;
 - there are not any suspicious marks of repairs or reshaping;
 - clips with the correct dimensions have been selected.

Turn back specified length of wire rope from thimble (please refer tables given below). Put first clip one saddle width from seized "dead end" (Figure 1). Seat "live end" (load carrying) of the wire rope in saddle and position U-bolt over "dead end." Tighten nuts evenly to proper torque.



Put the second clip as near the loop or thimble as possible (Figure 2). Install nuts firmly but do not yet tighten to proper torque.



Install all remaining clips equally spaced between the first two clips (Figure 3). Install nuts firmly but do not yet tighten to proper torque. Apply light tension to wire rope assembly to take up rope slack and then tighten all nuts evenly to proper torque.

Drop Forged and Stainless Steel Wire Rope Clips			
Clip Size (inches)	Minimum No. of Clips	Amount of Rope to Turn Back in Inches	Torque in Ft. Lbs.
1/8"	2	3-1/4"	4.5
3/16"	2	3-3/4"	7.5
1/4"	2	4-3/4"	15
5/16"	2	5-1/4"	30
3/8"	2	6-1/2"	45
7/16"	2	7"	65
1/2"	3	11-1/2"	85
5/8"	3	12"	95
3/4"	4	18"	130
7/8"	4	19"	225
1"	5	26"	225

*The tightening torque values apply to new threads that are clean, dry, and free of lubrication.

Drop forged wire rope clips are used in heavy duty applications where strength is paramount.

Malleable Electro-Galvanized Wire Rope Clips	
Clip Size (inches)	Minimum No. of Clips
1/16"	3
1/8"	3
3/16"	3
1/4"	3
5/16"	3
3/8"	3
7/16"	4
1/2"	4
5/8"	4
3/4"	5
7/8"	5
1"	6

Light duty wire rope clips perfect for fencing, hand rails, animal runs, and other applications that do not sustain loads overhead.

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.

Typical shackles



Screw pin anchor shackle



Round pin anchor shackle



Safety type anchor shackle



Screw pin chain shackle

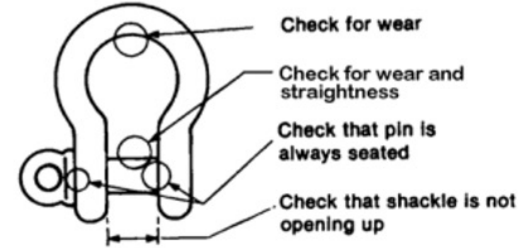


Round pin chain shackle



Safety type chain shackle

Shackle inspection areas



Do not use screw pin shackles if the pin can roll under load and unscrew

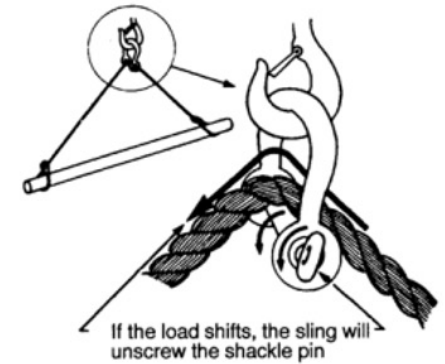
Eccentric shackle loads



Poor Practice
Never allow shackle to be pulled at an angle — the legs will open up



Good Practice
Pack the pin with washers to centralize the shackle



If the load shifts, the sling will unscrew the shackle pin

Replacing shackle pins

Never replace a shackle pin with a bolt



The load will bend the bolt

Figure 12-2. Shackles

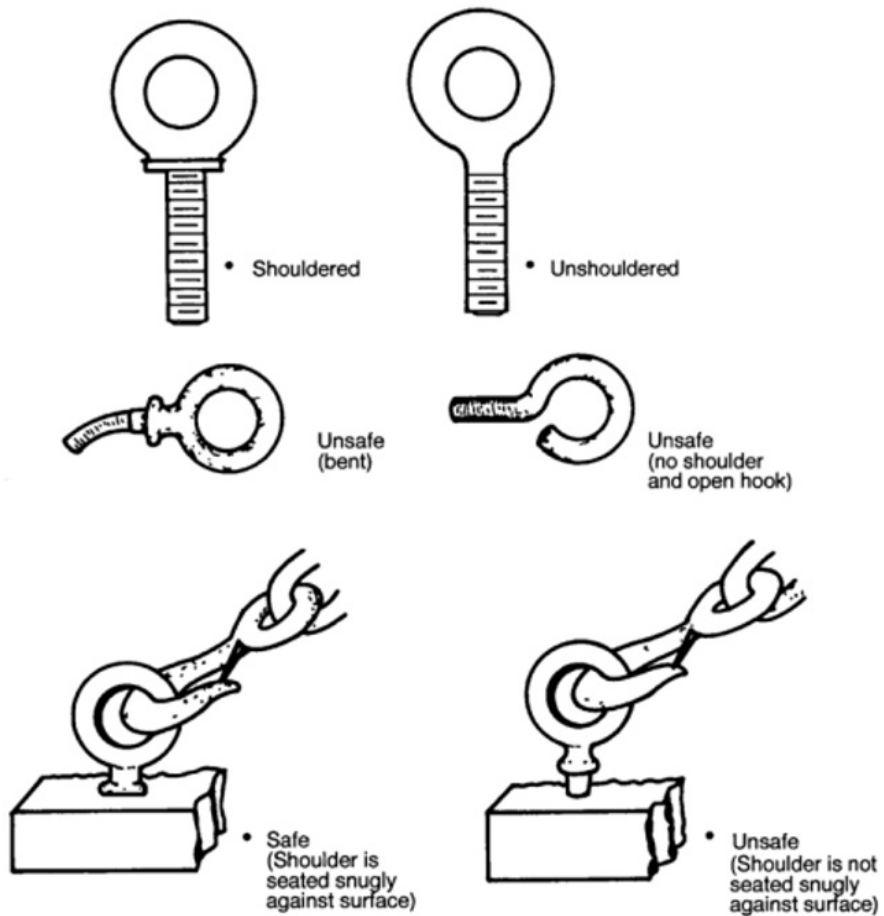
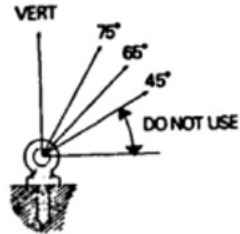
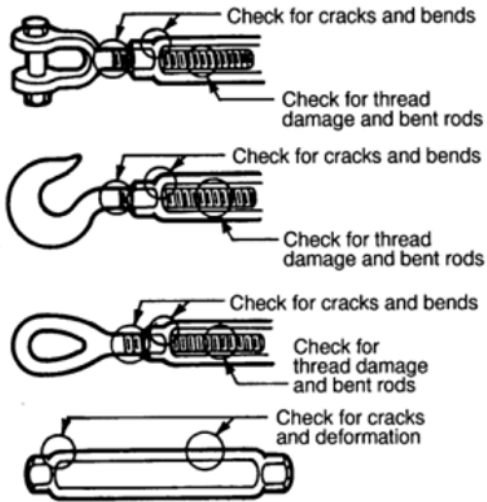


Figure 12-3. Eyebolts.

<p style="text-align: center;">EYEBOLTS - Shoulder Type Only - Forged Carbon Steel</p> 					
Stock Diameter (in.)	SAFE WORKING LOADS CORRESPONDING TO ANGLE OF PULL				
	Vertical	75 degrees	60 degrees	45 degrees	Less than 45 degrees
1/4 5/16 3/8 1/2 5/8 3/4 7/8 1 1 1/4 1 1/2	500 800 1,200 2,200 3,500 5,200 7,200 10,000 15,200 21,400	Reduce vertical loads by 45%	Reduce vertical loads by 65%	Reduce vertical loads by 75%	NOT RECOMMENDED
<p>Note: The safe working loads for plain (shoulder-less) eyebolts is the same as for shoulder bolts under vertical load. Angular loading is not recommended.</p>					

Turnbuckle Inspection Areas

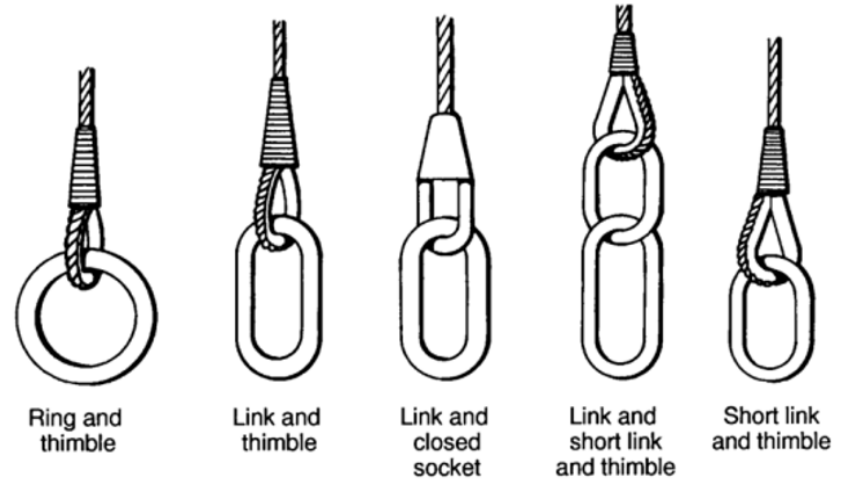


Turnbuckles

- Weldless Construction
- Forged Alloy Steel

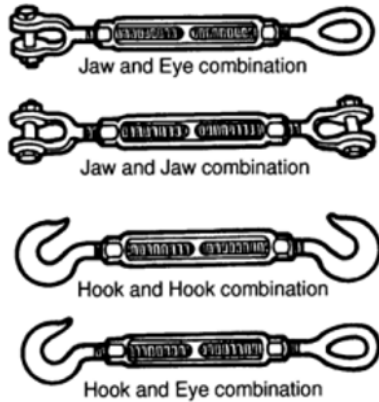
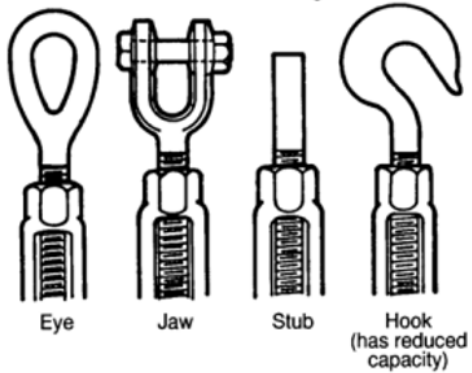
End fitting, stock diameter (in.)	Safe working load (SWL) of any combination of jaw end fittings, eye end fittings, and stub end fittings (lb)	SWL of any turnbuckle having a hook end fitting (lb)
1/4	500	400
5/16	800	700
3/8	1,200	1,000
1/2	2,200	1,500
5/8	3,500	2,250
3/4	5,200	3,000
7/8	7,200	4,000
1	10,000	5,000
1 1/4	15,200	5,000
1 1/2	21,400	7,500
1 3/4	28,000	—
3	37,000	—
2 1/2	60,000	—
2 3/4	75,000	—

TYPES OF RINGS AND LINKS




Turnbuckles

Turnbuckle and fittings




SAFE LOADS FOR WELDLESS RINGS AND LINKS

RINGS



Dimensions		Est. wt., Each (lb)	Safe load, Single pull (lb)
Diam., stock (in.)	Diam., inside (in.)		
7/8	4	2 3/4	7,200
7/8	5 1/2	3 1/2	5,600
1	4	3 5/8	10,800
1 1/8	6	6 1/2	10,400
1 1/4	5	7	17,000
1 3/8	6	10	19,000


SLING LINKS



Diam., stock (in.)	Length, inside (in.)	Inside width, small end	Inside width, large end	Est. wt. Per 100 (lb)	Safe load, single pull (lb)
3/8	2 1/2	3/8	1 1/4	23	1,800
1/2	3	1/2	1 5/8	50	3,200
*5/8	3 3/4	1 1/4	2 1/2	110	4,200
*3/4	4 1/2	1 1/2	3	190	6,000
*7/8	5 1/4	1 3/4	3 1/2	285	8,300
*1	6	2	4	430	10,800
1 1/4	6	1 1/4	3 3/4	700	22,000
*1 3/8	8 1/4	2 3/4	5 1/2	1125	20,500

* Sizes of sling links denoted by the asterisk are new and have the larger inside dimensions needed for 2-leg slings.

END LINKS

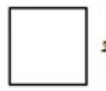
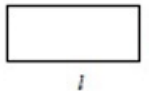
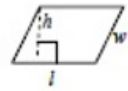
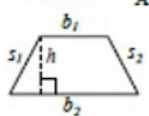
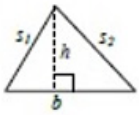

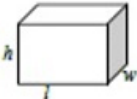
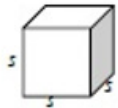


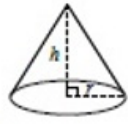

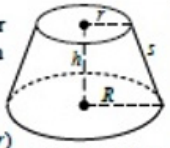








Diam., Stock (in.)	Inside length (in.)	Inside width, (in.)	Est. wt. Per 100 (lb)	Suggested Safe loads (lb)
5/16	1 3/4	1/2	14	2,500
3/8	1 7/8	9/16	21	3,800
1/2	2 3/8	3/4	48	6,500
5/8	3 1/4	1	92	9,300
3/4	3 1/2	1 1/8	137	14,000
7/8	5 1/8	2	275	12,000
1	5 1/8	2	360	17,000
1 1/4	6 7/16	2 1/4	700	28,000
1 3/8	7 3/4	2 3/4	1000	30,000

WEIGHTS OF COMMON MATERIALS

Name of metal	Weight (lb/ft ³)	Name of material	Weight (lb/ft ³)
Aluminum	166	Bluestone	160
Antimony	418	Brick, pressed	50
Bismuth	613	Brick, common	125
Brass, cast	504	Cement, Portland (packed)	100-120
Brass, rolled	523	Cement, Portland (loose)	70-90
Copper, cast	550	Cement, slag (packed)	80-100
Copper, rolled	555	Cement, slag (loose)	55-75
Gold, 24-carat	1,204	Chalk	156
Iron, cast	450	Charcoal	15-34
Iron, wrought	480	Cinder concrete	110
Lead, commercial	712	Clay, ordinary	120-150
Mercury, 60 degrees F	846	Coal, hard, solid	93.5
Silver	655	Coal, hard, broken	54
Steel	490	Coal, soft, solid	84
Tin, cast	458	Coal, soft, broken	54
Uranium	1,163	Coke, loose	23-32
Zinc	437	Concrete or stone	140-155
		Earth, rammed	90-100
<u>Name of wood</u>		Granite	165-170
		Gravel	117-125
Ash	35	Lime, quick (ground loose)	53
Beech	37	Limestone	170
Birch	40	Marble	164
Cedar	22	Plaster of paris (cast)	80
Cherry	30	Sand	90-106
Chestnut	26	Sandstone	151
Cork	15	Shale	162
Cypress	27	Slate	160-180
Ebony	71	Terra-cotta	110
Elm	30	Traprock	170
Fir, Balsam	22	Water	65
Hemlock	31		
Maple, Oak	62		
Pine, Poplar	30		

GEOMETRY FORMULAS SHEET




Square  $A = s^2$ $P = 4s$	Rectangle  $A = lw$ $P = 2l + 2w$	Parallelogram  $A = lh$ $P = 2l + 2w$																																
Trapezoid  $A = \frac{1}{2}h(b_1 + b_2)$ $P = s_1 + s_2 + b_1 + b_2$	Triangle  $A = \frac{1}{2}bh$ $P = s_1 + s_2 + b$	Circle  $A = \pi r^2$ $C = 2\pi r$ or $C = \pi d$																																
Rectangular Solid  $V = lwh$ $S = 2lh + 2wh + 2wl$	Cube  $V = s^3$ $S = 6s^2$	Right Circular Cylinder  $V = \pi r^2 h$ $S = 2\pi r h + 2\pi r^2$																																
Sphere  $V = \frac{4}{3}\pi r^3$ $S = 4\pi r^2$	Right Circular Cone  $V = \frac{1}{3}\pi r^2 h$ $S = \pi r \sqrt{r^2 + h^2}$	Square or Rectangular Pyramid  $V = \frac{1}{3}lwh$																																
Right Circular Cone Frustum  $S = \pi s(R+r)$ $V = \frac{\pi(r^2 + rR + R^2)h}{3}$	Geometric Symbols <table border="0"> <tr> <td>$\angle A$</td> <td>angle A</td> <td>\vec{AB}</td> <td>vector AB</td> </tr> <tr> <td>$m\angle A$</td> <td>measure of angle A</td> <td>\perp</td> <td>right angle</td> </tr> <tr> <td>\overline{AB}</td> <td>line segment AB</td> <td>$\overline{AB} \parallel \overline{CD}$</td> <td>Line AB is parallel to line CD.</td> </tr> <tr> <td>AB</td> <td>measure of line</td> <td>$\overline{AB} \perp \overline{CD}$</td> <td>Line AB is perpendicular to line CD.</td> </tr> <tr> <td>\overleftrightarrow{AB}</td> <td>segment AB line AB</td> <td>$\angle A \cong \angle B$</td> <td>Angle A is congruent to angle B.</td> </tr> <tr> <td>$\triangle ABC$</td> <td>triangle ABC</td> <td>$\triangle A \sim \triangle B$</td> <td>Triangle A is similar to triangle B.</td> </tr> <tr> <td>$\square ABCD$</td> <td>rectangle ABCD</td> <td></td> <td>Similarly marked segments are congruent.</td> </tr> <tr> <td>$\parallel ABCD$</td> <td>parallelogram ABCD</td> <td></td> <td>Similarly marked angles are congruent.</td> </tr> </table>		$\angle A$	angle A	\vec{AB}	vector AB	$m\angle A$	measure of angle A	\perp	right angle	\overline{AB}	line segment AB	$\overline{AB} \parallel \overline{CD}$	Line AB is parallel to line CD.	AB	measure of line	$\overline{AB} \perp \overline{CD}$	Line AB is perpendicular to line CD.	\overleftrightarrow{AB}	segment AB line AB	$\angle A \cong \angle B$	Angle A is congruent to angle B.	$\triangle ABC$	triangle ABC	$\triangle A \sim \triangle B$	Triangle A is similar to triangle B.	$\square ABCD$	rectangle ABCD		Similarly marked segments are congruent.	$\parallel ABCD$	parallelogram ABCD		Similarly marked angles are congruent.
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METRIC CONVERSION CHART

Into Metric			Out of Metric		
If you know	Multiply by	To Get	If you know	Multiply by	To Get
Length			Length		
inches	2.54	centimeters	millimeters	0.04	inches
foot	30	centimeters	centimeters	0.4	inches
yards	0.91	meters	meters	3.3	feet
miles	1.6	kilometers	kilometers	0.62	miles
Area			Area		
sq. inches	6.5	sq. centimeters	sq. centimeters	0.16	sq. inches
sq. feet	0.09	sq. meters	sq. meters	1.2	sq. yards
sq. yards	0.8	sq. meters	sq. kilometers	0.4	sq. miles
sq. miles	2.6	sq. kilometers	hectares	2.47	acres
Mass (Weight)			Mass (Weight)		
ounces	28	grams	grams	0.035	ounces
pounds	0.45	kilograms	kilograms	2.2	pounds
short ton	0.9	metric ton	metric tons	1.1	short tons
Volume			Volume		
teaspoons	5	milliliters	milliliters	0.03	fluid ounces
tablespoons	15	milliliters	liters	2.1	pints
fluid ounces	30	milliliters	liters	1.06	quarts
cups	0.24	liters	liters	0.26	gallons
pints	0.47	liters	cubic meters	35	cubic feet
quarts	0.95	liters	cubic meters	1.3	cubic yards
gallons	3.8	liters			
cubic feet	0.03	cubic meters			
cubic yards	0.76	cubic meters			
Temperature			Temperature		
Fahrenheit	Subtract 32, then multiply by 5/9ths to get	Celsius	Celsius	Multiply by 9/5ths, then add 32 to get	Fahrenheit

HAND SIGNALS FOR CRANE OPERATION

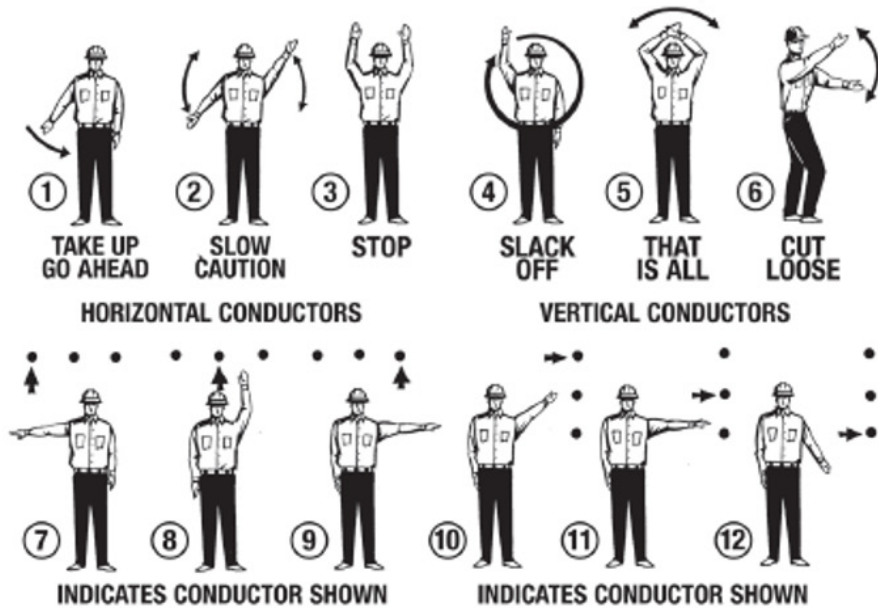
 <p>STOP – With arm extended horizontally to the side, palm down, arm is swung back and forth.</p>	 <p>EMERGENCY STOP – With both arms extended horizontally to the side, palms down, arms are swung back and forth.</p>	 <p>HOIST – With upper arm extended to the side, forearm and index finger pointing straight up, hand and finger make small circles.</p>
 <p>RAISE BOOM – With arm extended horizontally to the side, thumb points up with other fingers closed.</p>	 <p>SWING – With arm extended horizontally, index finger points in direction that boom is to swing.</p>	 <p>RETRACT TELESCOPING BOOM – With hands to the front at waist level, thumbs point at each other with other fingers closed.</p>
 <p>RAISE THE BOOM AND LOWER THE LOAD – With arm extended horizontally to the side and thumb pointing up, fingers open and close while load movement is desired.</p>	 <p>DOG EVERYTHING – Hands held together at waist level.</p>	 <p>LOWER – With arm and index finger pointing down, hand and finger make small circles.</p>
 <p>LOWER BOOM – With arm extended horizontally to the side, thumb points down with other fingers closed.</p>	 <p>EXTEND TELESCOPING BOOM – With hands to the front at waist level, thumbs point outward with other fingers closed.</p>	 <p>TRAVEL/TOWER TRAVEL – With all fingers pointing up, arm is extended horizontally out and back to make a pushing motion in the direction of travel.</p>

HAND SIGNALS FOR CRANE OPERATION CONTINUED

 <p>LOWER THE BOOM AND RAISE THE LOAD – With arm extended horizontally to the side and thumb pointing down, fingers open and close while load movement is desired.</p>	 <p>MOVE SLOWLY – A hand is placed in front of the hand that is giving the action signal.</p>	 <p>USE AUXILIARY HOIST (whipline) – With arm bent at elbow and forearm vertical, elbow is tapped with other hand. Then regular signal is used to indicate desired action.</p>
 <p>CRAWLER CRANE TRAVEL, BOTH TRACKS – Rotate fists around each other in front of body; direction of rotation away from body indicates travel forward; rotation towards body indicates travel backward.</p>	 <p>USE MAIN HOIST – A hand taps on top of the head. Then regular signal is given to indicate desired action.</p>	 <p>CRAWLER CRANE TRAVEL, ONE TRACK – Indicate track to be locked by raising fist on that side. Rotate other fist in front of body in direction that other track is to travel.</p>
 <p>TROLLEY TRAVEL – With palm up, fingers closed and thumb pointing in direction of motion, hand is jerked horizontally in direction trolley is to travel.</p>		

Source for hand signals: OSHA 29 CFR 1926, Subpart CC, Appendix A

SUGGESTED STANDARD SIGNALS FOR LINE WORK



Signal 1 is used to indicate the start of the pull (take up) or the continuation of the pull (go ahead). 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.

TRUCK HOIST SIGNALS

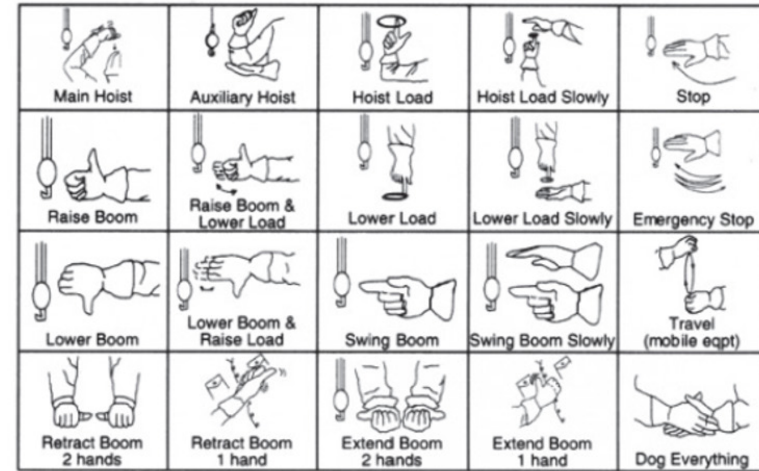


Table G-16 - Permissible Noise Exposures¹

Duration per day, hours	Sound level dBA slow response
8	90
6	92
4	95
3	97
2	100
1½	102
1	105
¾	110
½ or less	115

¹ When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions: $C_1/T_1 + C_2/T_2 + C_n/T_n$, exceeds unity, then, the mixed exposure should be considered to exceed the limit value. C_n indicates the total time of exposure at a specified noise level, and T_n indicates the total time of exposure permitted at that level.

Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.

Hazard/Risk Category	Clothing Description	Required Minimum Arc Rating of PPE [J/cm ² (cal/cm ²)]
0	Nonmelting, flammable materials (i.e., untreated cotton, wool, rayon, or silk, or blends of these materials) with a fabric weight at least 4.5 oz/yd ²	N/A
1	Arc-rated FR shirt and FR pants or FR coverall	16.74 (4)
2	Arc-rated FR shirt and FR pants or FR coverall	33.47 (8)
3	Arc-rated FR shirt and pants or FR coverall, and arc flash suit selected so that the system arc rating meets the required minimum	104.6 (25)
4	Arc-rated FR shirt and pants or FR coverall, and arc flash suit selected so that the system arc rating meets the required minimum	167.36 (40)

Equipment Type	Nominal Voltage Range and cal/cm ²		
	50 V to 250 V	251 V to 600 V	601 V to 1000 V
Self-contained meters/cabinets	4 ²	20 ⁴	30 ⁸
Pad-mounted transformers	4 ⁹	4 ⁹	6 ⁸
CT meters and control wiring	4 ²	4 ⁵	6 ⁸
Metal-clad switchgear/motor control centers	8 ³	40 ⁶	60 ⁸
Pedestals/pull boxes/hand holes	4 ²	8 ⁷	12 ⁸
Open air (includes lines)	4 ²	4 ⁷	6 ⁸
Network protectors	4 ¹⁰	_11	_11
Panel boards-single phase (all)/three phase (≤100A)	4 ²	8 ¹²	12 ⁸
Panel boards-three phase (≥100 A)	4 ²	_13	_13

¹This table was developed from fault testing based on equipment type and is independent of fault current unless otherwise noted.
 Calculations and test data are based on an 18 in. separation distance from the arc to the employee. See IEEE Std 1584-2002.
 Other methods are available to estimate arc exposure values and may yield slightly different but equally acceptable results.
 The use of the table in the selection of clothing is intended to reduce the amount or degree of injury but may not prevent all burns.
²Industry testing on this equipment by two separate major utilities and a research institute has demonstrated that voltages 50 V to 250 V will not sustain arcs for more than 2 cycles, thereby limiting exposure to less than 4 cal/cm². (See Ref [1].)
³Value based on IEEE 1584 formula for Motor Control Centers. (Gap = 1 in) (Xd = 1.641) (18 in distance) 51 kA (Based on a 208 V, 1000 kVA, 5.3% Z, served from a 500 MVA system) Maximum duration without circuit protective device operation from industry testing (see Ref [1]) is 10 cycles: 46.5 cal/s/cm² x 0.167 s = 7.8 cal/cm².
⁴Industry testing on 480 V equipment indicates exposures for self-contained meters do not exceed 20 cal/cm².

⁵Industry testing on 480 V equipment indicates exposures for CT meters and control wiring does not exceed 4 cal/cm².

⁶Value based on IEEE 1584 formula for Motor Control Centers. (Gap = 1 in) (Xd = 1.641) (18 in distance) 12.7 kA at 480 V (worst-case energy value from testing). (See Ref [2].) Maximum duration without circuit protective device operation from tests is 85 cycles: 26.2 cal/s/cm² x 1.42 s = 37 cal/cm².

⁷Incident analysis on this equipment indicates exposures do not exceed the values in the table.

⁸Engineering analysis indicates that applying a 150% multiplier to the 480 V exposure values provides a conservative value for equipment and open air lines operating at 601 V to 1000 V.

⁹Industry testing on 480 V equipment indicates exposures on pad-mounted transformers do not exceed 4 cal/cm². (See Ref [2].)

¹⁰Industry testing on 208 V network protectors indicates exposures do not exceed 4 cal/cm². (See Ref [1].)

¹¹Industry testing on 480 V network protectors indicates arcs will not self-extinguish and heat flux rates will exceed 60 cal/cm²/s at 24 in working distance. Perform arc hazard analysis. (See Ref [2].)

¹²Industry testing on 480 V panels with non-edge mounted bus bars indicates exposures do not exceed 8 cal/cm². (See Ref [2].)

¹³Industry testing on panelboards with edge-mounted, parallel bus bars indicate arcs will not self-extinguish and heat flux rates will exceed 60 cal/cm²/s at 18 in working distance. Perform arc hazard analysis. (See Ref [2].)

¹⁴IEEE 1584 original test data indicates there is no significant difference between heat flux rates for 400 V class equipment versus 600 V class equipment.

Clothing and Clothing Systems – Voltage, Fault Current, and Maximum Clearing Time for Voltages 1.1Kv to 46Kv¹ ac

Equipment Type	Nominal Voltage Range and cal/cm ²		
	50 V to 250 V	251 V to 600 V	601 V to 1000 V
Self-contained meters/cabinets	4 ²	20 ⁴	30 ⁸
Pad-mounted transformers	4 ⁹	4 ⁹	6 ⁸
CT meters and control wiring	4 ²	4 ⁵	6 ⁸
Metal-clad switchgear/motor control centers	8 ³	40 ⁶	60 ⁸
Pedestals/pull boxes/hand holes	4 ²	8 ⁷	12 ⁸
Open air (includes lines)	4 ²	4 ⁷	6 ⁸
Network protectors	4 ¹⁰	- ¹¹	- ¹¹
Panel boards-single phase (all)/three phase (≤100A)	4 ²	8 ¹²	12 ⁸
Panel boards-three phase (≥100 A)	4 ²	- ¹³	- ¹³

¹This table was developed from fault testing based on equipment type and is independent of fault current unless otherwise noted.

Calculations and test data are based on an 18 in. separation distance from the arc to the employee. See IEEE Std 1584-2002.

Other methods are available to estimate arc exposure values and may yield slightly different but equally acceptable results.

The use of the table in the selection of clothing is intended to reduce the amount or degree of injury but may not prevent all burns.

²Industry testing on this equipment by two separate major utilities and a research institute has demonstrated that voltages 50 V to 250 V will not sustain arcs for more than 2 cycles, thereby limiting exposure to less than 4 cal/cm². (See Ref [1].)

³Value based on IEEE 1584 formula for Motor Control Centers. (Gap = 1 in) (Xd = 1.641) (18 in distance) 51 kA (Based on a 208 V, 1000 kVA, 5.3% Z, served from a 500 MVA system) Maximum duration without circuit protective device operation from industry testing (see Ref [1]) is 10 cycles: 46.5 cal/s/cm² x 0.167 s = 7.8 cal/cm².

⁴Industry testing on 480 V equipment indicates exposures for self-contained meters do not exceed 20 cal/cm².

Live-Line Tool Work Clothing and Clothing Systems – Voltage, Fault Current, and Maximum Clearing Time for Voltages 46.1 kV to 800 kV⁽¹⁾ ac (page 1 of 2) (See NESC Rule 410A3 in its entirety)

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	18.2	36.4	54.5
	30	10.2	20.4	30.6
	40	6.6	13.2	19.7
	50	4.6	9.2	13.9
72.6 to 121	20	9.9	19.8	29.8
	30	5.7	11.4	17.1
	40	3.8	7.5	11.3
	50	2.7	5.4	8.1
138 to 145	20	12.1	24.1	36.2
	30	7.4	14.9	22.3
	40	5.2	10.4	15.6
	50	3.9	7.8	11.7
161 to 169	20	11.9	23.9	35.8
	30	7.4	14.8	22.2
	40	5.2	10.3	15.5
	50	3.9	7.8	11.6
230 to 242	20	13.6	27.3	40.9
	30	8.4	16.8	25.2
	40	5.9	11.7	17.6
	50	4.4	8.8	13.2
345 to 362	20	26.4	52.7	79.1
	30	16.2	32.4	48.6
	40	11.3	22.6	34.0
	50	8.5	17.0	25.5

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)
500 to 550	20	23.1	46.2	69.2
	30	14.2	28.4	42.6
	40	10.0	19.9	29.9
	50	7.5	15.0	22.4
765 to 800	20	25.3	50.5	75.8
	30	15.6	31.2	46.8
	40	10.9	21.7	32.6
	50	8.2	16.3	24.5

¹Arc gap—calculated by using the phase-to-ground voltage of the circuit and dividing by 10. The dielectric strength of air is taken at 10 kV per inch. See IEEE Std 4-1995.

Distance from arc—calculated by using the minimum approach distance from Table 444-1, subtracting two times the assumed arc gap length, and using the following T values: 72.6 kV to 362 kV = 3.0, 362.1kV to 550 kV = 2.4, 550.1 kV to 800 kV = 2.0.

These calculations were derived using a commercially available computer software program. Other methods are available to estimate arc exposure values and may yield slightly different, but equally acceptable results.

The use of the table in the selection of clothing is intended to reduce the amount or degree of injury but may not prevent all burns.

Maximum-Use Voltage for Rubber Gloves (Source: OSHA 29 CFR 1910.137(c)(2)(i) Table I-4)

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.

Assigned Protection Factors⁵

Type of respirator ^{1,2}	Quarter mask	Half mask	Full facepiece	Helmet/hood	Loose-fitting facepiece
1. Air-Purifying Respirator	5	3-10	50		
2. Powered Air-Purifying Respirator (PAPR)		50	1,000	4 25/1,000	25
3. Supplied-Air Respirator (SAR) or Airline Respirator					
• Demand mode		10	50		
• Continuous flow mode		50	1,000	4 25/1,000	25
• Pressure-demand or other positive-pressure mode		50	1,000		
4. Self-Contained Breathing Apparatus (SCBA)					
• Demand mode		10	50	50	
• Pressure-demand or other positive-pressure mode (e.g., open/closed circuit)			10,000	10,000	

Notes:

- ¹Employers may select respirators assigned for use in higher workplace concentrations of a hazardous substance for use at lower concentrations of that substance, or when required respirator use is independent of concentration.
- ²The assigned protection factors in Table 1 are only effective when the employer implements a continuing, effective respirator program as required by this section (29 CFR 1910.134), including training, fit testing, maintenance, and use requirements.
- ³This APF category includes filtering facepieces, and half masks with elastomeric facepieces.
- ⁴The employer must have evidence provided by the respirator manufacturer that testing of these respirators demonstrates performance at a level of protection of 1,000 or greater to receive an APF of 1,000. This level of performance can best be demonstrated by performing a WPF or SWPF study or equivalent testing. Absent such testing, all other PAPRs and SARs with helmets/hoods are to be treated as loose-fitting facepiece respirators, and receive an APF of 25.
- ⁵These APFs do not apply to respirators used solely for escape. For escape respirators used in association with specific substances covered by 29 CFR 1910 subpart Z, employers must refer to the appropriate substance-specific standards in that subpart. Escape respirators for other IDLH atmospheres are specified by 29 CFR 1910.134, (d)(2)(ii).

Minimum Distance Between Protector Gauntlet and Cuff or Rubber Glove

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.

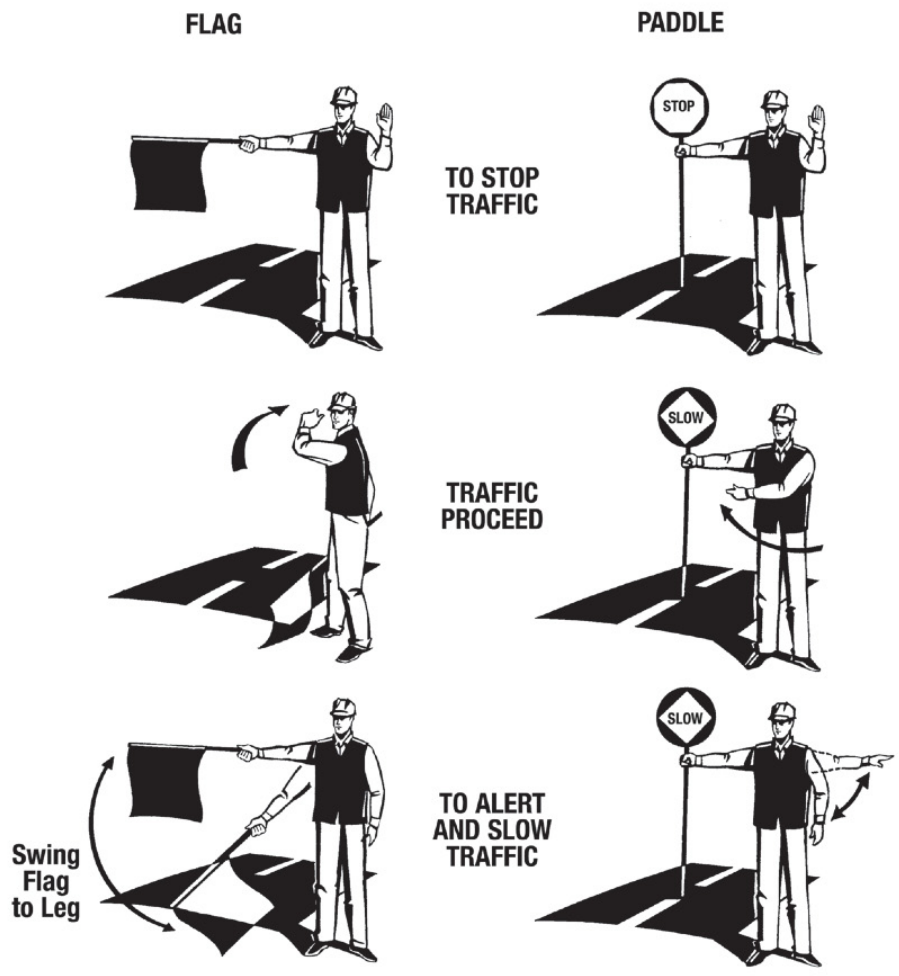
Exception 2: If electric equipment and devices are insulated, isolated, or both, such that the multiphase exposure on a grounded wye circuit is removed and if supplemental insulation (e.g., insulated aerial device or structure-mounted insulating work platform) is used to insulate the employee from ground,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

Minimum Clearance Distances

Voltage (nominal, kV, alternating current)	Minimum clearance distance (feet)
up to 50	10
over 50 to 200	15
over 200 to 350	20
over 350 to 500	25
over 500 to 750	35
over 750 to 1,000	45
over 1,000	(as established by the utility owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution).

Note: The value that follows "to" is up to and includes that value. For example, over 50 to 200 means up to and including 200kV.

USE OF HAND-SIGNALING DEVICES BY FLAGGERS



AC Live-Work Minimum Approach Distance (page 1 of 2) (See NESC Rule 441 in its entirety)

AC Live-Work Minimum Approach Distance (page 1 of 2) (See NESC Rule 441 in its entirety)

Voltage in Kilovolts Phase-to-Phase ^{1,2,3}	Distance to employee ⁴					
	Phase-to-ground		Phase-to-phase			
	(m)	(ft-in)	(m)	(ft-in)		
0 to 0.050	Not specified		Not specified			
0.051 to 0.300	Avoid contact		Avoid contact			
0.301 to 0.750	0.33	1-1	0.33	1-1		
0.751 to 5.0	0.63	2-1	0.63	2-1		
5.1 to 15.0	0.65	2-2	0.68	2-3		
15.1 to 36.0	0.77	2-7	0.89	3-0		
36.1 to 46.0	0.84	2-10	0.98	3-3		
46.1 to 72.5	1.00	3-4	1.20	4-0		
Voltage in Kilovolts Phase-to-Phase	Distance to employee from energized part ^{4,5,6,10}					
	Without tools phase-to-ground		With tools phase-to-ground ^{7,9}		Without tools phase-to-phase ⁸	
	(m)	(ft-in)	(m)	(ft-in)	(m)	(ft-in)
72.6 to 121	1.06	3-6	1.13	3-9	1.42	4-8
121.1 to 145	1.21	4.0	1.30	4-4	1.64	5-5
145.1 to 169	1.36	4-6	1.46	4-10	1.94	6-5
169.1 to 242	1.87	6-2	2.01	6-8	3.08	10-2
242.1 to 362	3.19	10-6	3.41	11-3	5.52	18-2
362.1 to 420	3.99	13-2	4.25	14-0	6.81	22-5
420.1 to 550	4.78	15-9	5.07	16-8	8.24	27-1
550.1 to 800	6.53	21-6	6.88	22-7	11.38	37-5

AC Live-Work Minimum Approach Distance (page 2 of 2) (See NESC Rule 441 in its entirety)

¹For single-phase lines off three phase systems, use the phase-to-phase voltage of the system.

²For single-phase systems, use the highest voltage available.

³Inadvertent movement factors used in these tables are as follows:

0.301 kV to 0.750 kV = 0.31 m (1 ft)

0.751 kV to 72.5 kV = 0.61 m (2 ft)

72.6 kV to 800 kV = 0.31 m (1 ft)

⁴Distances 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 h or 24 km per h, unsaturated air, normal barometer, uncontaminated air, and clean and dry insulators. If standard atmospheric conditions do not exist, extra care must be taken.

⁵For voltages above 72.5 kV, distances are based on altitudes below 900 m (3000 ft) above sea level. For altitudes above 900 m (3000 ft), Rule 441A6 applies.

⁶Distances were calculated using the following TOV values:

72.6 kV to 362 kV = 3.5

362.1 kV to 550 kV = 3.0

550.1 kV to 800 kV = 2.5

⁷Distances for live-line tools in the air gap were calculated by adding a tool factor to the electrical component (OSHA 29 CFR 1910.269 Appendix B[B68]).

⁸Phase-to-phase live-line tool in the air gap values are not available. If this situation exists, an engineering evaluation should be performed.

⁹*With tools* means a live-line tool bridging the air gap to the employee from the energized part.

¹⁰For barehand work where the employee is at line potential, this distance is to an object at a different potential.

DC Live Work Minimum Approach Distance (See NESC Rule 441 in its entirety)

Maximum pole-to-pole voltage in kilovolts ^{1,2,3}	Distance to employee			
	Pole-to-ground			
	(m)		(ft-in)	
0 to 0.050	Not specified			
0.051 to 0.300	Avoid contact			
0.301 to 0.750	0.32		1-1	
0.751 to 5	0.64		2-2	
5.1 to 72.5	0.89		2-11	
Maximum pole-to-ground voltage in kilovolts ^{1,2,3}	Distance to employee from energized part			
	Without tools pole-to-ground		With tools ⁴ pole-to-ground	
	(m)	(ft-in)	(m)	(ft-in)
72.6 to 250	1.28	4-3	1.37	4-7
250.1 to 400	1.95	6-5	2.11	7-0
400.1 to 500	2.61	8-7	2.81	9-3
500.1 to 600	3.39	11-2	3.62	11-11
600.1 to 750	4.79	15-9	5.08	16-8

¹For voltages above 72.6 kV, distances were calculated using a TOV value of 1.8.

²The data used to calculate these tables 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 h or 24 km per h, unsaturated air, normal barometer, uncontaminated air, and clean and dry insulators. If standard atmospheric conditions do not exist, extra care must be taken.

³For voltages above 72.5 kV, distances are based on altitudes below 900 m (3,000 ft) above sea level. For altitudes above 900 m (3,000 ft), Rule 441A6 applies.

⁴Distances for live-line tools in the air gap were calculated by adding a tool factor to the electrical component (IEEE 516 C2 1.1 tool factor).

Communication Work Minimum Approach Distances^{3,4} (See NESC Rule 431 in its entirety)

Voltage range phase-to-phase (rms) ¹	Distance to employee at altitudes from sea level to 3,600 m
0 to 50 V ²	Not specified
51 to 300 V ²	Avoid contact
301 to 750 V ²	0.32 m
751 V to 15 kV	0.69 m
15.1 kV to 36 kV	0.91 m
36.1 kV to 46 kV	1.07 m
46.1 kV to 72.5 kV	1.22 m

At altitudes from

Voltage range phase-to-phase (rms) ¹	Sea level to 900 m	901 to 1,800 m	1,801 to 3,600 m
72.6 kV to 121.0 kV	1.43 m	1.52 m	1.77 m
121.1 kV to 145.0 kV	1.60 m	1.71 m	2.01 m
145.1 kV to 169 kV	1.78 m	1.89 m	2.35 m
169.1 kV to 242 kV	2.29 m	2.47 m	2.93 m
242.1 kV to 362 kV	3.70 m	3.96 m	4.75 m
362.1 kV to 420 kV	4.55 m	4.91 m	5.82 m
420.1 kV to 550 kV	5.38 m	5.79 m	6.89 m
550.1 kV to 800 kV	7.19 m	7.74 m	9.23 m

¹For single-phase lines off three-phase systems, use the phase-to-phase voltage of that system.

²For single-phase systems, use the highest voltage available.

³Distances listed are for standard atmospheric conditions defined as temperatures above freezing, wind less than 24 km per h, and normal barometric pressure with unsaturated and uncontaminated air.

⁴The basis for the MAD values in this table was obtained from OSHA 29 CFR 1910.269 Tables R-3 through R-7. Below 72 kV, the MAD values for phase-to-phase exposure of Table R-6 were used. Above 72 kV, the values for phase-to-ground exposure of Table R-7 were used. An additional 0.3 m was added for communications workers over the electrical worker value.

Communication Work Minimum Approach Distances^{3,4} (See NESC Rule 431 in its entirety)

Voltage range phase-to-phase (rms) ¹	Distance to employee at altitudes from sea level to 12,000 ft
0 to 50 V	Not specified
51 to 300 V	Avoid contact
301 to 750 V	1 ft-1 in
751 V to 15 kV	2 ft-3 in
15.1 kV to 36 kV	3 ft-0 in
36.1 kV to 46 kV	3 ft-6 in
46.1 kV to 72.5 kV	4 ft-0 in

At altitudes from

Voltage range phase-to-phase (rms) ¹	At altitudes from		
	Sea level to 3,000 ft	3,001 to 6,000 ft	6,001 to 12,000 ft
72.6 kV to 121.0 kV	4 ft-9 in	5 ft-0 in	5 ft-10 in
121.1 kV to 145.0 kV	5 ft-4 in	5 ft-8 in	6 ft-8 in
145.1 kV to 169 kV	5 ft-10 in	6 ft-3 in	7 ft-3 in
169.1 kV to 242 kV	7 ft-8 in	8 ft-2 in	9 ft-08 in
242.1 kV to 362 kV	12 ft-3 in	13 ft-2 in	15 ft-8 in
362.1 kV to 420 kV	14 ft-11 in	16 ft-2 in	19 ft-2 in
420.1 kV to 550 kV	17 ft-8 in	19 ft-0 in	22 ft-8 in
550.1 kV to 800 kV	23 ft-8 in	25 ft-5 in	30 ft-4 in

¹For single-phase lines off three-phase systems, use the phase-to-phase voltage of that system.

²For single-phase systems, use the highest voltage available.

³Distances listed are for standard atmospheric conditions. The data used to calculate Table 431-1(ft) was derived from test data taken under standard atmospheric conditions for dry and clean insulators. Standard atmospheric conditions are defined as temperatures above freezing, wind less than 15 mi per h, and normal barometric pressure with unsaturated and uncontaminated air.

⁴The basis for the MAD values in this table was obtained from OSHA 29 CFR 1910.269 Tables R-3 through R-7. Below 72 kV, the MAD values for phase-to-phase exposure of Table R-6 were used. Above 72 kV, the values for phase-to-ground exposure of Table R-7 were used. An additional 0.3 m was added for communications workers over the electrical worker value.

Rubber Insulating Equipment, Voltage Requirements (See: OSHA 29 CFR 1910.137 Table I-4)

Class of equipment	Maximum use voltage ¹ AC rms	Retest voltage ² AC rms	Retest voltage ² DC avg
00	500	2,500	10,000
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

¹ 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 if:

- (1) There is no multiphase exposure in a system area and the voltage exposure is limited to the phase-to-ground potential, or
 - (2) The electric equipment and devices are insulated or isolated or both so that the multiphase exposure on a grounded wye circuit is removed.
- ² The proof-test voltage shall be applied continuously for at least 1 minute, but no more than 3 minutes.

Rubber Insulating Equipment Test Intervals Maximum (Source: OSHA 1910.137(c)(2) Table I-5)

Rubber Insulating Equipment	When to Test
Rubber insulating line hose	Before first issue and every 12 months thereafter ¹ or upon indication that insulating value is suspect.
Rubber insulating covers	Before first issue and every 12 months thereafter ¹ or upon indication that insulating value is suspect.
Rubber insulating blankets	Before first issue and every 12 months thereafter ¹ or upon indication that insulating value is suspect.
Rubber insulating mechanical jumpers	Before first issue and every 12 months thereafter ¹ or upon indication that insulating value is suspect.
Rubber insulating gloves	Before first issue and every 6 months thereafter ¹ or upon indication that insulating value is suspect.
Rubber insulating sleeves	Before first issue and every 12 months thereafter ¹ or upon indication that insulating value is suspect.
¹ 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.	

Western Red Cedar Total CCA Treatment Poles--Average Weights (Source: 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

Creosoted Yellow Pine Poles--Average Weights (Source: ANSI 05.1-2002)

Length (ft)	Class											
	H6	H5	H4	H3	H2	H1	1	2	3	4	5	6
30												
35												
40												
45					2,222	1,884						
50					2,585	2,222						
55					2,976	2,585						
60					3,454	2,976						
65					4,015	3,454						
70					4,620	4,015						
75					5,198	4,620						
80					5,863	5,198						
85					6,590	6,130						
90					7,458	6,600		5,863	4,730			
					8,019	7,458		6,600	5,264			
					8,762	8,019		7,458	5,869	4,730		

Pounds

Douglas Fir Penta Treated Poles—Average Weights (Source: ANSI 05.1-2002)

Length (ft)	Class						1		2			
	H6	H5	H4	H3	H2	H1	I	J	K			
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							1,930	1,560	1,410	1,225	1,075	930
50	4,397	3,998	3,825	3,034	2,635	2,280	2,225	1,870	1,625	1,420	1,245	
55	4,270	4,872	4,354	3,490	3,000	2,573	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			
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

Maximum Allowable Slopes for Excavations Less than 20 Feet deep

SOIL OR ROCK TYPE	MAXIMUM ALLOWABLE SLOPES (H:V)(1) FOR EXCAVATIONS LESS THAN 20 FEET DEEP(3)
STABLE ROCK	VERTICAL (90°)
TYPE A (2)	3/4:1 (53°)
TYPE B	1:1 (45°)
TYPE C	1 1/2:1 (34°)

Footnote(1) Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off.

Footnote(2) 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°).

Footnote(3) Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.

Type A: A cohesive soil with an unconfined, compressive strength of 1.5 ton per square foot (tsf)(144 kPa); or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered type A.

Type B: Cohesive soil with an unconfined strength greater than 0.5 tsf (48kPa), but less than 1.5tsf (144 kPa); or Granular cohesionless soils including; angular gravel (similar to crushed rock) silt, silt loam and in some cases silty clay loam and sandy clay loam. Previously disturbed soils except those that would otherwise be classified as Type C soils.

Soils that meets the unconfined compressive strength or cementation requirements of Type A, but is fissured or subject to vibration; or dry rock that is not stable; or material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

Type C: Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less, or granular soils including gravel, sand and loamy sand; or submerged soil or soil from which water is freely seeping; or submerged rock that is not stable, or material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4H:1V) or steeper.

¹Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.

²Numbers in parentheses are angles expressed in degrees from the horizontal. Angles have been rounded off.

³A 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°).

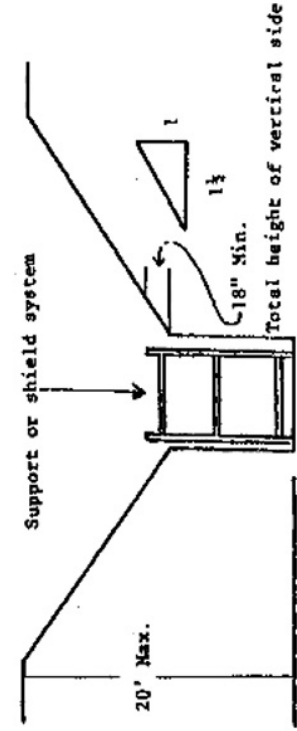
Excavations Made in Type C Soil

1. All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1½:1.



SIMPLE SLOPE

2. All excavations 20 feet or less in depth which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. All such excavations shall have a maximum allowable slope of 1½:1.



VERTICAL SIDED LOWER PORTION

Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHZ)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time IEL ² , IHL 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 IEL ² , IHL 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.

Minimum Depth of Clear Working Space at Electric Equipment, 600 V or Less

Nominal voltage to ground	Minimum clear distance for condition ²³					
	Condition A		Condition B		Condition C	
	m	ft	m	ft	m	ft
0-150	1.0	3.0	1.0	3.0	0.9	3.0
151-600	1.0	3.0	1.0	3.5	1.2	4.0

Notes to Table S-1:

1. Minimum clear distances may be 0.7 m (2.5 ft) for installations built before April 16, 1981.

2. Conditions A, B, and C are as follows:

Condition A - Exposed live parts on one side and no live or grounded parts on the other side of the working space, or exposed live parts on both sides effectively guarded by suitable wood or other insulating material. Insulated wire or insulated busbars operating at not over 300 volts are not considered live parts.

Condition B - Exposed live parts on one side and grounded parts on the other side.

Condition C - Exposed live parts on both sides of the work space (not guarded as provided in Condition A) with the operator between.

3. Working space is not required in back of assemblies such as dead-front switchboards or motor control centers where there are no renewable or adjustable parts (such as fuses or switches) on the back and where all connections are accessible from locations other than the back. Where rear access is required to work on deenergized parts on the back of enclosed equipment, a minimum working space of 762 mm (30 in.) horizontally shall be provided.

Minimum Depth of Clear Working Space at Electric Equipment, Over 600 V

Nominal voltage to ground	Minimum clear distance for condition ²³					
	Condition A		Condition B		Condition C	
	m	ft	m	ft	m	ft
601-2500 V	0.9	3.0	1.2	4.0	1.5	5.0
2501-9000 V	1.2	4.0	1.5	5.0	1.8	6.0
9001 V-25 kV	1.5	5.0	1.8	6.0	2.8	9.0
Over 25-75 kV ¹	1.8	6.0	2.5	8.0	3.0	10.0
Above 75 kV ¹	2.5	8.0	3.0	10.0	3.7	12.0

Notes to Table S-2.

¹Minimum depth of clear working space in front of electric equipment with a nominal voltage to ground above 25,000 volts may be the same as that for 25,000 volts under Conditions A, B, and C for installations built before April 15, 1991.

²Conditions A, B, and C are as follows.

Condition A - Exposed live parts on one side and no live or grounded parts on the other side of the working space, or exposed live parts on both sides effectively guarded by suitable wood or other insulating material. Insulated wire or insulated busbars operating at not over 300 volts are not considered live parts.

Condition B - Exposed live parts on one side and grounded parts on the other side. Concrete, brick, and tile walls are considered as grounded surfaces.

Condition C - Exposed live parts on both sides of the work space (not guarded as provided in Condition A) with the operator between.

³Working space is not required in back of equipment such as dead-front switchboards or control assemblies that has no renewable or adjustable parts (such as fuses or switches) on the back and where all connections are accessible from locations other than the back. Where rear access is required to work on the deenergized parts on the back of enclosed equipment, a minimum working space 762 mm (30 in.) horizontally shall be provided.

Radio Frequency Radiation Warning Symbol



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